PAPER NAME

Prosiding Internasional - The Learning Effectiveness of Women's Fashion Making Practice with The Up-

AUTHOR

Kurniati FT UNM

WORD COUNT

189276 Words

CHARACTER COUNT

1096508 Characters

PAGE COUNT

451 Pages

FILE SIZE

9.5MB

SUBMISSION DATE

Jun 22, 2023 6:39 AM GMT+8

REPORT DATE

Jun 22, 2023 6:54 AM GMT+8

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PERKUMPULAN AHLI PENDIDIKAN TEKNOLOGI DAN KEJURUAN INDONESIA

Strengthening Technology and Vocational Competence on Pandemic Era Through Digital Ecosystems

November 25, 2021
Hosted By
Faculty of Engineering
Universitas Negeri Manado Manado, Indonesia

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Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

**The Paptekindo International
Conference And Convention 2021**

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TEKNOLOGI DAN KEJURUAN INDONESIA**

Strengthening Technology and Vocational Competence
Era Through Digital Ecosystems

**Strengthening Technology
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KATA PENGANTAR

Puji syukur kami panjatkan kehadirat Tuhan Yang Maha Esa yang telah menganugerahkan banyak nikmat sehingga kami dapat menyusun buku " Strengthening of Technolgy and Vocational Competenty on Pandemic Era Trough Ecosystem Digital".

Menjawab tantangan industri 4.0, pendidikan kejuruan (Vocational Education) sebagai pendidikan yang berbeda dari jenis pendidikan lainnya harus memiliki karakteristik sebagai berikut; berorientasi pada kinerja individu dalam dunia kerja; justifikasi khusus pada kebutuhan nyata di lapangan; fokus kurikulum pada aspek-aspek psikomotorik, afektif, dan kognitif; tolok ukur keberhasilan tidak hanya terbatas di sekolah; kepekaan terhadap perkembangan dunia kerja; memerlukan sarana dan prasarana yang memadai; dan adanya dukungan masyarakat.

Namun saat ini revolusi industry berkembang menjadi Society 5.0. Yang dimaksud dengan Society 5.0 atau Masyarakat 5.0 adalah konsep teknologi masyarakat yang berpusat pada manusia dan berkolaborasi dengan teknologi (AI dan IoT) untuk menyelesaikan masalah sosial yang terintegrasi pada ruang dunia maya dan nyata.

Buku ini adalah hasil pemikiran dan presentasi peserta dan digunakan untuk kepentingan ilmu pengetahuan dan diedarkan untuk masyarakat umum untuk diperjual belikan maupun dibagikan secara gratis. Semoga buku ini bermanfaat.

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DAFTAR ISI

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

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ABSTRACT PARALLEL SESSION

THE CORRELATION OF STUDENTS' INTERESTS AND LEARNING OUTCOMES USING BLENDED LEARNING IN KONSTRUKSI JALAN DAN JEMBATAN

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The widespread spread of Corona Virus Disease (COVID-19) has disrupted the teaching and learning process. The government carry out an online learning rules for all schools to minimize the spread of the corona virus in the education field. However, this rule considered irrelevant for Vocational High Schools (SMK) which require practical activities to support theoretical knowledge in the learning activity. In this case, the mixed combination learning model of an online learning and an offline learning or the blended learning model is applied for Vocational School's students. The blended learning influences a different learning interest and learning outcomes for each student. This research aims to figure out the learning interest of vocational school students in the Konstruksi Jalan dan Jembatan subject (Road and Bridge Construction) learning process using blended learning and its correlation with the students' learning outcomes. In this research, the sampling technique used is purposive sampling. The total participants in this study were 31 students of 12th graders of DPIB class in SMKN 2 Surabaya. The approach used in this research is quantitative with the type of correlational research. The research instrument used in this research was closed-ended questionnaire of students' learning interest using a 5-point Likert Scale and the learning outcome's document of vocational school students using the blended learning in the Konstruksi Jalan dan Jembatan subject. The collected data was analyzed using SPSS 25.0 with Pearson Product Moment analysis techniques and statistic descriptive methods. The results of statistic descriptive analysis show that most students have a positive perception of their learning interest with blended learning in road and bridge construction learning with an average of 3.94. The results of the product moment analysis show that there is a correlation between students' learning interest and learning outcomes with blended learning model in the Konstruksi Jalan dan Jembatan subject, the r-value of 0.936 with a significance level of 0.05 and r table 0.355, also the data correlation coefficient is 0.15 {r-value ≥ r table (0.936 ≥ 0.355)}. The higher the students' learning interest, the higher the value of the students' learning outcomes.

THE EFFECTIVENESS OF VISUAL MEDIA IN INCREASING LEARNING OUTCOME OF TEXTILE SUBJECT IN SMK N 1 JAMBU

A. Kusumastuti, N. Afifah, and Widowati

This study was carried out to determine the effectivity of visual media on textile subjects of grade X students in SMKN 1 Jambu. This experimental research was executed with pre-test and post-test design. In this research, the used population was all students of grade X boutique fashion of 68 students. Sample was taken through random sampling. Data was collected using test, documentation, and observation methods, followed by t-test analysis. Examining hypothesis, it was found that tc 24.54> ttable 2.035, revealed that media visual was effective to determine learning outcome of textile subject. The gain test achieved 0.62 or 62%, indicated the improvement of learning outcome using media visual reached medium category.

Index Terms— Effectiveness, Visual Media, Learning Outcomes, Boutique Fashion

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Entrepreneurial Activities Of Unesa Fashion Design Students During The Covid-19 Pandemic

Indarti, Urip Wahyuningsih, Yulistiana, Yuhri Inang Orihatina and Li Hsun Peng

One of the government's hopes for graduates of vocational students in higher education is to become entrepreneurs. The Vocational Student Entrepreneurship Program (PWMV) is an effort by the Directorate of Vocational Education of the Ministry of Education and Culture to foster new entrepreneurs for vocational students. The purpose of this study was to explore the entrepreneurial activities of PWMV recipient students in running a business in the creative industry during the pandemic COVID-19 and student entrepreneurship readiness. The research method uses surveys and interviews. Respondents were 14 students of the fashion design study program at the State University of Surabaya who were recipients of the 2021 PWMV grant. This study explores student entrepreneurial activities as best practices in entrepreneurship learning.

Index Terms— Entrepreneurial Activities; entrepreneurship learning; Vocational Student Entrepreneurship Program; COVID-19 Evaluastion Of Nutritional Properties Of Pia Cowpeas (Vigna Unguiculata) As Food Souvenir In Malang City

Anggi Martiningtyas1, Umi Rohajatien1, Teti Setiawati 1, Wiwik Wahyuni1,

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Pia is one type of cake that is very popular with the public. Pia is also very suitable as a souvenir. In general, pia is a mixture of green beans with sugar wrapped in flour and then baked. This research was conducted using cowpeas as the contents of pia. Pia cowpeas is made using several ingredients, including wheat flour, glutinous rice flour, cooking oil, cowpeas, brown sugar, salt, hot water and vanilla. In addition, this study also aims to evaluate pia cowpeas with different formulas. This studies used experimental methods by enriching the pia by filling it with different formulations of cowpeas. Furthermore, the data analysis was by two way ANOVA.. The evaluation results of nutritional properties is known as follows, the highest rate of protein (15.042%) in Formula C, fat (11.269%) in Formula C, carbohydrates (71.769%) in Formula A, ash (3.311%) in Formula C, water (6.871%) in Formula C. Base on the evaluation studies, enriching of pia cowpeas had an impact on the nutritional properties. The more use of cowpeas and glutinous rice flour has an impact on the gradation of the percentage of water, carbohydrates, protein, ash in bread, and increases the percentage of carbohydrates in pia.

Keywords: Pia, Cowpeas, Nutritional properties, food souvenir

THE BATIK SEMANGGI PROJECT AS A COLLABORATIVE EFFORT BETWEEN LECTURERS, STUDENTS AND SMES IN THE EX-LOCALIZATION OF DOLLY

Indarti, Urip Wahyuningsih, Yuhri Inang Prihatina, Yulistiana, and Li Hsun Peng

Collaboration is the ability to participate in an activity and build relationships with other people and teamwork to achieve a goal. In realizing one of the research activities and independent learning on an independent campus (MBKM), student collaboration with lecturers and industry is carried out. The purpose of the study was to describe the pattern of collaboration between lecturers, students, and SMEs in the making of the Semanggi Suroboyo Batik Project. The research method uses a descriptive, involving the role of students and SMEs involved, namely batik SMEs in Putat Jaya Village. Putat Jaya is an urban village in Surabaya, which lacks economic growth after the closure of Dolly's localization. Research results can be used as best practices in conducting collaborative research.

Index Terms— Batik Semanggi; Collaborative; Research Project; MBKM

INDUSTRIAL REVOLUTION 4.0 AND DEMOGRAPHIC BONUS: CHALLENGES AND TVET POLICIES THAT THE INDONESIAN GOVERNMENT NEEDS TO PREPARE

M. Agphin Ramadhan, R. Eka Murtinugraha

The Industrial Revolution 4.0, the demographic bonus, and the global Covid-19 pandemic caused national economic growth to be quite impacted. Technical and Vocational Education and Training (TVET) is an education system that focuses on acquiring knowledge and skills in the world of work. The TVET policy in Indonesia needs to be prepared by the government in response to real challenges, especially in the next five years. This paper aims to answer five questions. First, our view of the next five years is related to the disruptive era and demographic dividend. Second, the policies must be prepared in industry and human resources for the next five years. Third, vocational education policies need to be ready for the next five years. Fourth, the risks that are important to consider in the development of Indonesian TVET. Fifth, a review of Presidential Regulation number 86 of 2020 regarding the government's work plan for 2021.

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EFFECTIVENESS COMPARISON OF CO-OP CO-OP WITH MAKE A MATCH METHODS IN ONLINE LEARNING DURING THE COVID19 PANDEMIC

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Covid 19 pandemic leads to the implementation of online learning. Teachers' innovation is of important to support learning activities. Suitable learning models that can arouse students' interest and activity is highly required. This study aims to compare the effectiveness of co-op co-op and make a match online learning model. This quasi-experimental research employed experimental class consisted of 35 students of class X DPIB 1 and control class consisted of 36 students of class X DPIB 2. Pre-test and post-test questions were given via google forms to the classes. The average result of N-Gain calculation in the experimental class with the co-op co-op model was 75.9%. It means that the use of co-op co-op online learning model was effective in improving student learning outcomes. In the experimental class with make-up a match model by 73%, it means that the use of make a match online learning model was quite effective in improving student learning outcomes. It can be concluded that the use of co-op co-op online learning model was more effective in improving student learning outcomes

Keywords: Online learning, learning model, co-op co-op, make a match

KNOWLEDGE-BASED BUMDESA DIGITAL ECONOMY

Muhammad Rifai Katili, Lanto Ningrayati Amali, Lillyan Hadjaratie, Mohamad Syafri Tuloli, Sitti Suhada, Mohamad Ramdhan Arif Kaluku, Gladly Caren Rorimpandey, Vivi Peggie Rantung, Stralen Pratasik, and Made Krisnanda

This paper aims to describe the concept of a knowledge-based BUMDesa digital economy, owing to today's stagnant activities and productivity of BUMDesa. Various parties, therefore, have recommended revitalizing BUMDesa through synergy and collaboration programs, as well as optimizing the capacity of BUMDesa through a digital transformation concept. However, an initial research report revealed that the lack of knowledge of BUMDesa officials contributed significantly to the emergence of problems in the management of BUMDesa. This paper shows that a knowledge-based BUMDesa digital economy is an innovative concept in supporting and accelerating efforts to improve the economy of rural communities through the participation of BUMDesa.

Keywords— collaboration, digital economy, knowledge-based, revitalizing

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Self-directed Learning Readiness (SDLR) of Mechanical Engineering Student in Online Learning Context

Ayub Budhi Anggoro, Sarwi Asri, Taofan Ali Achmadi, Andri Setiyawan, Sudiyono, Hendrix Noviyanto Firmansyah

Self-directed learning is an important factor for adult learning, especially in online learning. Awareness of students to direct themselves in learning will optimize the learning process. Optimally the learning process will certainly have an impact on learning outcomes, so that students are able to master the competencies taught and get high quality learning. This study aims to: 1) see the level of self-directed learning of students in online learning; 2) see the difference in SDLR between new and old students, and 3) find out which aspects of SDLR are most prepared and most need to be improved in students of the Department of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Semarang. This research is a survey research using a cross-sectional design. The research sample consisted of 160 students from the Mechanical Engineering Department consisting of 88 new students and 72 old students. The sampling technique used stratified random sampling. Questionnaire sheets were used in data collection and analyzed by descriptive and inferential statistics. The results showed that: 1) students' readiness for self-study in the Mechanical Engineering Department, FT Unnes, was in the average category of 65.3%, the category above the average was 29.3%, and below the average was 1.2%; 2) There is a difference in readiness for independent learning between old and new students, new students have a higher readiness for independent learning than old students, although the difference is not in a wide range; 3) The aspect of SDLR that is most readily available is task management and the most need to be improved is procrastination management.

Keyword: Adult learning, Mechanical Engineering, Online learning, Self-directed learning readiness.

Design Facility of Waste to Electricity Plant by Implementing Incinerator of Two Stages Air Supply: A Case Study in Medan City, North Sumatera-Indonesia

J.P. Simanjuntak

In planning an electricity power generation system using waste as energy source, it is necessary to carry out initial analysis of the potential waste available. Not all waste can be used as the source of thermal energy by burning in an incinerator, so the selection is required to obtain the suitable waste and characterization to determine how much the potential thermal energy content in the waste. The purpose of this article is to obtain the electrical capacity which can be produced from a local waste to generate electricity in certain areas in the city of Medan. The analysis is carried out on availability of the waste and its potential for thermal energy that can be generated. The selected incinerator of the fixed bed type with a two-stage air supply also was explained comprehensively. Minimum pollution, high thermal conversion, and easy to operate are the critical point of the selected incinerator. According to the results of the analysis, 20 kWe can be generated from a power plant system by using waste as the feedstock. This amount of electricity is able to provide electricity for 10 households in the area where the case is located. Waste to electric technology by implementing incinerator is very promising. Besides being able to reduce environmental pollution by the waste, it can also increase the supply of electricity for community needs

Keywords: Incinerator, combustion, gasification, pyrolysis, thermal energy,waste

DESIGN AND CONSTRUCTION OF PRESSURE PIPE INSTALLATION TO SUPPORT PRACTICAL LEARNING AT AUTOMOTIVE LABORATORY

Wahyu Dwi Kurniawan, Soeryanto, Priyo Heru Adiwibowo
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The compressed air piping system is very important in automotive laboratories because in automotive practice the majority of practicum activities at the Automotive Laboratory, Mechanical Engineering Department, Faculty of Engineering, Universitas Negeri Surabaya require compressed air including: cleaning engine components, chassis components, and fuel system components. During the automotive practicum process, the use of air is quite a lot to support the activities in the laboratory. So far, the compressed air pipe has been planted under the floor, making it difficult to maintain, in addition, during renovations, it hinders practical activities. Therefore, it is necessary to re-install the pressurized pipe so that practical activities in the Automotive Laboratory that use compressed air from the compressor can run well. This research method uses research and development. The results showed that the pipe installation can function properly so that it is very supportive of practical learning. As many as 100% of respondents answered very happy because it was very helpful in practical learning in the automotive laboratory, 90% of respondents answered that pipe installation was very ergonomic because it was easy to reach and 90% had met work afety.

Keyword: pipe, installation, practical learning, automotive laboratory

DEVELOPMENT OF CUTTING TEST APPARATUS FOR AGRICULTURAL MATERIALS USING STRAIN GAGES SENSOR

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Cutting force (CF) is an important variable to determine the quality and efficiency of the cutting process of agricultural materials. CF is influenced by several factors, including cutting speed, blade type, blade edge angle, and blade oblique angle. CF can only be obtained through measurements using accurate and precise cutting test equipment. Therefore, it is necessary to develop a cutting test apparatus (CTA) for agricultural materials that is easy to operate and has a high level of accuracy. CTA for agricultural materials based on strain gages sensor have been developed and tested for their performance for cutting sugarcane stalks. CTA is capable of operating at three cutting speeds: 2.42 mm s-1, 3.22 mm s-1 , and 4.83 mm s-1. The blade clamp can be used for smooth, serrated, and notched blade edge with a blade oblique angle of 20o, 30o, and 40o. Ring transducers are capable of sensing CF with an accuracy rate of 98%. At a cutting speed of 3.22 m s-1 with a blade oblique angle of 20o, the maximum CF was 728.00 N for smooth edge, 941.64 N for serrated edge, and 1223.19 N for notched edge. CTA can be used to measure the CF of sugarcane stalks and can be used for cutting experiments involving variables of cutting speed, blade type, blade edge angle, and blade oblique angle for various other agricultural materials such as corn, soybeans, and rice stalks.

Keywords: apparatus, cutting, force, strain, sugarcane

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The Impact of Human Capital on Innovation Performance mediated by Human Asset Specificity and Joint Learning Capacity

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This study examines the human capital (HC) in bottle drinking industries in Indonesia, impacting the innovation performance via mediator variables. Applying the theory of resourcebased view (RBV) and theory of relational exchange (RET) to explore these links, several hypotheses are constructed regarding human asset specificity (HAS) and joint learning capacity (JLC) as a mediator variable. The research is examined by the partial least square-structural equation model (PLS-SEM), and 143 manufactures in Indonesia gather the data sample. The empirical findings show that HAS and JLC mediate HC on innovation performance. Theoretically, the study reveals that complements between RBV and RET create synergy relation human capital on innovation performance through some mediator variables.

Keywords: Human Capital, Human Asset Specificity, Innovation Performance, Joint Learning Capacity.

Development Of Makassar Bugis Wedding Makeup Learning Media Based On Video Tutorials For PKK FT UNM Students

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FT UNM MAKASSAR

This study aims to determine the procedure for developing learning media, feasibility, and student responses to the Makassar Bugis Bride Makeup learning video. This research is a development research with research and development (R&D) research methods conducted in March–June 2020 at Diyan Mike-up Studio. Data collection techniques used are observation documentation, and questionnaires. The data analysis technique used is descriptive analysis with development procedures using ADDIE design (analysis, design, development, implementation, evaluation) then validated by material experts and media experts as well as student responses to video tutorials. The validation results show that the Makassar Bugis Wedding Makeup video is included in the very feasible category with the percentage of media experts at 92.73% and 89.9% material experts at 89.17% and 95.83% while the results of the student feasibility test are 87.11% including in the very feasible (valid) category.

Keywords: Learning media, Video, Makassar Bugis Bridal Makeup

INTEGRATING INSTRUCTIONAL FLEXIBILITY THROUGH AGILE LEARNING IN VOCATIONAL EDUCATION

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The industry necessitates graduates with skill and experience in providing to business in an inventive approach. Moreover, the industry challenges obtaining such competent laborers due to training incompatibility because there are weak connections between educational organizations and industry. The learning schemes should be improved, acknowledging these experienced employees as lacking competencies at an academic degree outside of universities. Then the agile learning is required to create responsive, adaptative, and collaborative processes to accomplish successful information system (IS) projects. Sixty-four students participated in IS projects and were categorized into eight project groups, each of which comprised eight project participants that collaborated with the industry. The results of the study reveal that agile learning is efficacy to provide media support as well as the domain-specific quality of solutions for the learning project. The integration of agile learning focused on enhancing project improvement that incorporates into project-based learning.

Keywords: agile learning, industry, project-based learning, skill

IDENTIFICATION OF HALAL CRITICAL POINTS OF FRIED FOOD SERVED BY RESTAURANT IN PADANG

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The research is aimed at knowing the critical point of halal fried foods in restaurants in Padang. Qualitative method is used in the research. Sources of research data were taken from informants, namely restaurant managers, using snowball sampling techniques. Research data in the form of observations and interviews with informants, as well as observations at the research location. The data in this study is processed by using the software NVivo 11. The results showed that there are three important themes related to food processing techniques in restaurants, these techniques are frying, boiling with coconut milk, and burning. There are 53 fried food menus, consisting of processed chicken, seafood, fresh fish, beef, eggs, and vegetable ingredients. The identification results show that there are 19 important themes related to the critical point of halal fried foods based on processed chicken, seafood, fresh fish, meat, eggs, and vegetable ingredients. The themes include: (1) how to slaughter animals; (2) cooking oil; (3) salt; (4) flavoring; (5) flour; (6) soy sauce.

Keywords: Fried Food, Halal, Restaurant, Critical Point

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Blog Development As A Classroom

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The use of blogs as classroom lectures will greatly assist the students in studying and understanding the lecture material without being limited space and time. This study aims to: (1) develop IT-based learning tools in the form of content, teaching materials and instructional media, and (2) developing Blog as an online lecture space. This research is a development research. The development of a blog as a lecture room and learning tools based on IT content, teaching materials and learning media. Learning tools that will be developed are in the basic course-Design and Environmental Engineering. The course position in the curriculum of KKNI Prodi PTB is the main course and must be weighted 2 credits. The study is located at the Department of Technical Education Building Faculty of Engineering UNIMED held in June - November 2017. Data were analyzed using descriptive statistics. Result of learning device development in the form of lecture material in the form of handout, mini study guide, device evaluation. Learning media in the form of learning videos about the flood and its solution and powerpoint 8 times meeting. The resulting learning tools are published to web 2.0. The results of trials on blog usage targets show that in general the blogs developed already meet the feasibility based on aspects of learning content, blogging organization, desan and display, navigation and programming, and links. The conclusion of the results has been obtained that the development of learning tools contribute to the quality of blogs as classrooms and blogs as a classroom to help students in understanding the material without being limited space and time.

Keywords: Blog, Media, Learning, Classroom

RESEARCH AND COMMUNITY SERVICE ROADMAP FOR COSMETOLOGY EDUCATIONAL PROGRAM IN UNIVERSITAS NEGERI SURABAYA

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A research and community service roadmap has three important components that must be interrelated with one another. The roadmap will be able to show the relationship between research activities that have been, are being and will be carried out. An institution, the development of a research roadmap is needed. Cosmetology Education is the science of how to apply beauty therapists and make-up artists to human wellbeing and comfort. The purpose of this study was to examine: 1) the scientific group of the Unesa Cosmetology Education lecturers 2) the research roadmap for the Unesa Cosmetology Education Study Program. The methods used in this research are observation, focus group discussion, and documentation. The collected data is presented narrative in the form of a blue print. The results showed that 1) the scientific group of Unesa Cosmetology Education lecturers included: Education, Skin Care, Hair Care, Face Makeup, Hairdressing, Spa and Body Care, Skin and Hair Health Sciences, Bridal Makeup and Fantasy. 2) Research Roadmap in the field of Cosmetology is as follows: Research that has been carried out includes models, media and evaluation of learning in the field of Cosmetology. Skin and hair care includes: skin care and hair care cosmetics, bridal make-up. Currently, research is being carried out, namely applied research on models, media, and evaluation of learning, cosmetics for scalp and hair care, and beauty care. While the research that will be carried out is related to the marketing of learning and beauty products.

Key word: reasearch and community service, roadmap, cosmetology

HYBRID POWER PLANT (COMBINATION OF OCEAN WAVE ENERGY AND WIND ENERGY) STUDIES FOR POWER GENERATION FOR FRONTIER, OUTERMOST AND DISADVANTAGED AREAS)

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This study examines the incorporation of a moving pontoon ocean wave power plant with a wind power plant as a hybrid power plant to obtain the stability of the resulting voltage. The ocean wave power plant converts the vertical energy of ocean waves into pressurized water energy, the system is made so that both when the waves rise and fall, they produce sea water pressure which is accommodated in the reservoir tube to then rotate the turbine and generator to produce electricity, the electricity produced by the ocean wave generator is combined with sea wind energy to produce a stable voltage supply for the frontier, outermost and underdeveloped areas.

Keywords: Sea Wave Power, Win Power, hybrid, Renewable.

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DIFFERENCES IN THE FINAL RESULT OF FOUNDATION USING MANUAL TECHNIQUES AND AIR BRUSH TECHNIQUES FOR WEST BRIDE MAKE UP ON OIL SKIN

Murni Astuti1), Novi oktavia 2) Email: murniastuti@fpp.unp.ac.id

The application of foundation by using Airbrush to get the impression of more natural makeup. The study aims to analyze foundation results using manual techniques, airbrush techniques and analyze differences in foundation end results using manual techniques and airbrush techniques for Western Bridal Makeup on oily facial skin. This type of research is experimental research with the design of nonequivalent group desaign research. This research variable consists of a free variable (X) and a bound variable (Y). The study population was a cosmetology and beauty student Bp 16 and 17 with 6 people sampled. This type of data uses primary data with a data source of 7 panelists. Data collection techniques are carried out by means of observation and documentation. The data analysis techniques in this study were conducted with normality tests, homogeneity tests and hypothesis tests. The result of this study is the use of Manual techniques on oily facial skin in western bridal makeup the highest average value is in the indicator of smoothness of the result which is 2.85 has a smooth criteria, on the endurance indicator which is 2.76 has a resistance criteria, and in the average indicator of the result which is 2.57 has a durability criterion. The use of Airbrush technique on oily facial skin in western bridal makeup the highest average value is in the indicator of smoothness of the result which is 3.81 has a very smooth criteria, on the endurance indicator which is 3.71 has a very resistant criteria, and in the indicator of flatness of results that is 3.66 has a very resistant criteria. There are differences in the use of Manual techniques and Airbrush techniques on oily facial skin in western bridal makeup. It is recommended that students add knowledge about the installation of Manual techniques and Airbrush techniques.

Keywords: differences, manual techniques, air brush techniques, oily facial skin

THE EFFECT OF MORDAN TAWAS AND KAPUR SIRIH ON SILK MATERIAL USING RED ONION SKIN EXTRACT TO THE RESULT OF DYING

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The background of this research is to utilize waste as natural dyes in the textile industry, and reduce the use of synthetic dyes that can pollute the environment. Red onion skin is made into extracts of natural dyes that are safe for the environment. The purpose of this study was to describe the color name (hue), color intensity (chroma), color evenness, and the effect of mordant tawas and kapur sirih on dyeing silk using red onion skin extract on color intensity and color evenness. This type of research is experiment research. The type of data used is primary data, sourced from 20 panelists using an instrument with likert scale in the form of a rating scale. The analysis technique used is descriptive analysis and analysis of varianceone (one-way ANOVA) techniques. The result of dyeing without using mordant is Golden Sundance color (60%), with less bright chroma (50%), and evenness of color is average (60%). Dyeing with mordan tawas produces a Golden Rod color (70%) with bright chroma (55%) and the evenness of the color is very average (45%), while the dyeing with mordan kapursirih resulted in Sefia Brown color (65%) with gloomy chroma (55%) and the evenness of the color is average (40%). The results of the analysis test for color intensity (chroma) are 0.000 <0.05, meaning that there is a difference in color intensity is significant. Meanwhile, the color evenness is 0.023 <0.10, which means that there is a difference in color evenness is significant in dyeing the material using red onion extract with mordan tawas and kapur sirih.

Key words: mordant, tawas, kapur sirih, silk, red onion skin, dyeing

CROSS-SECTIONAL COMPARISON OF RUNNERS TO IMPROVE CROSSFLOW TURBINE PERFORMANCE

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In small-scale hydroelectric systems, crossflow turbines are widely used because they are relatively flexible in various heads and discharges, simple in design, sturdy and durable construction. Crossflow turbines work is elementary in contrast to Pelton and Francis turbines, where each inter blade crossflow turbine occurs twice collision. Still, the power produced by crossflow turbines tends to be low, so crossflow turbines need to be developed using a crosssectional variation of runner width. The cross-sectional ratio of runners used is (L/D) = 13/16, 14/16 and 15/16 with various capacities and loadings. The experiment results showed that the runner's cross-sectional ratio of 15/16 resulted in optimal performance, both in power and efficiency. The highest power produced was 3,136 watts, and the highest efficiency was 58.21%, with a load of 8000 grams and at a capacity of 12.58 L/s. This shows that the cross-section ratio of the width of the runner is higher, able to utilize the flow of water with a larger cross-sectional area, the flow of water accommodated by the runner is getting bigger so that it can produce high rpm and ample torque, which results in increased power and efficiency.

Keywords: Cross-Sectional Comparison of Runners, Runner width, Runner diameter, Performance

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The Effectiveness Of Information Services Using John Lewis Holland's Career Theory Towards The Construction Of Career Planning For Career Of Students TRK FPP UNP

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This research is motivated by the phenomenon of students who do not understand their potential and professional interests, so they do not know the direction of their next career. Students often have difficulty making decisions to determine which alternative to choose. One of them is the difficulty in understanding yourself related to your career and making decisions related to the career plans that will be chosen for your future. Information services using John Lewis Holland's career theory play an important role in improving career decision-making for vocational students. The overall objective of this research is to determine the effectiveness of providing information services using John Lewis Holland's career theory to strengthen career planning for Beauty Vocational High School students. This research was carried out using a quasi-experimental method with a pretest posttest control group design. The population of this study were students of Pagelaran Rias with a specialization in Beauty with a total sample of 42 students. The technique to determine the sample is an intentional sampling that is divided into 2 groups, namely the experimental and control groups. The data analysis technique used is inferential analysis with parametric statistics using the t test. The results showed that information services using John Lewis Holland's career theory were effective in improving career decision making for Beauty Vocational High School students.

Keywords: Student Career Stabilization, John Lewis Hollad Career Theory, Information Services

Preparing Vocational Education in Indonesia by Cultivating Teachers' Responsibilities

Didik Nurhadi and Siti Zahro

Education that prepares graduates employable is commonly known as vocational education. This education is responsible for preparing the needs of a global workforce to develop the country's economy. However, issues of vocational education in developing countries are a lack of link and match between education and industry, lack of relevant skills of graduates with the needs of industry owners, the lack of quality, competencies, and professionalism of vocational teachers. The quality of teachers affects the quality of students' skills so that vocational teachers need to understand the role of vocational education to work properly. The question that arises is how to cultivate their responsibilities for preparing education to work? The solution offered is a framework to prepare vocational education to work. This understanding is bringing education to be able to follow the manpower needs in accordance with local and global trends. Furthermore, steps to cultivate teacher's responsibilities were discussed in this paper.

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HOW IS THE ACTIVITY OF ENTREPRENEURSHIP IN SPECIALIZED SMK STUDENTS DURING THE PANDEMIC?

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Objective: Entrepreneurship education involves educating students to think creatively and to be innovative and competitive when doing business [1]. The purpose of this study was to find out the picture of vocational student activity during the pandemic by comparing the learning students received before and during the pandemic. Method and Procedures: Research uses qualitative approaches with interpretative phenomenological analysis methods. The research procedure was conducted through participatory observation and in-depth interviews to determine the phenomenon of learning activities carried out and felt by students before the pandemic and during the pandemic. Result: The results showed that learning activities during pandemics even outside the classroom were more likely to contain only theories whereas before the pandemic learning was done alternating between theory and practice each week. Where entrepreneurial practices before pandemics are conducted outside of lesson hours. Learning before the pandemic showed that students did not mind the entrepreneurial practices that are done more often because for students this practice makes them feel more about how entrepreneurship, they can also have income-generating themselves. Learners during the pandemic practice entrepreneurship conducted online. They feel that this activity does not make their interest in entrepreneurship is also due to a lack of understanding of how to do entrepreneurial activities online. Conclusion: Pandemic-time learning requires students to have entrepreneurship competencies online in contrast to learning before a pandemic. Whatever the situation, entrepreneurial learning activities must remain effective even at the n level. Learning methods are expected to make learning more interesting so that students can increase their attitudes and interests in entrepreneurship. Learning methods are needed that can be used for online learning by applying material about online entrepreneurship and their practices to be able to feel entrepreneurship online.

Keywords: entrepreneurial learning activities, SMK students, pandemic, entrepreneurial learning methods, online learning

IMPLEMENTATION OF COMPETENCY CERTIFICATION IN BEAUTY EDUCATION STUDY PROGRAM

Maria Krisnawati

Competency certification is the process of awarding certificates of competence that are carried out systematically and objectively through competency tests that refer to national work competency standards, international standards, and or other special standards. The purpose of this research is to explain the implementation of competency certification in the Beauty Education study program. Students, educators and education personnel who already have certificates of competence in the field of beauty with stage makeup schemes, Cicatri and Geriatrics, Procedures to Do the Hair Trimming Arrangements, SPA Cluster Scheme and Bridal Makeup. Competency certification is done in collaboration with LSP beauty, LSP Tourism and LKP Bridal Makeup and LKP SPA.

Keyword:implementation, certification of beauty competencies

DEVELOPMENT OF TEACHING MATERIALS OR STATISTICS COURSES

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During the COVID-19 pandemic, lectures are held online. The main obstacle in this lecture is the absence of texbooks as a guide for students in achieving the expected competencies. The research aim to determine (1) the development procedure, and (2) the feasibility of the Statistics Texbook. This type of research uses a descriptive RnD approach using nine stages. The focus of the research is the feasibility of texbook including readability, material quality, and language quality. Validators consist of peer groups, media experts, and linguist. The data collection method uses a quastionnaire with the instruments using percentages. The result of the study show that the processs of developing texbooks based on RPS, that is in effect when this course is programmed by student is a follows: (1) a.Potensial and Problems, namely the literature that is used as a reference in Statistical lecture using two cumpolsory books, the existing problems namely students find it difficult to understand the topic using cumpolsory books. b. Collecting data in form of literature referred to in the preparation and development of textbooks, c. Designing and compiling texbooks, d. The validation were carried out bu peergroup, media expert, and lingists, namely the suitability of layout, e. The input of validator is revised, f. Conducting a limited trial to students about 15 people., g. Revised the drawing section, h. Conducted field trials to as many as 82 students to tes the feasibility of textbooks, i. Make a final revision. (2) Readability is 87%, material Quality is 92 %, and language quality is 89%. Thus the three options in the category are very feasible.

Keywords: texbook, feasibility, book development procedures

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Teachers Perception on Critical Thinking Skills of Vocational High School Students

Purnamawati, Anas Arfandi, Muhammad Yahya, Sabran, Fitrah Darmawan

This study aims to identify the critical thinking skills of SMK students based on the teacher's assessment. This research is one of the needs assessments of the research that will develop a teaching industry learning model. This research includes descriptive research with research subjects of SMK teachers on industrial electronics expertise competencies in the 2021/2022 academic year. Data on students' critical thinking skills were collected through questionnaires distributed to teachers of productive, adaptive, and normative subjects. Determination of the sample using proportional random sampling. Data were analyzed descriptively. The results showed that most of the teachers thought that the dominant students did not have good critical thinking skills. For this reason, further action is needed in the form of developing learning models that can help teachers in the learning process in stimulating students to think critically.

Index Terms—Critical thinking skill, vocational high school, industrial electronics expertise program

The Effect of Module Utilization To Learning Outcomes of Mechanical Drawing

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The achievement of learning outcomes in Technical Drawing training shows that the results are not optimal. This is because teachers still use the lecture method in learning. This condition causes students to become passive and less responsive in learning and not all students listen well, causing the information conveyed by the teacher cannot be accepted by students optimally. The purpose of this study was to describe the effect of the use of learning modules on the learning outcomes of the Engineering Drawing training subject in class X students of the Mechanical Engineering Department of SMK Negeri 1 West Sumatra. The research method used in this study is Quasi-Experimental Research, with the research design of Nonequivalent Control Group Design. This research was conducted at SMK Negeri 1 West Sumatra in class X students of the Mechanical Engineering Department. In this study, it was found that student learning outcomes using the learning module in the Technical Drawing training course had a pre-test mean score of 50.77 and a post-test mean score of 78.40 so that this indicates that students' graduation rates reached 87%. From the cognitive learning outcomes of students who use the Engineering Drawing learning module with conventional learning methods have a significant difference in learning outcomes scores from the post-test score of 0.245. Based on the results of this study, it can be concluded that the use of learning modules affects the learning outcomes of class X students majoring in Mechanical Engineering at SMK Negeri 1 West Sumatra.

Keywords: Modules, Learning Outcomes, Mechanical Drawing

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THE EFFECTIVENESS OF THE CREDIT TRANSFER PROGRAM FOR UNNES AND UNY STUDENTS IN THE COURSE OF DIGITAL CLOTHING PATTERN (CAD) FOR IMPLEMENTATION OF THE MBKM PROGRAM

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Merdeka Learning – Merdeka Campus (MBKM), is a policy of the Minister of Education and Culture, which aims to encourage students to master various sciences that are useful for entering the world of work. Merdeka Campus provides an opportunity for students to choose the courses they will take. One form of MBKM is a learning exchange program (credit transfer) at the UNNES Fashion Design Education Study Program in the form of student exchanges in the same study program at different universities. One of the courses implemented by the MBKM program for the even semester of the 2021/2022 academic year is the digital fashion pattern making (CAD) course. In the digital fashion pattern making (CAD) course, students carry out student exchanges between UNNES and UNY for one semester. The aims of this study were to determine: (1) the effectiveness of the learning effectiveness of the UNNES and UNY student credit transfer program in the digital fashion pattern making (CAD) course seen from the context aspect; (2) learning effectiveness of the UNNES and UNY student credit transfer program in the digital fashion pattern making (CAD) course seen from the input aspect; (3) learning effectiveness of the UNNES and UNY student credit transfer program in the digital fashion pattern making (CAD) course seen from the process aspect; (4) the learning effectiveness of the UNNES and UNY student credit transfer program in the digital fashion pattern making (CAD) course is seen from the product/outcome aspect. This study uses the program evaluation method with the CIPP evaluation model. The results achieved in this study are seen from: 1) the context aspect of the relevance of the credit transfer program with MBKM has "very relevant" results, namely 90.63%; 2) input aspects of the credit transfer program including curriculum, RPS, participants, and supporting lecturers have "very good" inputs, namely 96.1%; 3) the process aspect includes the learning process, learning media, and the learning evaluation process has "very effective" results, namely 88.23%; 4) aspects of the results including teaching and non teaching have "very effective" results, namely 94.1%.

Keyword: Effectiveness, Learning, Credit Transfer, CAD, MBKM.

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Validity of Job Sheet Electrical Control Tech niques Simulator (EKTS) Industrial Electrical Installation Practices in the Electrical Engineering Department

Syaiful Islami, Risfendra, and Sukardi

This article aims to reveal the validity of Job Sheet Electrical Control Techniques Simulator (EKTS) Industrial Electrical Installation Practices in the Electrical Engineering Department. Based on the observation, the existing problem is the unavailability of a job sheet that causes the learning process has not to be maximized. The method used is Research and Development with development model Analysis, Design, Development, Implementation, and Evaluation (ADDIE). The validation process is accompanied by a discussion or direct interview with the expert on improvements to be made. The design of a Job Sheet EKTS Industrial Electrical Installation Practices is consulted first with experts. Then, the design is judged by the competent people who have understood the module development principle. Data collection instrument in the form of a questionnaire. The results obtained are a valid Job Sheet EKTS Industrial Electrical Installation Practices on aspects of content, aspects of the format, and presentation aspects.
Index Terms— EKTS, Industrial Electrical Installation Practices, job sheet, validity

Exploring students' knowledge of HOTS learning: Case Study of students in Indonesia

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Due to the low ability of students, the Indonesian government is working on HOTS-based exam questions. The HOTSbased national exam results show that students could only answer simple questions, yet they were taught using the HOTS approach. This study aims to explore the students' knowledge of HOTS both before and after participation. In this context, HOTS acts as a learning stimulus. Knowledge is reviewed based on four aspects, including factual, conceptual, procedural, and metacognitive. Each aspect is reviewed with 4C criteria that involve critical thinking, creativity, collaboration, and communication. Furthermore, the study uses the survey method and aims to improve students' higher-order thinking skills. The sample was selected using random cluster sampling of 2560 students, while data was collected using questionnaires. The results showed that before participating in the learning, students' knowledge was less than 2%, then 24% sufficient, 50% strong, and 24% very strong. Meanwhile, their knowledge after attending the lesson was less than 1%, then 14% sufficient, 56% strong, and 28% very strong. The conclusion of this study is that the HOTS-based learning stimulus does not significantly improve to the student's learning experience in developing higher-order thinking. This is indicated by their knowledge which does not experience a significant difference between before and after learning.

Keywords—4C, HOTS, knowledge aspects, learning

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The Learning Effectiveness of Women's Fashion Making Practice with the Up-Cycling Technique during the Covid-19 Pandemic

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Practical learning during the Covid-19 pandemic requires the creativity and innovation of a lecturer to keep exist in providing the knowledge and skills needed by students. The spread of Covid-19 has caused the closure of access in all fields, including the difficulty of obtaining raw materials for skills practice activities in the learning process.

This research is a case study research in the field of Fashion Studies, Makassar State University which aims to find out how the learning process of women's fashion practice during the covid -19 pandemic. Data collection has been carried out by observation and documentation, namely observing the work that has been made by students during the learning process of women's fashion making practice.

The results showed that 1) The learning process has been carried out online using learning applications provided by the institution; 2) The results of women's fashion making practice have been made using an up-cycling technique, namely reprocessing used clothes and leftover cloth creatively to produce new fashion models to wear. Women's fashion making practice learning activities during the covid-19 pandemic can be carried out effectively even though using limited raw materials without leaving the side of creativity and innovation in designing and making clothes.
Keywords: Practical Learning, Women's Fashion, Up-Cycling, Covid-19 Pandemic

Mapping Analysis of The Entrepreneurial Potential of Students

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The study aimed was to obtain a mapping analysis of the entrepreneurial potential of students. The method used is descriptive and correlative with the number of respondents are 83 students of the automotive engineering education program, Engineering Faculty, Universitas Negeri Makassar who have taken entrepreneurship course. This study adopts the model (Santos et al, 2013) which consists of entrepreneurial motivation, management competence, psychological competence, and social competence. Data collection techniques used were through documentation, focus group discussions, and distributing questionnaires. The results show that the four variables are entrepreneurial motivation, management competence, psychological competence, and social competence. These have positive effect on entrepreneurial potential. Management competence is the most dominant variable and Entrepreneurial motivation is a variable that still needs to be improved.

Keywords: Entrepreneurial potential, students, and mapping.

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VOCATIONAL EDUCATION ORIENTED IN EMPLOYABILITY AND ENTREPRENEUR SKILLS TO FACE CHALLENGES AND COMPETITIVENESS OF GRADUATES

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Each country is always trying to improve human resources through various innovations to keep up with the competition in science, technology, economy, and global business, including a competition to enter the working world. The low quality of workforce with vocational education graduates who have not responded to the development needs of labor market is one of the reasons why Indonesia's productivity and competitiveness are still lagging. The biggest challenge for vocational education institutions is to produce graduates who have academic skills, technical skills, and employability skills are balanced. Mastery of employability skills is one of the main characteristics needed by Indonesian human resources in the revolution industry 4.0. The constantly changing working world creates new challenges for employers and workforces. Employers expect the new workforce to have a wider range of competencies and abilities, strong job-specific skills, and employability skills. Employability skills can be interpreted as the ability to adjust a person's workforce to a job so that it is possible to survive and be aware of opportunities for success at work. In addition, they are expected to have entrepreneurial skills. These skills are defined as the entrepreneur's ability to be creative, innovative, and run a business.

Keywords: Employability Skills, Entrepreneurship Skills, and Vocational Education

ANALYSIS OF PROBLEM SOLVING BASED ON STUDENTS' CRITICAL THINKING SKILLS THROUGH THE APPLICATION OF PROBLEM BASED LEARNING MODELS WITH THE EDPUZZLE MEDIA PLATFORM

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This study aims to describe the results of problem solving analysis based on students' critical thinking skills in the application of the edpuzzle-assisted problem-based learning model. The subjects of this study were 66 students. The data collected is in the form of an essay test which consists of 6 questions. The test results were analyzed according to the indicators of critical thinking skills used, including interpretation, analysis, evaluation, conclusions, explanations, and self-regulation. The results of data analysis showed that overall students' critical thinking skills were classified as good. This is evidenced in the results of data analysis which shows that the overall results are in the good category. Most of the students were able to solve the questions based on the indicators of critical thinking skills used.

Keyword : Critical Thinking; Problem Based Learning; the edpuzzle Media Platform

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Stabilitas Transien Sistem Tenaga Listrik: Studi Penerimaan Aplikasi Simulink untuk Stabilitas Transien dalam Pembelajaran Penggunaan Komputer Dalam Sistem Tenaga Listrik

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Penggunaan program simulink Matlab untuk menganalisis sistem tenaga listrik memerlukan penerimaan dari penggunanya. Penelitian ini bertujuan untuk menyelidiki pengaruh penerimaan aplikasi Simulink untuk stabilitas transien dalam Pembelajaran Penggunaan Komputer Dalam Sistem Tenaga Listrik. Penelitian ini menggunakan pendekatan kuantitatif. Sampel penelitian sebanyak 60 orang Mahasiswa yang menggunakan Aplikasi Simulink untuk stabilitas transien. Analisis data menggunakan analisis jalur dengan pendekatan Partial Least Square. Hasil penelitian menunjukkan bahwa persepsi kemudahan, berpengaruh langsung terhadap persepsi kegunaan, sikap dan niat dalam menggunakan Aplikasi Simulink untuk stabilitas transien dengan koefisien jalur secara berurutan sebesar 0,581; 0,574 dan 0,249; persepsi kegunaan dan kemudahan dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap sikap untuk menggunakan Aplikasi Simulink untuk stabilitas transien dengan kofisien jalur secara berturut-turut sebesar 0,218 dan 0,574; sikap dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap niat untuk penggunaan Aplikasi Simulink untuk stabilitas transien dengan koefisien jalur sebesar 0,581, dan niat dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap penggunaan Aplikasi Simulink untuk stabilitas transien yang sebenarnya dengan koefisien jalur sebesar 0,491. Penelitian ini menyimpulkan bahwa penggunaan Aplikasi Simulink untuk stabilitas transien dipengaruhi oleh kemudahan dan kegunaan program aplikasi simulink tersebut serta perilaku pengguna.

Kata kunci: Penerimaan TIK, Simulink, Matlab.

Effectiveness Comparison of Co-Op Co-Op with Make a Match Methods in Online Learning during the Covid19 Pandemic

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Covid 19 pandemic leads to the implementation of online learning. Teachers' innovation is of important to support learning activities. Suitable learning models that can arouse students' interest and activity is highly required. This study aims to compare the effectiveness of co-op co-op and make a match online learning model. This quasi-experimental research employed experimental class consisted of 35 students of class X DPIB 1 and control class consisted of 36 students of class X DPIB 2. Pre-test and post-test questions were given via google forms to the classes. The average result of N-Gain calculation in the experimental class with the co-op co-op model was 75.9%. It means that the use of co-op co-op online learning model was effective in improving student learning outcomes. In the experimental class with make-up a match model by 73%, it means that the use of make a match online learning model was quite effective in improving student learning outcomes. It can be concluded that the use of co-op co-op online learning model was more effective in improving student learning outcomes

Index Terms— Online learning, learning model, co-op co-op, make a match

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PEMBELAJARAN BERBASIS WEB DALAM PENGAJARAN PEMROGRAMAN DASAR

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Kecendrungan perubahan yang perlu diantisipasi dibidang pendidikan di era merdeka belajar dan situasi covid-19 saat ini salah satunya pemanfaatan berbagai inovasi Iptek, yang berkaitan dengan media elektronik, informatika serta komunikasi. Ketika Covid-19 mewabah diseluruh dunia termasuk di Indonesia secara tidak langsung memberi dampak pada proses pembelajaran di berbagai institusi pendidikan. Institusi pendidikan diharapkan mencari cara penyajian pembelajaran yang memungkinkan peserta didik belajar dirumah yakni dengan menggunakan system pembelajaran dalam jaringan. Pemrograman dasar merupakan mata kuliah yang kompleks jika dibandingkan dengan mata kuliah umumnya dan telah diajarkan pada mahasiswa Program Studi Pendidikan Teknologi Informasi dan Komunikasi. Fakultas Teknik Universitas Negeri Manado. Tujuan penelitian untuk mendapatkan produk web pembelajaran yang dapat dipakai sebagai media belajar mata kuliah Pemrograman Dasar. Ini adalah jenis penelitian Pengembangan, mengikuti langkah-langkah Borg dan Gall (1983). Pengujian produk dalam bentuk perangkat lunak oleh satu ahli bidang materi dan satu ahli bidang media, sebelum diuji kepada mahasiswa. Uji coba terdiri dari empat mahasiswa dalam sesi percobaan individu, 10 mahasiswa dalam dalam sesi percobaan kelompok kecil, dan 25 mahasiswa dalam sesi percobaan lapangan. Tiga kuesioner dipakai untuk mendapatkan data: pertama, pengujian kelayakan ahli bidang media, kedua, pengujian kelayakan ahli bidang materi, ketiga, pengujian kelayakan oleh mahasiswa. Berdasarkan hasil penilaian ahli bidang materi, ahli bidang media serta mahasiswa, dapat dinyatakan bahwa produk media pembelajaran barbasis web hasil pengembangan, layak digunakan dan secara efektif dapat meningkatkan hasil belajar mata kuliah Pemrograman Dasar.

Kata Kunci: Pemrograman Web, Media pembelajaran, Covid-19, Merdeka Belajar

ANALISIS FAKTOR PENGARUH PENINGKATAN PRESTASI BELAJAR SISWA SMK NEGERI 2 MANADO

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Penelitian ini bertujuan untuk menganalisis: (1) hubungan kompetensi guru dan prestasi belajar siswa SMK N 2 Manado, (2) hubungan lingkungan sekolah dan prestasi belajar siswa SMK N 2 Manado, dan (3) hubungan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar siswa SMK N 2 Manado. Rancangan penelitian ini adalah penelitian kuantitatif dengan pendekatan penelitian korelasional. Dari hasil penelitian: 1) terdapat hubungan yang signifikan antara kompetensi guru dan prestasi belajar siswa SMK N 2 Manado, dan memberikan konstribusi sebesar 38.20%; 2) terdapat hubungan yang signifikan antara lingkungan sekolah dan prestasi belajar, dan memberikan konstribusi sebesar 32.95%; 3) terdapat hubungan yang signifikan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar, dan memberikan konstribusi sebesar 47.10%, maka secara langsung akan meningkatkan pretasi belajar siswa dalam hal dalam hasil atau taraf kemampuan yang telah dicapai siswa setelah mengikuti proses belajar mengajar dalam waktu tertentu baik berupa perubahan tingkah laku, keterampilan dan pengetahuan. Atau dalam meningkatkan prestasi belajar siswa harus memperhatikan kompetensi guru, dan lingkungan sekolah yang secara nyata memberikan sumbangan yang berarti.

Kata kunci: kompetensi guru, lingkungan sekolah dan prestasi belajar

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LEARNING MEDIA BASED ON MACROMEDIA DIRECTOR TO IMPROVE LEARNING OUTCOMES OF STUDENTS IN VOCATIONAL SCHOOLS

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Learning outcomes of students need to be improved. The one of the ways is by innovating in learning. Information technology that has developed can be an opportunity to create interesting learning media. More interesting learning activities will make students happier and easy to learn. Macromedia director is a program that can be used to create media that is interesting and able to be integrated into learning. The purpose of this study was to find out the learning outcomes of students, teacher teaching activities, learning activities of students, and responses of students in the application of interactive learning media based on macromedia director. This research is a classroom action research. The research was conducted at SMK Negeri 5 Surabaya. Data collection uses tests, observation, and questionnaire responses to students. Data analysis using quantitative descriptive techniques. The results of this study are as follows. (1) Learning outcomes of students after the application of interactive learning media based on macromedia director has increased (2) Teacher teaching activities are included in the good category. (3) Student learning activities are included in the good category. (4) Student responses are included in the excellent category.

Keywords— Interactive Learning Media, Macromedia Director

CORRELATION OF PARENTAL SUPPORT WITH STUDENT LEARNING MOTIVATION DURING THE COVID 19 PANDEMIC

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The COVID-19 pandemic has had a strong impact on all fields, including education. Learning is done online. Many students learn independently. The purpose of this study was to determine the relationship between parental support and student learning motivation. The research method used is a survey with a quantitative approach. The data collection technique was carried out by using a questionnaire using a linkert scale. Questionnaires were distributed online via google form to students of the Department of Family Welfare Education. The data analysis technique used is the product moment correlation. The results of the study are rx2y of 0.482. So there is a correlation between parental support and student learning motivation. The correlation is in the moderate category. The effective contribution of the correlation is 23.23%. This shows that there are other variables related to student learning motivation in addition to the parental support variable. In addition, there is a positive relationship, namely the higher parental support, the student's learning motivation also increases. In conclusion, to increase student learning motivation, parental support is needed in the form of attention and material, especially during the pandemic.

Keywords: learning motivation, coorlation, parental support

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

THE INFLUENCE OF KNOWLEDGE LEVEL ON INTEREST IN JOINING THE PROFESSIONAL ENGINEER PROGRAM OF STUDENTS OF THE BUILDING ENGINEERING EDUCATION STUDY PROGRAM UNIVERSITAS NEGERI SEMARANG

Eko Nugroho Julianto, Bambang Endroyo, Vurrinda Ayu Kartika

Indonesia has entered the ASEAN Economic Community in 2015 and now the global competence based on science and technology is very strict. One form of the Indonesian government's strategy to deal with it is to improve the quality of human resources and science and technology. It is therefore important to increase the number of engineers in Indonesia. In this regard, it is also important to increase student interest in engineering. Profiles of graduates of Building Engineering Education can become educators or technical personnel. Therefore, students of Building Engineering Education have the opportunity to continue their education in the Professional Engineer Program. This study aims to determine the effect of the level of knowledge about the engineer profession program on the interest in joining the engineer profession program in the 2017 students of the Building Engineering Education study program, State University of Semarang. This research is a quantitative research with the analysis used is regression. Data collection techniques using documentation, questionnaires and knowledge tests. Respondents in this study were 44 students of Building Engineering Education study program class 2017. The results of the research analysis show that there is a significant influence between the level of knowledge about the engineer's professional program on the interest in joining the Professional Engineer Program.

Keywords: student, interest, level of knowledge, Professional Engineer Program

PROJECT MANAGEMENT AND CHALLENGES TOWARDS THE INDUSTRIAL ERA 4.0

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Project Management is one of the areas of expertise that is needed in project work activities, especially in building construction services. Because a project work is a unique and complex product, which is carried out by many professions and expertise, in various stages, starting from the initiation stage, planning/design, bidding/auction, physical implementation, and Delivery and Operation. For this reason, good managerial skills are needed in managing through good work collaboration between time and between disciplines related to the needs of the project. Based on the results of research by Egan and Teicholz (2004) found that the productivity of construction workers decreased from 100% to 80%, while non-agricultural productivity increased from 100% to 220% from 1998-2004. This indicates the need to improve the productivity of construction work. By developing a construction project management system through the implementation of Building Information Modeling (BIM), it has been proven to be able to significantly improve the effectiveness and efficiency of construction work. Therefore, the introduction and implementation of BIM as a whole needs to be done in order to improve the productivity of project work in accordance with the direction of the development of the industrial revolution 4.0.

Keyword: Project management, Productivity, Industry revolution 4.0, Building Information Modeling

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STUDENT'S ENTREPRENEURIAL INTENTIONS AT UNIVERSITY LEVEL

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Entrepreneurship education is one of the courses given in almost all universities in Indonesia. This course not only provides students with knowledge about how to build an entrepreneurial spirit, but also the basic concepts of being an entrepreneur that are able to build employment for future employees after they graduate. This research aims to investigate the effect of communication skills, knowledge, innovation and self-efficacy on entrepreneurial intentions of students at university level. The method that was used for this research paper is descriptive quantitative with cross sectional design. The data is collected through survey from students in 17 universities. The total data that has been analyzed is 437 students. Data were analyzed using Multiple Regression Logistic to further understand each factors effect on student's drive in entrepreneurship. This research, found that entrepreneurship knowledge is a covariate/dominant factor towards entrepreneurial intentions, where entrepreneurial knowledge provides the greatest opportunity for entrepreneurial intentions with an Odd Ratio value 3,406, followed by innovation and self-confidence. Key words: Entrepreneurial, intentions, university level

EFFECT PROTEUS AS LEARNING MEDIA TO STUDENTS' LEARNING OUTCOME IN DIGITAL ELECTRONIC SUBJECT

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Learning is a consciously planned change through a program designed to produce behavioral change. Likewise, to learn to understand Digital Electronics, good planning is needed so that students' ability to solve problems in the form of projects can be improved through the help of Proteus learning media. When learning online, simulation learning media is needed to assist in the learning process. Proteus media is one of the simulation media that can be used to help simulate digital electronics theories in their implementation in the real world. This study aims to find out about (1) how students' learning outcomes on the use of Proteus media in project-based Digital Electronics learning, and (2) how students respond to learning with Proteus media in project-based Digital Electronics learning?. The research model is experimental research. The respondents of this research are students who program the Digital Electronics course. Data was collected through learning outcomes tests and questionnaires. Learning outcomes tests to measure learning outcomes of Digital Electronics and questionnaires to measure student responses to learning with Proteus media in learning. The results showed that the average student learning outcomes were 83, 5 with a very good category. Student responses to learning with Proteus media include two aspects, namely aspects of product results and aspects of effectiveness for students. The resulting aspect of the product shows that the average value is 86,06% while the effectiveness aspect for students is 87,84%. Based on these data, student responses to Proteus media can be classified as highly meeting the criteria as an very effective learning medium for learning Digital Electronics.

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MICROCONTROLLER LEARNING MEDIA BASED MOBILE AUGMENTED REALITY (MAR) IN VOCATIONAL SCHOOL

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This research is aims by the paradigm shift that occurs in vocational learning along with the digital transformation era. The aims of this research are (1) to produce Mobile Augmented Reality (MAR) Learning Media in Vocational School. (2) Knowing the Validity of Mobile Augmented Reality (MAR) Learning Media. The type of research carried out is research and development (R&D) by adapting the ADDIE development model. The development procedure starts from stages Needs Analysis; Design; Development; Implementation; and Evaluation. The results of this study are The Analyze stage is carried out to determine the types and needs of learning media. The Design phase is carried out to design the required learning media. The development stage is done by making learning media based on the results of planning. Implementation phase is done by applying learning media to the test subject to get feedback. The evaluation stage is carried out to determine the level of ease and impact of the application of learning media. The results of the analysis of the validity of the developed learning media obtained an average value of 3.21 with the category "Valid".

DEVELOPMENT OF PERFORMANCE ASSESSMENT BASED ON TASK ANALYSIS

Wakhinuddin S FT UNP PADANG

The purpose of this study is to develop a performance assessment based on task analysis. The development of automotive technology has made changes in teaching materials, teaching methods, and assessment of learning outcomes. Difficulties in making and developing assessments of learning outcomes must be overcome and found other ways in developing learning assessments, including using task analysis. At the activity stage in task analysis, it can be used as an indicator in developing a learning assessment. This assessment development method is a combination of FGD and interrater. There are five raters of respondents for the development of the assessment, 2 from industry, 2 from school and 1 from academician. From this activity, two performance assessment scripts were obtained for student learning outcomes. It can be concluded that the development of assessment of learning outcomes in the form of various performances can be made and developed by using task analysis.

Keywords: Teacher, Engineering, Automotive, FGD, interrater, performance.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

The Necessity of Digitizing Pre-Teacher Learning for Vocational Education in the Field of Civil Engineering Education in the Era of Environmental Turbulence In Indonesia

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The development of science and technology, globalization in the economic sector, labor disruption, the industrial revolution 4.0, the challenges of the era of society 5.0, and changes in institutional governance policies cause complex and ambiguous uncertainty. This phenomenon is known as environmental turbulence. The phenomenon of uncertainty and also accompanied by the Corona Covid-19 virus outbreak that has hit many countries, adds to the difficulties for a country, especially in providing health services, education, and also results in weakening economic growth. Vocational education, especially in the field of civil engineering, is one of the backbones of the country to be able to immediately recover from an economic downturn in a country. It can be seen that construction projects by the Government are still allowed to carry out activities to complete work even during a pandemic and with strict health protocols. Vocational education in the current era does not only meet the competency needs of industrial workers, but must be proactive in capturing and anticipating the uncertainty that occurs in the environment. Digitization in the field of Civil Engineering is one of the right steps to answer the challenges in the era of environmental turbulence by considering: 1) digitization is faster in responding to changes; 2) more efficient use of resources to make changes; 3) effectively achieve the changes that occur; 4) has high transferability; 5) safe from the spread of the Coronavirus disease (COVID 19) virus because it is carried out remotely; and 6) has an accurate track record in its development. This study will discuss the digitalization of learning in the field of Civil Engineering in vocational education in the era of environmental turbulence in Indonesia.

Keywords— environmental turbulence, digitalization of learning, civil engineering expertise

Effect of pump diameter on the power generated by a hybrid power plant (a combination of ocean waves and wind)

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This study examines the effect of pump diameter and outlet pipe diameter on the electrical power generated at a hybrid power plant. pump diameter variations of 8 inches, 10 inches, 12 inches and 14 inches. Variation of outlet pipe diameter 1 inch, 2 inch, 3 inch and 4 inch. Calculation simulation results to get the most optimal pump diameter and outlet pipe diameter in the hybrid power plant system built
Keywords: comparation, Sea Wave Power, hybrid.

Needs Assessment For The Development Of Learning Media For Normal Childbirth Care Practise Based On The Intelligent Tutor System

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The purpose of this study was to conduct a needs analysis to design learning media for normal delivery care practices based on a smart tutor system. Needs analysis is carried out through literature studies and field studies. The literature study carried out is related to the development of the concept of normal delivery care materials, practical videos about normal delivery care, and the concept of a smart tutor system. Field studies were conducted through interviews and questionnaires to students and lecturers. The results of the needs analysis show that it is necessary to develop learning media for normal delivery care practices based on a smart tutor system with responsive, use-self criteria, including videos of normal delivery care practices and guidelines for normal delivery care practices Index Terms: Need Assessment, Larning Media, Normal Childbirth Care Practises, Intelligent Tutor System

Classroom Investigation on Students' Learning Behavior during the Covid-19 Pandemic Period

S. Nurmasitah, P. Astuti, and A. B. Utomo

This study aims to investigate the students' learning behavior of the online learning during the Covid-19 pandemic period. The data collection carried out through an observation of 44 students at Home Economics Education Study Program, Department of Home Economics, Faculty of Engineering, Universitas Negeri Semarang (UNNES) on the activity completion during the asynchronous online learning from the learning activity in UNNES electronic learning aid (Elena). The data analysis used descriptive percentage technique. The result of this study shows that the students could give a good performance on asynchronous online learning in English for Specific Purposes class. All of the students completed all of the activities in the beginning of the lesson, including viewing the material, watching the video explanation, opening the URL link, responding the discussion, and doing the assignment. There was reduction in the following weeks but the number was not very significant. On the time of completion, in the beginning of the lesson, the students were excited to do the activities, but then declining on the following weeks. It can be caused by reduced learning motivation or boredom in leaning. It can be concluded that the students basically can adapt with the online learning model. They can show ability in self-directed learning model. It means that they are very ready to take a part in the online learning.

Index Terms— online learning, learning behavior, self-directed learning, English for Specific Purposes

APPLICATION OF ONLINE LEARNING USING "ZOOM MEETING" APPLICATION RESEARCH METHODOLOGY COURSES DURING THE COVID-19 PANDEMIC

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The purpose of this study is 1) Discovering the effectiveness of online learning through the application of the "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education. 2) Find online learning constraints through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 3) Find online learning solutions through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 4) Find the student's response to online learning through the application "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education. This research uses an ex post facto research model. In general, the results of this study give an idea that online learning using the application "Zoom Meeting" results in success. That's a success rate at a low level. Many obstacles that arise in teaching using this "Zoom Meeting" application, among others: communication is not smooth; The application "Zoom Meeting" is less convenient for learning models that give rise to many anga, such as calculations and formulas, the operation of tables, graphs or learning images.

Keywords: On-Line Learning, Zoo Meeting

MANAGEMENT OF LABORATORY WITH INDUSTRIAL CULTURE TO SUPPORT THE TEACHING FACTORY AND QUALITY OF VOCATIONAL SCHOOL GRADUATE BASED ON THE NEEDS OF THE MARKET

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The purpose of this study is to formulate and test the effect of management of laboratory with industrial culture to support teaching factory and the quality of vocational school graduates according to the needs of the market. This study used a quantitative approach with a non–experimental survey design. The data were gathered using questionnaires, interviews, observation, tests, and documentation. The research instrument development was initiated by writing test specification based on the focus of the problems and research questions which were elaborated on the objectives and indicators of the research. multiple linear regression was used to analyse the data. Results of the study revealed that there is a strong influence either partially or simultaneously between the management of laboratory with industrial cultural to support teaching factory and the quality of vocational school graduates according to market needs , with the contribution of 91.2%.

Keywords: management of the laboratory; industrial culture; supporting teaching factory; graduates; market needs.

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The Relationship Background Of Education And Parents' Attention With Learning Outcomes Of Basic Productive Vocational Competency Subject Of Culinary Students At SMKN 1 Painan

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This research is motivated by the finding that the learning outcomes of class X and XI students are still low in the culinary skill competency in the basic productive vocational competency subject. This problem is presumably because several factors influence, including educational background and parents' attention. This study aims to (1) describe the parents' educational background of students, (2) describe the parents' attention of students, (3) describe the basic productive vocational competency subject learning outcomes, (4) analyze the relationship between parents' education background and learning outcomes of basic productive vocational competency subject culinary students, (5) Analyzing the relationship between parents' attention and learning outcomes of basic productive vocational competency subject of culinary students (6) Analyzing the relationship between parents educational background and parents' attention with learning outcomes of basic productive vocational competency subject of culinary students. The type of research is correlation research. The research population was students of class X and XI of Culinary Service expertise competence as many as 61 students. The saturated sampling technique carried out the sampling technique. The variables in this study consisted of the independent variables, namely the educational background of parents (X1), parent's attention (X2), and the dependent variable on the basic productive vocational competence subject learning outcomes (Y). The data obtained were collected through a questionnaire containing questions in the form of choices about parents' educational background and statements about the parents' attention of students, which were compiled based on a Likert Scale. The data analysis technique used the help of the SPSS (Statistical Product Solution and Service) computer program for windows version 21.00. The results of the study concluded that; (1) The parents' educational background of the culinary students are on average low educated, (2) The parents' attention is in the medium category (50.8%), (3) The average student learning outcomes for basic productive vocational competency subject are in a low category (34.4%), (4) There is no positive and significant relationship between the educational background of parents and the basic productive vocational competence subject learning outcomes, obtained rcount < rtable (-0.179<0.254), (5) There is a positive and significant relationship between parents' attention and learning outcomes for basic productive vocational competency subject, obtained rcount > rtable (0.620> 0.254) (6) There is a positive and significant relationship between educational background and parents' attention with learning outcomes for basic productive vocational competency subject, rcount < rtable (0.647> 0.254).

Index Terms— background of education, parents attention, basic productive vocational competency, learning outcomes

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THE INFLUENCE OF HOME VISIT LEARNING, LEARNING ATTITUDE TO LEARNING ACHIEVEMENTS OF OCCUPATIONAL SAFETY AND HEALTH IN THE ERA OF THE COVID 19 PANDEMIC IN MECHANICAL ENGINEERING EDUCATION DEPARTMENT OF MANADO STATE UNIVERSITY

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Through this study, to determine the influence of home visit learning, learning attitudes, on learning achievement of occupational safety and health (K3) in the era of the covid 19 pandemic. The object of this research are students majoring in engineering education, who contracted K3 courses and the research location was held at the Department of Mechanical Engineering, State University of Manado. Based on the type of research is survey research, where research data is collected through questionnaires to describe the characteristics of the population. Analysis of the data used with correlation and regression analysis. The results of this study indicate that there is an influence between home visit learning on K3 learning achievement of 49.6% with the regression equation Y = 0.154 X, there is an influence between learning attitudes on K3 learning achievement of 72.4% with the regression equation Y = 0.055 X, and there is a joint influence between home visit learning and learning attitudes on K3 learning achievement of 78.6% with the regression equation Y = - 1.179 + 0.067X1 + 0.043X2

Keywords: Home Visit Learning, Learning Attitude, K3 Learning Achievement

STUDY OF LEARNING MOTIVATION AND STUDENTS' LEARNING ACHIEVEMENT AT ONLINE LEARNING DURING COVID-19

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This research was motivated by changes in learning methods during the Covid-19 pandemic. Based on the Semester Achievement Index of students in online learning, it can be seen that there is a decrease in the percentage from the period before going online. This study aims to describe student learning motivation and describe student learning achievement in online learning the Covid-19 pandemic at the PKK Study Program Concentration of Catering. This type of research is quantitative with a correlational approach. The population of this research is the students of the Culinary Concentration PKK Study Program who take online lectures totaling 383 people. The sampling technique used is proportional random sampling totaling 80 people. The data was collected by using a questionnaire via google form using a Likert scale that has been tested for validity and reliability. Data were analyzed by descriptive . The results showed that overall student learning motivation was in the moderate category with a percentage of 42.2%, student achievement was in the medium category with a percentage of 36.2%. The results of study can be concluded that learning motivation and learning achievement students in online learning during the Covid-19 pandemic at the Culinary Concentration PKK Study Program in the medium category

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PRESTASI BELAJAR MAHASISWA PENDIDIKAN TEKNIK BANGUNAN DENGAN PREDIKTOR KESIAPAN BELAJAR DAN MOTIVASI BELAJAR

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Penelitian ini bertujuan untuk menganalisis: (1) hubungan kesiapan belajar dan prestasi belajar mahasiswa PTB Fatek UNIMA, (2) hubungan motivasi belajar dan prestasi belajar mahasiswa PTB Gatek UNIMA, dan (3) hubungan antara kebiasaan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB FT UNIMA. Rancangan penelitian ini adalah penelitian kuantitatif dengan pendekatan penelitian korelasional. Dari hasil penelitian: 1) terdapat hubungan yang signifikan antara kesiapan belajar dan prestasi belajar, dan memberikan konstribusi sebesar 25,00%, 2) terdapat hubungan yang signifikan antara motivasi belajar dan prestasi belajar, dan memberikan konstribusi sebesar 12,11%, 3) terdapat hubungan yang signifikan antara kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar, dan memberikan konstribusi sebesar 37,10%. Dengan demikian bahwa peningkatan kesiapan belajar, dan motivasi belajar berupa adanya pertimbangan logis dan obyektif; adanya kemampuan dan kemauan untuk belajar sama dengan orang lain; memiliki sikap kritis; adanya keberanian untuk menerima tanggung jawab secara individual; adanya ambisi untuk maju dan berusaha; kesiapan mental; adanya motif; adanya harapan; adanya insentif, akan meningkatkan prestasi belajar dalam hasil atau taraf kemampuan yang telah dicapai mahasiswa setelah mengikuti proses belajar mengajar dalam waktu tertentu baik berupa perubahan tingkah laku, keterampilan dan pengetahuan.. Atau dalam meningkatkan prestasi belajar siswa harus memperhatikan kesiapan belajar, dan motivasi belajar yang secara nyata memberikan sumbangan yang berarti.

Kata kunci: kesiapan belajar, motivasi belajar dan prestasi belajar

OPTIMALISASI KAPASITAS PRODUKSI TEPUNG KELAPA DENGAN METODE RCCP DI PT. XYZ GORONTALO

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Kemampuan dari mesin ataupun benda lainnya yang digunakan akan menurun secara perlahan-lahan tetapi pasti. Kapasitas sebagai jumlah output maksimum yang dapat dihasilkan suatu fasilitas produksi dalam suatu selang waktu tertentu. Permasalahan adanya ketidakseimbangan proses produksi sehingga mengalami fluktuasi (naik turun). Hasil penelitian diperoleh waktu baku yang diperlukan untuk mengolah tepung kelapa pada stasiun kerja Bodega adalah 2,27 detik/unit, untuk stasiun kerja pengisian Nutcounter adalah 52,70 detik, untuk stasiun kerja Sheller 7,66 detik/unit, dan Pharrer 16,32 detik/unit. Berdasarkan perhitungan kapasitas setiap stasiun kerja dapat terlihat bahwa terdapat dua keadaan berbeda tentang kesesuaian kapasitas yang dibutuhkan dan yang tersedia. Stasiun kerja Bodega adalah stasiun kerja yang kapasitas lebih kecil dari pada kapasitas yang lain sehingga tidak dapat memenuhi permintaan dari stasiun kerja lainnya. Penambahan jumlah jam kerja lembur dapat diketahui berdasarkan kapasitas waktu pengerjaan yang kurang pada stasiun kerja Bodega. Jumlah jam kerja lembur pada bulan Januari = -108,85 jam / 12 operator = -1.81 jam per operator. Maka jumlah jam kerja lembur yang perlu ditambahkan adalah sebesar 1,81 jam per oprerator pada stasiun kerja Bodega.

Kata Kunci : Waktu Baku, Peramalan, RCCP Stasiun Kerja

The Effect Of The Application Of The Guided Inquiry-Based Cooperative Learning Model On Students' Learning Results

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This study aims to see the effect of guided inquiry-based cooperative learning model that is practiced to students on learning outcomes. This study is included in the Pre-Experimental design and Intact-Group Comparison, namely: using a group, one group as a research trial and one group not being treated, only as a comparison or control class. This study uses a population of all students in the class of 2019 who program microteaching courses as many as 33 people and have been divided into 5 groups. The division of groups is carried out by the lecturer in a homogeneous manner. The samples used were 2 groups taken by simple random sampling technique.

One group will be the control class or comparison where the learning activities are not applied by the guided inquiry learning model. One other group is used as an experimental class, a class that is applied by a guided inquiry learning model during teaching and training activities. Statistical analysis was carried out by using the 5% error rate test. The data that has been obtained has shown the completeness of learning outcomes with guided inquiry learning by 60% or 0.06 while the conventional class is 20% or 0.02. The results of the statistical analysis also show an increase in thinking skills in experimental class students
Keywords: guided inquiry, learning model, learning outcomes

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THE STUDY OF THE EFFECT OF E-LEARNING BASED ON CASE METHOD TO STUDENTS' LEARNING INTERESTS AND LEARNING OUTCOMES IN THE EARTHQUAKE TECHNOLOGY SUBJECT, CIVIL ENGINEERING DEPARTMENT, UNIVERSITAS NEGERI SEMARANG

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The learning process is an activity to provide education and training to students using certain learning methods that aims to achieve a good level of understanding of the material and satisfying learning outcomes. One of the learning methods that can be used is e-learning based on case method. This study aims to determine the effect of e-learning based on case method to students' learning interest and learning outcomes in the Earthquake Technology Subject at Civil Engineering Education Program, Civil Engineering Department, Universitas Negeri Semarang. The population used in this study were 57 students who took The Earthquake Technology Subject. The significance value obtained from the normality test results is 0.056 > 0.05, the significance value obtained from the homogeneity test results is 0.695 > 0.05, and the significance value obtained from the linearity test results is 0.927 > 0.05. Based on the results of the Pearson Product Moment Correlation Hypothesis Test, the r-count value is 0.459 > r-table value (0.261) and the r-count value is in the range 0.40 - 0.59 (the correlation between variables is strong enough). Based on the comparison of the average score between students who take e-learning based on case method compared to the average score of students who take learning activities in class, there is an increase, although not too big, which is 102.25%. So it can be concluded that e-learning based on case-method has a strong enough effect on learning interest and learning outcomes of students who take the Earthquake Technology Subject.

Index Terms— E-learning, Case Method, Learning Interests, Learning Outcomes

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ANALYSIS OF STUDENT SATISFACTION LEVELS FOR COSMETOLOGY EDUCATION UNDERGRADUATE STUDY PROGRAMS ON THE IMPLEMENTATION OF SYNCHRONOUS LEARNING DURING THE COVID-19 PANDEMIC

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The use of media such as e-learning in a learning process is expected to be an alternative to overcome the problem of self-regulated learning and cultivate students ' creativity. This study aims to measure the satisfaction of students towards the use of Syncronous Learning, by comparing the expectations and level of satisfaction was felt by the students on the implementation of Synchronous Learning. This type of research is quantitative research. The population in this study is that all students with active status on this semester in the Prodi S1 Pendidikan Tata Rias, State University of Surabaya. Data Collection techniques used in this study using questionnaires online with the google form. The questionnaire is designed with the use of the ordinal scale in the form of a likert scale, where the answers used in this study has been the assessment Indicators in the form of content, accuracy, format, ease of use, timeliness, and student satisfaction. Based on the results obtained in this study, that on each indicator level 3 or better get the highest score are selected by the student of cosmetology undergraduate study program.

Keywords: Syncronous learning, student satisfaction, cosmetology

SENSORY QUALITY OF PIE CRUST FROM LOCAL CORN FLOUR WEST SUMATRA

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West Pasaman is the city with the highest corn production in West Sumatra. High corn production is mostly used for animal feed. The utilization of corn in West Pasaman in processed food is not optimal, even though corn has good nutritional content. Corn has a weakness that is easy to rot, so it needs to be processed into intermediate food products such as flour so that it is resistant to storage and is easily applied to processed foods, such as pies. Pies vary a lot from the filling, so it is necessary to innovate the pie crust. The purpose of this study was to analyze the sensory quality (shape, color, aroma, texture, and taste) of pie crust from local cornflour and commercial corn flour. This research was conducted at the culinary arts workshop, Department of Family Welfare, Faculty of Tourism and Hospitality, Universitas Negeri Padang, in September 2021. This type of research was a pure experiment, using a Completely Randomized Design, which consisted of 2 treatments (Local Corn Flour, and Commercial Corn Flour) and 3 repetitions. The resulting pie crust was analyzed for sensory quality using an organoleptic test, which involved 5 expert panelists. After the data was obtained, it was tabulated in the form of a table and a t-test was performed. Based on the research that has been done, it shows that there are differences in the color of the local corn flour pie crust and commercial corn flour pie crust, while the shape, aroma, texture, and taste are not different.
Keywords: Local Cornflour, Commersial Cornflour, Pie Crust, Sensori Quality.

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CRITICAL STUDY OF THE LEARNING OUTCOMES OF FASHION TECHNOLOGY COURSES: CASE STUDIES BEFORE AND DURING THE COVID-19 PANDEMIC

Wulansari Prasetyaningtyas, Roudlotus Sholikhah, Atika

Fashion Technology Courses are one of the practical courses that must be taken by students of the Fashion Education Study Program. Learning methods carried out before the Covid 19 pandemic use demonstration methods and face-to-face learning in the classroom. The Covid 19 pandemic resulted in learning to be carried out offline (distance learning) using several media in sync and asynchronous, so it needs to be studied previous learning outcomes and during the Covid 19 pandemic. This research aims to find out the difference in student learning outcomes in Fashion Technology courses before and during the Covid 19 pandemic. This research is a comparative study used to find out the difference in learning outcomes in fashion technology courses. Data is collected through tests and observations. The population in this study is a student of the Fashion Education Study Program 2019 at the Department of Home Economics, which took fashion technology courses as many as 86 students consisting of 2 rombels. Sampling technique uses simple random sampling by scrambling rombel to be used as a research sample and obtained samples from rombel 2 as many as 41 students. Analyze data using the Wilcoxon test because the data is not normally distributed. The results of this study can be known that there are differences in the results of studying fashion technology courses before and during the covid 19 pandemic.

Index Terms— Covid-19 Pandemic, Fashion Technology Courses, Online Learning

THE EFFECT OF ONLINE LEARNING ASSISTED BY VIDEO LEARNING ON STUDENT LEARNING OUTCOMES ON SPUR GEAR MILLING MATERIALS

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This study aims to determine the effect of online learning equipped with learning videos on student learning outcomes in the material of milling spur gears. The learning outcomes studied are still in the realm of knowledge because during the pandemic students have not carried out direct practice. This research is an experimental study with a Randomized Control Group Pre-test-Post-test Design model. samples were taken randomly and obtained study group 1 as the control class and study group 4 as the experimental group. This study uses observation and tests as data collection methods. Data analysis used an independent t-test to compare the learning outcomes of the control and experimental groups. Based on the results of the study, it showed that the average increase in student learning outcomes who received online learning assisted by learning videos was higher than those without learning videos. The increase in learning outcomes in the experimental group was 19.67, while the control group was only 7.4. This can also be seen from the results of the posttest t-test, where t count is greater than t table, so it can be concluded that there is a significant effect on student learning outcomes using online learning assisted by learning videos compared to student learning outcomes without using learning videos on spur gear milling material.

Keyword: online learning, video, milling spur gears

WHY DO SMK STUDENTS AND TEACHERS CHOOSE TO USE ZOOM?

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Purpose: The COVID-19 pandemic has created both opportunities and challenges for vocational high schools (SMK) as they transition from face-to-face learning to online learning. This study aims to compare the attitudes of students and teachers of SMK in East Jakarta, Jakarta, Indonesia on the use of Zoom Meeting for practical learning. Method: Mixed methods design was used to measure student and teacher attitudes. Data were collected using a Likert scale survey with the additional opportunity to convey perceptions in the form of qualitative data. The quantitative data underwent descriptive analysis as well as inferential analysis comparing the results of the two groups. Thematic analysis was carried out for qualitative data. Result: Most vocational students and teachers like online learning directly through Zoom Meeting. Students' attitudes toward the online practice experience were very negative, citing a lack of emotional attachment and skill development. Achievements and barriers to online learning were also identified. Conclusion: With the future uncertain, there is an opportunity to investigate the learning design of current vocational programs and seriously improve online hands-on learning approaches.

Keywords : vocational; learning; online; zoom; Covid – 19

MODEL KURIKULUM PRAKTIK KERJA LAPANGAN BAGI MAHASISWA PROGRAM STUDI KEPENDIDIKAN DI JURUSAN TEKNIK ELEKTRO FT UNNES

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Proses belajar mengajar di perguruan tinggi merupakan suatu proses pendidikan untuk pengembangan potensi dan pegembangan karakter setiap mahasiswa untuk bidang kognitif, affektif maupun psikomotor sebagai hasil dari sinergi antara pendidikan yang berlangsung di kampus, keluarga dan masyarakat. Capaian pembelajaran mata kuliah (CPMK) harus mampu diraih setiap mahasiswa pada proses belajar mengajar yang mereka tempuh secara efektif dan efisien agar capaian pembelajaran lulusan (CPL) mampu mereka raih dengan sebaik-baiknya, dalam arti lulus di semua mata kuliah yang ditempuhnya sejumlah minimal 144 SKS untuk program sarjana. Nama mata kuliah yang berkarakter lapangan/industri pada program studi Pendidikan Teknik Elektro (PTE) serta program studi Pendidikan Teknik Informatika dan Komputer (PTIK) adalah Praktik Industri. Tujuan dari penelitian ini adalah: "mengembangkan model kurikulum praktik kerja lapangan bagi mahasiswa program studi kependidikan di jurusan Teknik Elektro FT Unnes". Pendekatan dari penelitian ini adalah kualitatif. Sumber data penelitian adalah: kurikulum tahun 2020 pada program studi PTE, kurikulum tahun 2020 pada program studi PTIK, serta dokumen-dokumen bimbingan terkait pelaksanaan Praktik Kerja Lapangan. Analisis penelitian ini adalah deskriptif kualitatif untuk mendapatkan model yang sesuai dengan kebutuhan jurusan Teknik Elektro, Fakultas Teknik maupun DUDIKA. Didapatkan dua model kurikulum terkait pelaksanaan Praktik Kerja lapangan, yaitu: a) model manajamen praktik industri; b) model penyelenggaraan praktik industri. Ketercapaian internalisasi kompetensi dan karakter industri pada mahasiswa pada praktik industri bisa berhasil jika didukung komitmen yang kuat dari lembaga, dalam hal ini jurusan Teknik Elektro dan atau prodi Pendidikan Teknik Elektro maupun Pendidikan Teknik Informatikan dan Komputer serta gugus Praktik Kerja lapangan Fakultas Teknik.

Kata Kunci: model kurikulum, praktik industri, DUDIKA.

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STANDARDIZATION OF MEAT RENDANG RECIPES AT LUBUK ALUNG PADANG PARIAMAN DISTRICT

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This study aims to produce a formulation of a good beef rendang recipe in the Lubuk Alung area, Padang Pariaman District, West Sumatra. This type of research is qualitative research using the case study method. Sources of data were taken from people who are good at making beef rendang in the area consisting of Bundo Kanduang (traditional leaders) and UMKM entrepreneurs in the rendang field in the area. Data collection techniques are observation, interviews, documentation. The data analysis technique uses three activity lines, namely: data reduction, data presentation, and concluding. Test the validity of the data, namely: extension of participation, diligent observation, and triangulation. Based on the results of the study, it was obtained that the recipe formula for Rendang Meat includes the ingredients used, the number of ingredients, and how to make it. From this beef rendang recipe, the formula for the standard recipe for beef rendang has been converted.

Index Terms— Formulation of meat rendang recipes, quality

FIELDWORK PRACTICE CURRICULUM MODEL FOR STUDENTS OF EDUCATIONAL STUDY PROGRAMS IN ELECTRICAL ENGINEERING FT UNNES

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The process of teaching and learning in college is an educational process for the development of potential and development of the character of each student for the cognitive, affective and psychomotor fields as a result of the synergy between education that takes place on campus, family and community. The achievement of course learning (CPMK) must be able to be achieved by every student in the teaching and learning process that they take effectively and efficiently so that the achievement of graduate learning (CPL) is able to achieve as well as possible, in the sense of graduating in all courses that he took a minimum of 144 credits for undergraduate programs. The name of courses of field / industrial character in the Electrical Engineering Education (PTE) study program as well as the Informatics and Computer Engineering Education (PTIK) study program is Industrial Practice. Objective: "developing a fieldwork practice curriculum model for students of educational study programs in the electrical engineering department of FT Unnes". Method: The approach of this research is qualitative. The sources of research data are: curriculum in 2020 in PTE study program, curriculum in 2020 in PTIK study program, as well as guidance documents related to the implementation of Field Work Practices. This research analysis is qualitative descriptive to get a model that suits the needs of electrical engineering majors, Faculty of Engineering and DUDIKA. Results: Two curriculum models are obtained related to the implementation of fieldwork practices, namely: a) the management model of industrial practice; b) model of implementation of industrial practices. Conclusions: The achievement of internalization of competence and character of industry in students in industrial practice can be successful if supported by a strong commitment from the institution, in this case majoring in Electrical Engineering and or Electrical Engineering Education program as well as Informatics and Computer Engineering Education and field work practice group of the Faculty of Engineering.

Keywords: curriculum model, industry practice, DUDIKA

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IMPROVING STUDENTS' COGNITIVE ABILITY IN CIVIL BUILDING DRAWING COURSES USING JOBSHEET MEDIA

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Drawing building construction still poses difficulties for vocational students of the Building Engineering Department. Therefore we need innovative and creative learning media that can be easily understood by students. In other words, the media must be able to increase the construction literacy of student, so that students can easily understand the information and instructions delivered by the learning media. This study aims to illustrate the use of jobsheet learning media in Building Construction Drawing subjects in improving the literacy construction of vocational students of the Building Engineering Department. Through a qualitatively literature review approach, this study concludes that the use of jobsheet media can improve the construction literacy ability of students of Department of Building Engineering. This construction literacy ability will subsequently have an impact on students' ability to complete the tasks delivered in the Building Construction Drawing subject. Jobsheets that can improve competence koqnitive are jobsheets that meet the validity aspects of the jobsheet, namely material, language, appearance, use, consistency, format, graphics, benefits, feasibility. In addition, the jobsheet must also be practical, which is indicated by the fulfillment of aspects including clarity of content, clarity of material coverage, clarity of information, effective and efficient use of language (clear and concise), meaningfulness, appearance, presence of reader appeal, use of fonts writing, lay out jobsheet, clarity of the layout of the structure characteristics of the jobsheet.
Keywords : competence koqnitive, drawing civil building, jobsheet, learning media.

SELF DIRECTED LEARNING ABILITY STUDENTS THROUGH WORKSHOPS

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The purpose of this study is to determine the student learning independence, self-directed learning ability, the relationship of student self-reliance with student ability in self-directed learning, and how much the contribution of student independence to self-directed learning ability through self-employed activities. Subjects in this study were students class of XI Agricultural Product Processing Technology (APPT) program. In measuring the independence of learning, the instrument used to modify the self rating of self-directed learning (SRSDL) is adjusted to the self-employed assessment indicator in SMK Pertanian Pembangunan Negeri Lembang. Instrument used to measure self-directed learning ability of students was adopted from questionnaire self rating scale of self directed learning (SRSSDL). The results showed the independence of learning is in low and medium category. The abilityof self directed learning is in the category of medium, high, and low. The relationship between learning independence and self-directed learning ability, in the medium relationship category. The contrubution of self-learning idependence to self directed learning is in the moderate category.

Key words: self-employed activity, learning independence,self directed learning ability

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PREPAREDNESS AND EFFORT OF VOCATIONAL SCHOOL IN EAST JAVA IN FACING ONLINE LEARNING IN THE ERA OF THE COVID-19 PANDEMIC: A CASE STUDY IN BANGKALAN CITY

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The global Covid-19 pandemic has created a new order in the world of education by creating an online-based learning system. This new system makes educational institutions such as schools have to adapt and prepare quickly for internet-based learning. The survey method and FGD were carried out in 7 vocational schools in Bangkalan city to determine readiness and evaluation of online learning. The survey results show that the skills of teachers and students in learning 64% and 52% online are quite high, respectively. The motivation and pedagogical ability of teachers in preparing teaching materials and materials is quite low at 36%. The results of the implementation of online learning are still less than 54%. The results of the FGD concluded that the readiness of students' facilities and infrastructure in online learning was very less than 15% because almost all students gathered at schools to obtain internet access.

Keyword: Covid-19; Online learning; Preparedness; Efforts

RELATIONSHIP OF LEARNING ENVIRONMENT WITH LEARNING MOTIVATION AND STUDENTS OF TATA BOGA UNNES-EDUCATION AS A FORM OF EVALUATION OF MBKM PROGRAM IN 2021

Saptariana. Author, Wahyuningsih, Author, Siti Fathonah, Author and Romiyatun Mijiling Astuti, Author, Unnes

Pogram MBKM, has been written in Permendikbud No. 3 of 2020 on National Standards of Higher Education Article 18 which states that undergraduate students are allowed to choose a maximum of 3 semesters of learning outside their study program. The existence of this program is a challenge for students because students will pursue different learning environments, different ways of learning, different learning methods. Of all these factors, it will affect student learning motivation and ultimately affect student learning achievement. Objective: a.Knowing the learning motivation of students of Tata Bog Education MBKM program b.Knowing the learning environment felt by students of Tata Boga Education MBKM program c. Knowing the relationship of the learning environment with the motivation of learning students of Tata Boga Education mbkm program. Technology or Method: This type of research is correlational or associative research. Research variables are learning motivation, learning environment and climbing achievement. The instrument used is a questionnaire with the form of google form. The data analysis used is descriptive of the percentage and correlation of moment products. Results: 1) The learning environment of students of the Tata boga Education study program outbond MBKM is a very bad learning environment 11.11%, not good 58.3$%, Enough 27.7% 2) The motivation to study students of the Study Program Tata boga outbond MBKM program is motivation quite 33.3%, high 63.9%, very high 2.7 7% 3) There is no relationship of learning environment with learning motivation (sig.t (0.167) ≥ α (0.05).

Keywords: MBKM program, Learning motivation, Learning environment and Prestassi learning

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CREATIVITY AND MOTIVATION FOR ACHIEVEMENT INFLUENCE ON EXPERTISE COMPETENCE MECHANICAL ENGINEERING FACULTY OF ENGINEERING UNIMA

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The influence of creativity and motivation for success on the competence of expertise in mechanical engineering, Faculty of Engineering, Unima, will be analyzed. The lack of learning outcomes will impact the competence of the skills possessed by the students. The aim of this study was to determine the effect of creativity and motivation to achieve success on the competence of mechanical engineering skills. The method used in this study was a quantitative descriptive approach using regression analysis, the population of this study was 50 and the sample taken was 44 respondents. The data collection technique was performed using a questionnaire for the variables of creativity, activity and motivation for achievement, while the skill competency used the documentation of learning outcomes data with indicators for all mechanical engineering skills courses. The results of this study found a significant positive effect between the variables of creativity and motivation for accomplishment on the competence of mechanical engineering expertise.

Keywords: Creativity, Motivation for success, Competence.

Keywords: comparation, Sea Wave Power, Win Power, hybrid, Renewable.

EVALUATION OF NUTRITIONAL PROPERTIES OF PIA COWPEAS (VIGNA UNGUICULATA) AS FOOD SOUVENIR IN MALANG CITY

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Pia is one type of cake that is very popular with the public. Pia is also very suitable as a souvenir. In general, pia is a mixture of green beans with sugar wrapped in flour and then baked. This research was conducted using cowpeas as the contents of pia. Pia cowpeas is made using several ingredients, including wheat flour, glutinous rice flour, cooking oil, cowpeas, brown sugar, salt, hot water and vanilla. In addition, this study also aims to evaluate pia cowpeas with different formulas. This studies used experimental methods by enriching the pia by filling it with different formulations of cowpeas. Furthermore, the data analysis was by two way ANOVA.. The evaluation results of nutritional properties is known as follows, the highest rate of protein (15.042%) in Formula C, fat (11.269%) in Formula C, carbohydrates (71.769%) in Formula A, ash (3.311%) in Formula C, water (6.871%) in Formula C. Base on the evaluation studies, enriching of pia cowpeas had an impact on the nutritional properties. The more use of cowpeas and glutinous rice flour has an impact on the gradation of the percentage of water, carbohydrates, protein, ash in bread, and increases the percentage of carbohydrates in pia.

Keywords: Pia, Cowpeas, Nutritional properties, food souvenir

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Analysis Of The Implementation Of The Culinary Entrepreneurship Emodule In Online Learning

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One of the profiles of a culinary education program graduate is to become a food entrepreneur. The COVID-19 pandemic forces online-based learning. The Entrepreneurship Module is designed to assist lecturers and students in carrying out online learning. The purpose of this study was to analyze the application of the entrepreneurship e-module during online learning. This research was conducted at the Production Unit Laboratory of the Culinary Education Study Program, PKK major, Faculty of Engineering, State University of Medan. The population is the students of the Production Unit. Samples were taken from the entire population of 43 people. Data was collected by filling out a questionnaire using google form pretest and posttest. Data were analyzed descriptively qualitatively. Many factors hinder the success of students in the practice of food business. The results showed that students were not able to choose the food to be sold, unsure of their own processed products, unable to market products, unable to manage finances and pessimistic that no consumers would buy food due to the covid 19 pandemic. Application of Production Unit learning using e-modules maximum entrepreneurship and mentoring by lecturers when practical material can improve student understanding. Difficulties and obstacles faced can be reduced because there is interaction between lecturers and students. Increased learning outcomes for Production Unit courses using entrepreneurship-based Production Unit teaching materials by 20% with 61% pretest and 81% posttest results. Conclusion: there is an increase in student knowledge using the entrepreneurship module with guidance by lecturers when practicing.
Keywords: entrepreneurship, emodul, pandemic, teaching

Interactive Learning Media for Innovation in Learning to Draw with Software in Vocational High Schools

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This study aims to produce interactive learning media as learning aids in drawing with software (MDPL) subjects and to test the feasibility of interactive learning media in MDPL subjects according to media experts, instructional experts, and material experts. The research method used is the research and development method. The development of learning media is made through several stages, starting from pre-production, production, and post-production. The results of making products are validated by media experts, instructional experts and material experts. The data obtained were analyzed using a Likert scale. The results of this study are: 1) Produced interactive learning media as learning aids in drawing subjects with software. 2) the results of product validation by media experts are 92% (very feasible), instructional experts 66% (decent), and material experts 93% (very feasible). Based on the validation test stages from media experts, instructional experts, and material experts, it can be concluded that interactive learning media can support as a tool to help learning in drawing subjects with classroom softwarein vocational high schools.

Index Terms— Innovation, learning media, interactive, drawing, vocational high school

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The effect of titanium dioxide-coated copper catalytic converters to reduce fuel consumption from four-stroke engines

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This study aims to evaluate the ability of titanium dioxide-coated copper catalytic converters to the fuel consumption of a four-stroke engine. This experimental research uses Yamaha Vixion Lightning as the object of research. Research instruments used include chassis dynamometer, and fuel flow meter. Fuel consumption measurements are carried out based on SNI standard 7554:2010. Results from this study showed that the use of copper-based metal catalytic converters coated in titanium dioxide tended to decrease fuel consumption compared to standard exhaust. Decreased in average fuel consumption using a copper-based metallic catalytic converter coated in titanium dioxide by 3.70% - 11.09%.

Keywords: metallic catalytic converter, copper, titanium dioxide, fuel consumption, four stroke motorcycle.

The Application of Plasticine Wax Media to Improve the Understanding of Right Hand Tool Geometry for Mechanical Engineering Education Students During the Covid-19 Pandemic

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The COVID-19 pandemic that has hit the world has paralyzed various aspects of human life, including education. Students should be skilled to practice but currently have to survive with online learning. The lack of student understanding in the material of lathe chisel geometry with an average value of 61.9 is one proof that practical learning cannot always be converted into online learning. This study aims to determine the increase in students' understanding of the material of lathe chisel geometry in the group using plasticine wax media and the group using working drawing media. The method used in this study is a quasiexperimental method with a nonequivalent control group design. The population of this research is all mechanical engineering student class of 2019 at the Department of Mechanical Engineering, State University of Semarang. The data analysis technique used the N-Gain score. Then, an independent t-test was conducted to determine the significance of the N-Gain score. The results showed that the use of plasticine wax media was able to increase students' understanding of the right-aligned chisel geometry material in a fairly effective interpretation with a percentage of 57.34%. Meanwhile, the results of the study on the control class showed a value in the less effective interpretation with a percentage of 42.22%. The conclusion of this study is plasticine wax media can be used as a solution to help improve student understanding because this media is able to provide a real visual to mechanical engineering students in right-aligned chisel geometry material.

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Interdisciplinary Thematic Learning (INTEL) Model to Support Implementation of Freedom to Learn-Independent Campus

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The 4.0 Industrial Revolution occurred concurrently with the rapid advancement of science and technology, requiring every sector of society to innovate optimally in order to meet the challenges of global competition and the emergence of new jobs. The education sector, which plays a critical role in developing students' skills, must act quickly to equip young people with the necessary skills to navigate the disruptive era of the fourth industrial revolution. This is a review of the literature. The research design process included topic selection, exploration, determining the research focus, determining data sources, reading library sources, collecting research data, processing research note data, and compiling research results. Data collection techniques include editing, organizing, and locating data. The data analysis techniques used are interpretive and deductive analysis. One such effort could be the creation of innovative learning models based on the Interdisciplinary Thematic Learning (INTEL) Model. The primary goal of the INTEL Model is to provide students with real-world experience related to the world of work through lectures, thereby affecting their improvement of 4C skills.

Keywords - INTEL Model, 4C skills, freedom to learn, independent campus

Rancang Bangun Mini Trainer Sensor Induktif Berbasis Arduino

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Sensor Dan Tranduser Adalah Salah Satu Mata Kuliah Yang Wajib Diikuti Oleh Mahasiswa Jurusan Teknik Otomotif Fakultas Teknik Universitas Negeri Padang Yang Berbobot 2 SKS. Sesuai Dengan RPS Mata Kuliah Sensor Dan Tranduser, Terdapat Beberapa Jenis Sensor Yang Menjadi Pokok Kajian Salah Satunya Adalah Sensor Induktif. Aplikasi Sensor Induktif Diaplikasikan Di Dunia Otomotif Seperti Crankshaft Posisition Sensor (CKP), Camshaft Posisition Sensor (CMP), Vilocity Sensor. Untuk Memudahkan Memahami Masing-Masing Sensor Yang Diaplikasikan Di Dunia Otomotif, Maka Mahasiswa Diharuskan Menguasai Konsep Dasar Dari Sensor Induktif Tersebut. Peningkatan Kompetensi Mahasiswa Dibidang Sensor Induktif Salah Satunya Melalui Penggunaan Alat Peraga Saat Proses Pembelajaran. Media Pembelajaran Sensor Induktif Yang Ada Di Laboratorium Di Jurusan Teknik Otomotif Masih Menggunakan Prosesor Analog, Untuk Mendukung Perkembangan Teknologi Digital Saat Ini, Sehingga Penulis memberikan Alternatif Dengan Membuat Alat Peraga Berupa Mini Trainer Sensor Induktif Berbasis Arduino. Penelitian Ini Menggunakan Metode Research And Development (R&D) Yang Terdiri Dari Define, Design, Development, Dan Desseminate. Mini Trainer Sensor Induktif Yang Telah Dirakit Dilakukan Uji Accuracy, Dan Uji Repeatibility Serta Uji Kelayakan Dari Ahli Media Dan Mahasiswa Selaku Pengguna. Hasil Penelitian Terhadap Ujicoba Produk Yang Dilakukan, Diperoleh Tingkat Accuracy 96,21%, Uji Repeatibility Diperoleh Dengan Rata-Rata 0,1%. Tingkat Kelayakan Produk Dari Ahli Media, Adalah 94,68% Dan Dari Responden 96,23%. Jadi Dapat Disimpulkan Mini Trainer Sensor Induktif Sangat Layak Digunakan Sebagai Media Pembelajaran.

Kata Kunci: Mini Trainer Sensor Induktif , Arduino, Media Pembelajaran, Kompetensi Mahasiswa

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IMPLEMENTATION OF INQUIRY-BASE PRACTIUM MODULES IN COMPOSITE MATERIAL COURSES

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Abstract: The purpose of this research is to develop an inquiry-based practicum module and test the feasibility of the module. The method used in this research is the R&D (Research and Development) method and uses the ADDIE model in making inquiry-based practicum modules. From previous research, composite materials practicum modules for composite materials courses in the Mechanical Engineering Education Study Program have been produced with the results of subject matter expert validation for this practicum module being included in the "Very Eligible" category with a feasibility percentage of 93.75%. The evaluation results from the learning media expert are also included in the "Very Eligible" category with an eligibility percentage of 87.5%. In this study, the finished module will be tested for implementation to students and determine the feasibility level of this practicum module.

Keywords: composite materials course , implementation test, inquiry , practicum module.

TECHNICAL STUDY OF SETTLING POND MAINTENANCE IN IRON ORE PROCESSING, PT. KUATASSI, SOLOK DISTRICT, WEST SUMATERA BARAT

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PT. Karya Usaha Aneka Tambang Solok Selatan Indonesia has 6 settling pond. One thing that needs to be considered in deposition is the tailings and the dimensions of the settling pond, whether the pond is able to handle the waste that comes out of iron ore processing. The purpose of this study is to calculate the dimensions of the pond, calculate the percentage of deposition, alculate the period of dredging, calculate the length of dredging, and the costs that need to be incurred for pond maintenance. The method used in conducting this research uses the type of quantitative esearch. This is because in future research, data will be used in the form of numbers. The research was carried out by calculating the tailings entering the pond, taking water samples, calculating the dimensions of the pond, dredging the settling pond, the cycle time of the digging tool for dredging activities, and the cost of heavy equipment. The area and volume of the settling pond is 20345.3 m2 and the volume is 16,799.66 m3. With a depth of 0.3-0.95 m. After analyzing the maintenance cycle for pool 1 is 16.71 and pool 2 is 6.45 years. For pond dredging activities, the company uses one Hitachi zaxis 210f excavator and one Mitsubishi Fuso 220Ps Dump Truck with a total TSS tonnage transfer time of 1.17 days and a loading and digging time of 3.92 days with the dredging cost for pond 1 being Rp3,587,500.00. (three million five hundred eighty-seven thousand five hundred rupiah) and pool 2 is Rp. 13,511,000.00. (thirteen million five hundred and eleven thousand rupiah)

Index Terms— Settling Pond, Dredging Time, Dredging Cost.

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MODELING OF HIGH TURBULENCE OF WATER IN THE CHANNEL ON CHANGES OF DISCUSSION

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The need for water for agricultural irrigation often faces problems when farmers need it during the planting period. The main planting period at the age of the nursery in the rice field location must be observed carefully and periodically so that later on we get rice varieties that are resistant to pests when at a certain age they must be moved to the actual location of rice fields and side by side with other varieties of rice plants are expected to be superior following the plan.

rice varieties planned cropping patterns and the age of the planting period. Channels with model testing in the laboratory are a very cheap and accurate attempt to get results that are close to theoretical and empirical truth. The planting period enters the dry season, water in the irrigation canal is very limited, but the need for planting is still high. After all, Indonesia is an agrarian country where the majority of the population earns from farming and consuming agricultural products in the form of rice. The competition to get water in the dry season is very competitive, so it requires engineering modeling of sluice gates from conventional to hydraulic that is scalable and scalable. The current Sluice Gate (sluice gate) model is very unlikely to get an adequate high water level turbulence to meet agricultural needs during the dry season with very small and limited discharge. Rapid and precise modeling of water level turbulence is expected, namely by modifying the existing floodgates by adding mechanical engineering that can move the floodgates quickly to go up or down in the hope of getting the ideal water level for servicing plant water needs. without increasing the discharge in the Tilting Flume (model channel). With a safe amount of capacity for plants and members of the Water-Using Farmers' Association (HIPPA), as well as the Drinking Water-Using Farmers' Association (HIPPAM) as raw material for drinking water in rural areas through testing with certain samples in the waterlaboratory.

Keyword: Sluice, Water Turbulence, Tilting Flume.

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SCHEDULING INFORMATION SYSTEM DEVELOPMENT FINAL PROJECT MAKASSAR STATE UNIVERSITY

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Scheduling exams at universities is a routine job carried out by majors/study programs in the process of completing student thesis. The Department of Informatics and Computer Engineering has active students totaling 1,881 students with the exam scheduling process carried out manually where the staff contacts each lecturer to request an exam schedule which takes 2 to 4 days, As a case study, technology-based information systems have played an important role to improve academic services such as scheduling processes. This research is an R&D that develops an automatic exam scheduling system, simplifies work and minimizes errors in scheduling. The scheduling system was tested according to the ISO 25010 standard with 5 characteristics: 1) functionality suitability testing the buttons on the system functioned well and obtained a percentage of 100%,2) usability to find out user responses related to the system with 35 respondents, namely lecturers, students, and department staff who obtained a percentage of 89.10% in the very feasible category and testing using SPSS obtained a Cronbach Alpha value of 0.793, 3) reliability was tested using WAPT Pro software v5.0 during the testing process no errors were found, because it had a 100% success percentage of sessions, pages and hits, 4) portability was tested on different browsers, androids a nd OS with a test gain of 100% and5) security is carried out to determine the level of security vulnerability of the software being developed, security aspect testing lasts for 12 minutes 5 seconds with a total alerts level 1 (low) of 0, alerts level 2 (medium) as much as 0, and the number of alerts level 3 (hight) as much as 0 so it can be concluded that the system is safe to use.

Keywords: Schedule, Seminar, Automatic and Final Proje

THE EFFECT OF TOURIST FACILITIES ON TOURIST SATISFACTION AT PINTU ANGIN WATER PARK SITUJUAH, LIMA PULUH KOTA DISTRICT

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The research was conducted after it was found that there were many problems at the Pintu Angin Water Park, ranging from long waiting guests in the rinse room, and insufficient facilities for many tourists. This study used a quantitative method using a causal associative approach. The sample used as many as 97 people with a sampling technique with simple random sampling by limiting the age of the respondents 17 years and over. The data collection technique used a questionnaire distributed in tourist attractions with 30 questions that had been tested on the instrument and the Likert scale was used in the preparation of the questionnaire. Data processing in research using linear regression analysis. Based on hypothesis testing, it is obtained that the Adjusted square value of 0.194 shows the magnitude of the influence of tourist facilities (X) on satisfaction (Y) which is 19.4% while other factors that influence are 80.6%. Then the F value is 22.839 with F table 3.94, so the calculated F value > F table value and sig value 0.000 <0.05 so that as a result the tourist facilities variable (X) has a significant effect on tourist satisfaction (Y) at Pintu Angin Water Park.

Index Terms— Facilities, Satisfaction, Tourists, Pintu Angin Water Park

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BLENDED LEARNING DESIGN AND THE ATTITUDES OF JUNIOR HIGH SCHOOL TEACHER ON THE BLENDED LEARNING

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Human resource management (HRM) is critical in addressing the difficulties of industrial revolution 4.0 and society 5.0. Merdeka Belajar is one of the educational policies whose primary objective is the development of human capital. Merdeka Belajar is an excellent metaphor for a philosophy of change in terms of delivery or learning process. The need of developing dependable human resources in the new normal era of the COVID-19 pandemic condition, including educational activities, must be merged with the advancement and growth of computer and internet-based information technology and technology (ICT). Learning science, such as science / physics, is a difficult topic in comparison to other courses. Basic Electricity is a component of the science curriculum at the junior high school level (SMP) or equivalent. The purpose of this project was to develop a blended learning teaching approach for science / physics students to understand the fundamentals of electricity using computers and the internet. This learning paradigm enables students to create direct current electrical knowledge by combining the advantages of three different learning resources: I face-to-face instruction; (ii) offline instruction; and (iii) internet instruction. The research benefits include: I aiding teachers in facilitating students' independent and group learning; and (ii) pushing students to innovate and be creative in direct current electric learning activities. A mixed learning design concept and survey research are used as the research methods. The study's findings were (1) that blended learning instruction should incorporate both offline and online components, and (2) that 87.5 percent of junior high school science teachers had a favorable attitude toward eaching blended learning.
Keywords: independent learning, blended learning design, the attitude of junior high school science teachers

DEVELOPMENT MEDIA VIDEO TUTORIAL ACNE FACETREATMENT WITH TECHNOLOGY IN SMK N 6 PADANG

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This study aims to develop video media acne facial treatment tutorial using technology at SMK N 6 Padang and measuring the validity, practicality of the development results. This research is research and development (R&D), the research procedure is carried out with the Four D's development design with the stages of Define, Design, Develop and isseminate. The data collection instrument was a Likert scale questionnaire assessing validity to experts and practicality by teachers and students, observation sheets were used to observe the learning process in assessing practicality. Analysis of validity data using the Aiken V formula, practical analysis using the percentage formula. Research sample is 0class student0 XII (twelve) SMK beauty system0N 6 Padang0as many as 33 students. The results of the research are 1) Development has been carried out with the Four D's development model which produces a video tutorial for acne skin care using technology 2) The results of the validity analysis have an average value on the aspect of media quality 0.84 with a very valid category, and have an average value of 0.84 on the media quality aspect. the media layout aspect is 0.80 with a very valid category, and the average value in the language use aspect is 0.78 with a valid category. The results of the practicality analysis based on the teacher's response obtained an average value of 0.94 in the very practical category and the practicality results based on the student's responses were 0.89 in the very practical category.

Keywords: Developmenti, Videos Tutorialsi, Maintenance Acne Face with Technology

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Improving Child Feeding, Various Of Rinuak Recepies As Food Alternative In Stunting

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Stunting is a nutritional problem caused by a lack of nutrients that contain protein intake for a long time. The Southeast Asia Nutrition Survey (SEANUTS) in 2010-2011 places Indonesia as the country with the largest number of short children under five, far above Malaysia, Thailand and Vietnam. The results of Nutrition Status Monitoring (PSG) (2015) conducted by the Ministry of Health found that 29% of Indonesian children under five are included in the stunting category, not least in West Sumatra. One way to overcomethe problem of stunting is to improve the quality of the potential of local food-based nutrition, including those made from protein-rich rinuak, small fish in Lake Maninjau.

The research objective is to analyze the needs and identify the potential of rinuak fish as local food to improve the nutritional quality of children under five years and to design standard products that can be a reference for parents and the community. The survey research method was carried out on 35 rinuak fish business groups that were selected purposively.

The survey results show that all business groups need other forms of processing of rinuak fish, besides being fried and steamed. Ruin potential that is processed by each business group on average 4 kg per day. But on holidays, rinuak fish processed by the business group reaches 20 kg per day. The results of the validity test of beef jerky, nugget and shredded rinuak showed good results with an average score of 4.2 (jerky), 4.8 (nugget) and 4.6 (shredded). This can be an alternative food for children stunting.

Keywords: stunting, rinuak maninjau lake, food alternative

THE DEVELOPMENT OF ONLINE LEARNING MODEL FOR SCHOOL INTERNSHIP ACTIVITIES

Zulkifli Matondang, Harun Sitompul, Riansyah Putra

This study aims to develop an online learning model for internship courses at schools. Online learning has developed due to the COVID-19 pandemic which has resulted in all activities being carried out without face to face. School internship activities are one of the compulsory subjects for educational study programs. School internship activities consist of 2 courses, namely the School Field Experience (SFE)-1 with a focus on school observations and SFE-2 with a focus on developing learning tools and their implementation in schools. School internship activities have been hampered by the COVID-19 pandemic. In overcoming these obstacles, an online learning model was developed for school internships. This type of research includes development research by adopting a 4D model, namely: Define, Design, Development, and esiminate. The learning model developed is an LMS which contains all student activities and can be monitored by lecturers and tutor teachers. The feasibility of the learning model developed was assessed using a questionnaire given to material experts, media experts, and linguists.

Students become respondents in knowing the ease of use of the developed model. The data analysis technique used is descriptive quantitative. The results of the study in the form of validation of the learning model were obtained, namely: The average score according of material experts was 94.12%, by media experts was 92.35%, and by linguists obtained by 95.51%. Based on student responses, the learning model eveloped is quite easy to use with an average score of 90.20%. The learning model can be used for implementation of school internships for students of educational study programs.

Index Terms— Development, Online Learning Model, 4D, School Internship.

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ARTICLE PARALLEL SESSION

IMPLEMENTATION OF COMPETENCY CERTIFICATION IN BEAUTY EDUCATION STUDY PROGRAM

Maria Krisnawati

Abstract Competency certification is the process of awarding certificates of competence that are carried out systematically and objectively through competency tests that refer to national work competency standards, international standards, and or other special standards. The purpose of this research is to explain the implementation of competency certification in the Beauty Education study program. Students, educators and education personnel who already have certificates of competence in the field of beauty with stage makeup schemes, Cicatri and Geriatrics, Procedures to Do the Hair Trimming Arrangements, SPA Cluster Scheme and Bridal Makeup. Competency certification is done in collaboration with LSP beauty, LSP Tourism and LKP Bridal Makeup and LKP SPA.

Keyword:implementation, certification of beauty competencies

INTRODUCTION1

Every university has the ideal of creating graduates with nationally and internationally recognized qualities. The Directorate of Higher Education (DIKTI) has passed a law that lists the quality criteria of graduates in order to participate in development. The law which related to that is Law No. 20 of 2003 on the National Education System which states that national education serves to develop capabilities and form the character and civilization of a dignified nation in order to educate the life of the nation. Education aims to develop the potential of students to become human believers and fear God Almighty, be noble, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Beauty Education Program is one of the Study programs in the PKK Department. This Study Program organizes beauty education with the aim of producing graduates in the field of beauty for formal, non-formal and entrepreneurial education with a superior undergraduate education (S1) qualification, professional, skilled and susceptible to environmental, natural, social and cultural sustainability. To support the legislation, the Beauty Education Study Program of Semarang State University organizes beauty education with the aim of producing graduates in the field of beauty for formal, non-formal and entrepreneurial education with superior undergraduate education (S1) qualifications, professional, skilled and sensitive to environmental, natural, social and cultural sustainability. The vision of the beauty education study program is to become a Conservation-Minded and Internationally Reputable Beauty Education Study Program in 2040, this is in accordance with the vision of Semarang State University. To realize the vision of the study program, the mission applied is as follows: The mission of the study program is to organize and develop a quality, competitive, and conservation-minded beauty education bachelors. Organize conservation-minded research that is beneficial for business, community and government development. Organize community service with a conservation outlook that is beneficial for business development, community and government. Cooperate with various parties in the field of beauty that is synergistic with the development of Beauty Study Program both nationally and internationally. To realize the vision and mission requires readiness that can provide the best service for the user community. Therefore, it is necessary to improve the quality of learning through curriculum improvement. The achievement of the goal to produce professional teacher candidates in the field of beauty depends on how the competency of graduates is set as a reference for the implementation of the curriculum in the Beauty Education Study Program. The

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curriculum used in the Beauty Education Study Program is directed to produce graduates of prospective professional education personnel in accordance with the vision and mission of the Study Program, with the expected opportunity that is for students self development to open very widely. The preparation of the structure and content of the curriculum in the Beauty Education Study Program is implemented by involving various component aspects by paying attention to various things such as the vision, mission, and purpose of the study program. The implementation of the curriculum is applied in a controlled manner through the availability of learning tools such as Semester Learning Plan (RPS), assessment system, monitoring activities and adequate facilities. The curriculum of the Beauty Education Study Program is arranged to produce graduates with pedagogical, personality, social, and professional competencies. Curriculum of Beauty Education Study Program Beauty has three competencies that include main competencies, supporting competencies and other competencies/options. The main competence of the Beauty Education Study Program graduates is to be able to organize learning in the field of Beauty Education by using innovative learning strategies with sophisticated technology in a democratic and responsible atmosphere (teachers). Graduates are able to provide guidance in the field of Beauty Education by using an innovative learning approach with sophisticated technology that is national culturally minded, well-mannered and concerned about environmental conditions (widyaiswara). Able to design, create and evaluate beauty products intelligently, skillfully, responsibly, and pay attention to the values of local wisdom. Able to provide training (as an instructor) in the field of Beauty, in a smart and religious ways. Able to design, create and evaluate beauty products in a skilled, mannered, and tolerant accordance with industry national standards (SNI). Able to develop the learning in the field of Beauty through honest and responsible research. The supporting competence of the Beauty Education Study Program graduates is able to apply and produce beauty products for various opportunities in a smart, creative, and responsible manner. Able to apply the science of beauty is based on concern for aesthetic,ethical and cultural principles that apply in society, while keeping abreast of global developments oriented for the future. Able toplan, organize, implement, and evaluate the business of the field of beauty for thefuture, based on the principles of management of a character that is resilient, responsible, and polite. Able to apply the science of beauty based on concern for aesthetic,ethical and cultural principles that apply in society, while keep following of global developments oriented for the future. Able to plan, organize, implement, and evaluate the business in the field of beauty for the future, based on the management principles of a character that is resilient, responsible, and polite. Another competency / choice of graduates is able to apply ICT to support work to run smoothly in the field of beauty. Able to utilize materials from the environment to support the learning process. Able to promote the work in the field of beauty with manners and tolerance. Able to entrepreneurship in accordance with the principles of management and manage business in the field of beauty with firm and responsible action. Regulation of the Minister of Education and Culture of Republic Indonesia Number 18 of 2014 about Diplomas, Certificates of Competence, and Certificates of Higher Education Professions has a work plan in chapter III article 14 which includes, 1) Certificates of competence are given to graduates who have passed the competency tests organized by professional organizations, training institutions, or accredited certification institutions in accordance with the laws and regulations; 2) Certificates of competence can be issued by universities whose competency tests are conducted in collaboration with accredited professional organizations, training institutions, or certification institution. [1]

Graduates of beauty education study programs in addition to obtaining diplomas are also expected to have certificates of competence. Based on this background, the purpose of this research is to explain the implementation of competency certification in beauty education study program.

Procedures For Paper Submission

Implementation
Implementation is an activity carried out by planning and refers to certain rules to achieve the main purpose of the activity. The goal of implementation is to implement and realize the plan that has been prepared into a tangible form. Implementation is about activities, actions, or the existence of a system mechanism, but implementation is not just an activity, but a planned activity and to achieve the purpose of the activity.

Competence
Competency can be interpreted as a person's ability to deal with situations and circumstances in their work. A person's competence can be seen from the level of creativity they have, the innovations they created and their ability to solve a problem. [3]

Competence is the ability to perform a job or task based on skills and knowledge and supported by the work attitude demanded by the job. [4] Thus, competence demonstrates skills or knowledge characterized by professionalism in a particular field as something most important, as the flagship of a particular field, with the indicators such as knowledge, skills and attitudes.

Knowledge
Work-related knowledge includes: Knowing and understanding knowledge in their respective fields; Knowledge related to new regulations, procedures, techniques in government institutions.

Skill
Individual skills include: Ability to communicate well in writing; Ability to communicate clearly orally.

Attitude
Individual attitudes, including: Having the ability to communicate in creativity at work and the existence of high morale.

Competence based on Law no. 13/2003 concerning Manpower: article 1 (10), "Competency is the work ability of each individual which includes aspects of knowledge, skills and work attitudes in accordance with the established standards".

From some of the opinions above, it can be concluded that competence is a number of abilities that a person must have, especially an employee, to reach the level of a professional employee. According to the strata, competence can be divided into 3 parts, namely:

Core competencies is a core competency that is linked to organizational strategy so that it must be owned by all employees in the organization.

Managerial competencies is a competency that reflects the managerial activities and performance required in a particular role.

Functional competencies is a competency that describes the ability of a particular role required and is usually associated with professional or technical skills. Certification is a process in which official recognition (legitimacy) of people, products, processes, ownership, or information is usually regulated by applicable laws and regulations.[5]

Competency Certification
Competency Certification is the process of awarding certificates of competence that is done by systematically and objectively through competency examinations that refer to certification schemes that have been created by LSP and approved by BNSP. The competency certification process organized by LSP consists of registration from prospective participants up to the issuance of competency certificates.

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The implementation of competency examinations is applied and assessed by an assessor. The evaluation results of the competency exam then become the basis for determining the participant's eligibility decision (assessment) to obtain the certificate. [6] Certificates of competence can also be obtained by certification bodies.

Competence (LSK). LSK is a certification body that organizes competency tests and certifications for course students as well as self-study communities..

Methode

The type of research used is descriptive research. Descriptive methods are used to describe, describe the things asked in the study such as who, where, when, and why. Descriptive research is intended to explore and classify a social phenomenon or reality, by describing a number of variables relating to the problem and the unit that being studied. In this study, the exposure will be adjusted to the reality on the ground by observing variable operationalization. This research uses competency certification implementation variable. Implementation of competency scheme certification activities is analyzed based on the evaluation of context components, inputs, processes, and products (called CIPP). [7]

Research and Discussion

Context

The implementation of competency certification in the Beauty Education Study Program is applied based on the established Higher Education Vision and Mission. The purpose of implementing competency certification is following what is mandated in Presidential Regulation number 8 of 2012 concerning the Indonesian National Qualifications Framework Article 1, as well as several Regulations of the Minister of Manpower in the Republic of Indonesia which have clearly shown that a competency test needs to be held for every university student who is in the process of completing a higher level as a form of quality assurance for university graduates and competence in the field of manpower provision in Indonesia. The purpose of professional certification is to ensure and maintain the competence of graduates, through certification that all knowledge, skills, experiences they have gained through various formal and non-formal learning processes must be maintained.

Students as parties taking the competency test have an interest in competency certification with various backgrounds such as certification that makes it easier to get a job, as an added score, as a sign or written evidence that shows competence in their field. Competency certification is a form of acknowledgment from the competent authority to the certificate holder to be an important component in assessing prospective workers in participating in competitions in the labor recruitment process.

Competency certification is an important attribute because it is based on three basic components, such as knowledge, skills, and attitudes that a person must have. The knowledge that students gain during class in university makes a big contribution to taking the competency certification test.

The scheme being tested is a study program/scientific field and competency test material following the lessons that have been obtained by students. This shows that the curriculum prepared by the study program cannot be separated or has followed the criteria set out in the Indonesian language, the Indonesian National Work Qualification Standard (SKKNI). The suitability of the study program curriculum with the criteria or competency units specified in the competency certification test is a key factor that determines the importance of implementing certification tests conducted by LSP and LSK.

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Input

Currently, the Beauty Education study program does not have an LSP yet, but because the demands and needs require students and lecturers as well as education staff to have a competency certificate, the steps taken are to collaborate with the Professional Certification Institute (LSP) P3. Beauty Education Study Program has collaborated with Beauty LSP and Tourism LSP. Cooperation is also implemented with Competency Certification Institutions through LKP, namely LKP Rosella Success and LKP Mizu Skin Beauty.

Evaluation Process

The implementation of the competency certification test follows what has been previously prepared. The various stages of the process before the date, day, time and place of implementation are determined. At the socialization stage, decisions or agreements are obtained from the results of discussions related to technical matters which also related to the coordination of general perceptions of various procedures/ sop that must be done by LSP in order to do the competency certification of testing activities. In the next stage, it is necessary to carry out various preliminary stages, such as: preparing a Competency Test Place (TUK), and verifying the TUK place, namely the laboratory used as a temporary competency test place.

The follow-up to the results of the socialization is manifested in a workshop on reviewing the competency of the trial material by presenting competent resource persons, usually presenting a master assessor from BNSP. In addition, they communicate regularly and consistently between LSP and study programs that have students (assessment) who have the potential to register as participants in the competency certification test. This communication is followed up in the form of compiling a plan for implementing the competency certification test, starting from the announcement of registration, and implementation.

Evaluation Outcome

The implementation of competency certification is a series of goals from the process done by students and lecturers. Student participation is based on course learning outcomes in the form of passing grades, and the achievement of a determined graduate profile following a determined curriculum. Meanwhile, students who have passed certain courses can apply to take a competency certification test, by taking the appropriate competency scheme in their own study programs.

The implementation of the certification test not only supports the achievement of goals but has become a criteria/indicator of the study program performance that has been set by the Chancellor of the Semarang State University. which is referred to as the Chancellor's performance contract to the Ministry of Education and Culture. The Chancellor's performance is translated into a Faculty performance contract and once again reduced to a study program. The requirement for each study program to produce graduates who have competency certification competencies is a concrete step for Beauty Education to implement competency certification through cooperation with parties authorized to test and issue competency certificates.

Tabel 1. Number of Competency Certificates for Beauty Education Study Program Students

Class of Students	Number of Students	LSP			LSK	Certificate Received
		MUA	SPA	HSC	SPA	
2017	47	18	34	5		57
2018	62	24	-	-	20	44
2019	61	5	-	-	1	6
Total	170	47	34	5	21	107
%	100	27	20	0,2	12,3	62,9

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Note :
MUA   : Make Up Artist
SPA   : Solus Per Aqua
HSC   : Hair Stylis Cutting

The data shows that as many as 62.9% certificates have been given to students in the Makeup Artist, Hair Stylis Cutting and SPA schemes which were obtained from LSP and LSK. Class of 2017 students, a total of 47 students have received 57 certificates, meaning that there are students who have obtained more than one competent certificate.

There are 8 lecturers in the Beauty Education Study Program. There are 4 lecturers who have competency certification. have more than 1 certificate of competence each obtained through LSP or LSK.

Certification Agency Cooperation

LSP Beauty, one of the professional certification institution is LSP Escrins. The schemes prepared are treating facial skin without problems manually (Junior Beauty Therapist), treatment for facial skin with problems manually (Beautycian), Stage makeup, Cicatri and Geriyatri (Make-up artist), Performing Body SPA-Massage and reflexology (Junior Body massage-Spa therapist). From several existing schemes, the beauty education study program took 2 schemes of each 20 students. LSP in the field of tourism, one of the LSP in the tourism sector that provides a scheme in the field of beauty, namely SPA with the SPA Cluster Scheme (SPA Basic Therapist) Competency Certification Agency (LSK) SPA Competency Certification Institute (LSK) for Bridal Makeup

Implementation of Competency Certification

Competency Certification by LSP Beauty and Tourism is applied in the campus laboratory which is used as a TUK (Competency Test Place) when the laboratory already has the requirements as a place for conducting competency tests for make-up artist schemes, hair stylist cutting and SPA, which has previously been verified for eligibility. Feasibility includes the area of the room, the feasibility of the room, lighting and ventilation as well as the availability of supporting facilities and infrastructure. Meanwhile, for LSK, the implementation is in the LKP or an adequate place to conduct the certification test.

Functional competencies is a competency that describes the ability of a particular role required and is usually associated with professional or technical skills.
Technical competence is related to the functional or technical ability of a job. In other words, this competency is related to the technical intricacies associated with the work being occupied.[4] More than 50 percent of students and lecturers of the Beauty Education study program have received technical competency certification.

Some of the abilities that are assessed in terms of competence in the field of beauty are as follows:
SPA Competency Unit: Implementing a clean and safe work environment in accordance with the principles of Occupational Health and Safety; do the preparation and packaging work; Communicating in the SPA workplace; Doing the Indonesian body massage; Performing body scrub/ exfoliating care; Perform traditional body mask treatments; Perform hand, foot and nail care; Perform hair and scalp treatments and Perform facial treatments
Make Up Artist Competency Test: Stage Makeup Make up Cicatri and geriyatri makeup
Bridal make-up by LSK competencies tested: Theory and practice; Attitudes and values; Making Equipment; Arrange tools and materials; Make up the bride and tidy up the work area

Conclusion

Based on the results of the discussion, it can be concluded several things as follows:

Implementation of competency certification test in Beauty Education is implemented based on the vision and mission of the university that has been determined. Competency certification is an important attribute because it is based on three components: competency dimensions, namely knowledge, skills, and attitudes that must be held by students and lecturers; Implementation of competency certification test in Beauty Education in collaboration with LSP and LSK through LKP; Implementation of the competency certification test in Beauty Education follows the plan that has been prepared, taking into account on several stages ranging from socialization, communication, implementation, and evaluation, with various LSP and LSK parties;

The implementation of competency certification tests in Beauty Education is a series of goals from the learning process done by students, based on the process of compiling and developing competency schemes determined based on SKKNI as the basis for achieving learning objectives in Higher Education. Certificates of competence obtained by students amounting to 62.9% certificates have been given to students in the Makeup Artist, Hair Stylis Cutting and SPA schemes obtained from LSP and LSK. Class of 2017 students, a total of 47 students have received 57 certificates, meaning that there are students who have obtained more than one competent certificate. Educators or lecturers who have a certificate of competence are as many as 50%.

References

G. S. Budiwitjaksono and E. Iryanti, "Certification Test in Evaluation of The Implementation of Competencythe Profession Certification Institution (LSP) UPN 'Veteran' Jawa Timur," vol. 2021, no. 20, pp. 162–169, 2021, doi: 10.11594/nstp.2021.0924.

N. Usman, Konteks Implementasi Berbasis Kurikulum. Jakarta: Grasindo, 2002.

N. Santiyadnya, "IMPLEMENTASI UJI KOMPETENSI DAN PENGARUHNYA TERHADAP KUALITAS LULUSAN SMK NEGERI BIDANG TEKNOLOGI DI PROVINSI BALI," J. Pendidik. dan Tek. Kejuru., vol. Vol 8, No, pp. 1–16, 2011, [Online]. Available: https://ejournal.undiksha.ac.id/index.php/JPTK/index.

Wibowo, Manajemen Kinerja. PT. Raja Grafindo Parsada, 2007.

M. A. Nurhadi, "Sertifikasi Kompetensi Profesi Pendidik," Form. J. Ilm. Pendidik. MIPA, vol. 1, no. 3, pp. 174–185, 2015, doi: 10.30998/formatif.v1i3.75.

P. A. Sunarya, N. Lutfiani, and D. S. Pratiwi, "Analisis Sistem Sertifikasi Profesi Untuk Pengembangan Kompetensi Mahasiswa," ADI Bisnis Digit. Interdisiplin J., vol. 1, no. 1, pp. 70–77, 2020, doi: 10.34306/abdi.v1i1.104.

J. C. Ari Kunto, S., Evaluasi program pendidikan. Jakarta: PT Bumi Aksara, 2014.

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WHY DO SMK STUDENTS AND TEACHERS CHOOSE TO USE ZOOM?

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Abstract

Purpose: The COVID-19 pandemic has created both opportunities and challenges for vocational high schools (SMK) as they transition from face-to-face learning to online learning. This study aims to compare the attitudes of students and teachers of SMK in East Jakarta, Jakarta, Indonesia on the use of Zoom Meeting for practical learning.

Method: Mixed methods design was used to measure student and teacher attitudes. Data were collected using a Likert scale survey with the additional opportunity to convey perceptions in the form of qualitative data. The quantitative data underwent descriptive analysis as well as inferential analysis comparing the results of the two groups. Thematic analysis was carried out for qualitative data.

Result: Most vocational students and teachers like online learning directly through Zoom Meeting. Students' attitudes toward the online practice experience were very negative, citing a lack of emotional attachment and skill development. Achievements and barriers to online learning were also identified.

Conclusion: With the future uncertain, there is an opportunity to investigate the learning design of current vocational programs and seriously improve online hands-on learning approaches.

Keywords :
vocational; learning; online; zoom; Covid – 19

Introduction

The COVID-19 pandemic has created challenges for educators around the world (Wahab & Ali, 2020). The pandemic is forcing educators to shift from face-to-face to online delivery. The transition to online learning is no exception demanding that SMK teachers in DKI Jakarta create an online learning environment that provides an effective learning experience when their students are not allowed to attend face-to-face meetings in class or practice. The big challenge for SMK teachers is to adapt materials, learning activities, and face-to-face assessment strategies for online learning to provide a positive learning experience.

In online learning, many teachers in vocational high schools use Zoom Meeting. Zoom Meeting is considered a device that can be used to replicate traditional online classrooms. Zoom Meeting enables synchronous communication using audio and visual data between two or more groups of people. Functions, such as the ability to record sessions, screen and file sharing, group workspaces, and polls, are all features that can be used to move traditional classrooms to online classrooms (Anderson & Looi, 2020; Henriksen et al., 2020).

There are different opinions regarding the use of Zoom Meeting to support online learning. The use of video conferencing platforms such as Zoom Meeting allows discussion, information sharing, and feedback in real-time. On the other hand, online learning through Zoom Meeting did not foster interaction, on the contrary it increased feelings of isolation and loneliness. A further concern is the so-called "Zoom fatigue", a term that refers to fatigue with excessive use of virtual communication platforms. Roth et al., (2020) noted that academic satisfaction and grades decreased as a result of the use of video conferencing.

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These attitudes and views, at least according to experts. The attitudes and views of teachers and students of SMK in DKI Jakarta may be different. Further research is needed. The purpose of the current study is to explore the attitudes of vocational students and teachers on the use of Zoom for learning since the restrictions on community activities were imposed. The research questions that guided this research include: (1) What is the attitude of SMK students towards the use of Zoom for practical learning in SMK? (2) What is the attitude of SMK students towards the use of Zoom for practical learning in SMK? (3) How do students' perceptions compare to teachers' perceptions of using Zoom in online learning? The purpose of this paper is to present a comparison of the attitudes of vocational students and teachers towards the use of Zoom in practical learning during the Covid-19 pandemic.

Literature Review

Video Conferencing Platform Advantages
Online classrooms using video conferencing platforms can promote feelings of connectedness between teachers and students and allow real-world discussion, information sharing, and feedback (McDaniels et al., 2016). Students learn to develop communication professionally in a virtual environment. Students who are initially reluctant may be more willing to participate in the online environment (Adedoyin & Soykan, 2020; Almarzooq et al., 2020; Klemm et al., 2020). Flexibility and increased engagement are other advantages discussed in the (Ramos-Morcillo et al., 2020) literature. Virtual reality simulations and activities can encourage learning (Lemay et al., 2018).

However, Sanderson et al (2020) emphasize that interpersonal relationships are fundamental and online learning cannot replace the necessary face-to-face education aspects. Similarly, other researchers found that online platforms in practical learning can hinder the development of communication and psychomotor skills and have a negative impact on student learning outcomes (Bramer, 2020).

Disadvantages of Video Conferencing Platform
Roth et al 0658 noted that the decline in student satisfaction and academic scores was a concern with the use of video conferencing when compared to face-to-face learning. Lack of interaction with friends and teachers in an online environment, can lead to feelings of isolation and loneliness (Adedoyin & Soykan, 2020; Almarzooq et al., 2020; Klemm et al., 2020).

A further concern for teachers and students turning to online classroom learning is "Zoom fatigue," which is a new term identified recently in published research and refers to feelings of tiredness, worry, or exhaustion with excessive use of virtual communication platforms. , such as Zoom (Jackson et al., 2020; Morin, 2020).

Both students and teachers can experience obstacles in online learning. Lack of technology, lack of necessary equipment, unreliable internet connection, competing demands and lack of suitable workspaces, free from distractions, are all barriers to online learning, as outlined in the literature (Azevedo et al., 2021; Crisanti et al., 2019; Ellington et al., 2019; Fatani, 2020; Lemay et al., 2018; Rasmitadila et al., 2020). Learning loss, a term that refers to the loss of learning opportunities due to limited facilities and access to the internet (Angrist et al., 2021; Sabates et al., 2021 Systematic planning is critical to a successful transition to online learning, especially if the move is permanent (Morin, 2020). Online learning opportunities can create unique experiences where teachers can foster the development of excellence in practice by educating and empowering students (Sanderson et al., 2020). With an uncertain future, there is an opportunity to reconsider involved, innovative, reflective and lifelong learning methods.

Method

The survey consisted of 21 items on a Likert scale distributed to 250 vocational students in the East Jakarta area, DKI Jakarta, Indonesia who met the requirements, with one additional item that could provide written responses. 90 eligible students completed the survey, with a response rate of 36%. The survey link is distributed via WhatsApp to all eligible students. Students who did not use Zoom for learning were excluded from the survey.

The 19-item Likert scale survey link was also distributed via WhatsApp to 23 qualified teachers who teach at SMKs located in the East Jakarta area, DKI Jakarta, Indonesia. The inclusion criteria consisted of teachers who had been teaching lessons using Zoom since March 2020. Eighteen teachers of twenty-three eligible individuals completed the survey with a response rate of 78%. Both students and teachers can access a one-time survey via a link to prevent submitting multiple responses.

The consent document attached asks for teacher and student approval before they submit a response. Participants may choose not to respond. Participant data remains anonymous, as the authors did not collect any identifying or demographic information about participants.

Results

The survey results show differences in student and teacher attitudes towards the use of Zoom in practical learning as depicted in Table 1. The general themes of the quantitative and qualitative data as identified in the survey results are categorized under the following headings: 1) Learning Environment on Zoom, 2) Learning Constraints with Zoom and 3) Acceptance of Using Zoom.

Table 1. Comparison of Student and Teacher Attitudes

Survey Item	Student (n=89) M(SD)	Teacher (n=18) M (SD)	Statistic Test
I enjoyed learning theory using zoom for the past semester	3.4 (1.08)	3.29 (1.45)	U=387* Z=3.007*
I enjoyed practical learning theory using zoom for the past semester	4.3 (1.33)	3.24(1.7)	U=320.5** Z=-2.21**
I feel comfortable with the camera while learning with Zoom	3.31 (1.14)	2.35(1.45)	U=425** Z=-2.804
I experience technical difficulties in accessing or participating during zoom classes including internet context or lack of supporting Equipment	2.97(1.29)	3.00(1.03)	U=609.5 Z=-0.306
I experience psychosocial barriers to accessing or participating during zoom classes including life at home not conducive to meeting the demands of learning	3.09(1.35)	4.00(0.97)	U=414** Z=-2.829**
I experience psychosocial barriers to accessing or participating during zoom classes including depression and anxiety	2.76(1.4)	3.18(1.20)	U-576 Z=-1.373
I feel connected to the teacher [student] during class with Zoom	3.58(1.2)	2.65(0.84)	U=405** Z=-2.997
I feel comfortable sharing and pitching ideas during class with Zoom	3.06(1.1)	2.76(0.94)	U=633 Z=-0.907
I feel an open learning environment during class	2.76(0.88)	1.94(0.73)	U=380

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with Zoom			Z=-3.382
I can participate fairly during class with Zoom	3.33(1.02)	2.12(0.83)	U=604 Z=-0.805
I feel directed/guided during class with Zoom (I direct/guide students during class with Zoom)	2.9(0.98)	2.18(0.71)	U=344/5** Z=-3;418**
I feel valued during class with Zoom (I feel it creates an open environment where students feel valued)	2.26(0.75)	2.12(0.76)	U=655 Z=-0.703
Using Zoom creates opportunities for personal (and professional) Good	3.37(1.08)	2.06(0.94)	U=277*** Z=4.195***
I prefer (teaching) virtual ZOOM class to face-to-face class	4.55(0.97)	3.94(1.00)	U=320*** Z=-4.096
I prefer (teaching) a virtual practical experience with Zoom to a real practical experience	4.92(0.41)	4.00(0.91)	U=269 Z=-2.342
I prefer to use Zoom for future theoretical learning	3.52(1.29)	3.24(1.52)	U=370* Z=-2.342*
I prefer to use Zoom for practical learning in the future	4.43(0.9)	3.71(1.67)	U=442.5 Z=-1.962
Notes. ( ) survey words for teachers ; M=Mean; SD=Standard Deviation;* p < 0.05 ** p < 0.01 *** p < 0.001			

Study Environment at Zoom

Teachers (M=3.3) were more likely than students (M=3.4) to report that they enjoyed using Zoom for theoretical learning (U= 387.00, p = 0.027). 41% of teachers enjoy theoretical learning on Zoom, while only 25% of students enjoy theoretical learning using Zoom. One student revealed that "most teachers try really hard to achieve the same level of learning through Zoom, but in the end I feel like I don't get enough understanding."

There was a statistically significant difference between teachers and students to enjoy hands- on learning (U = 320.50, p = 0.003), with teachers (M = 3.2) more likely than students (M=4.3) to report that they enjoyed practical online learning on Zoom. 47% of practice teachers enjoy teaching on Zoom, with one teacher stating: "Teaching practicals on Zoom goes really well with learning which I think is better than teaching face-to-face. Many of the obstacles we normally face that hinder continuity, flow, progress are not factors. There are disadvantages too of course and some losses in experience, but I feel much better." In contrast, only 12% of students reported enjoying hands-on learning online. Comments from students expressed dissatisfaction with the use of Zoom for practical learning, namely that "we learned nothing" and "practical learning cannot be done through Zoom".

There was a significant difference related to the item that using Zoom could create a comfortable learning environment (U = 380.00, p = .001). In response to the item, 89% of teachers (M = 1.9) reported agreeing compared to 49% of students (M = 1.9). = 2.7). There was also a significant difference between teachers (M = 2.7) and students (M = 4.0) in feelings of connectedness during online learning sessions on Zoom (U =

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405.00, p = .03). More than half of teacher respondents feel connected to their students on Zoom, compared to just 24% of students, who feel disconnected from peers and teachers. One student revealed that "zoom classes create a barrier between collaboration with peers. I feel disconnected from my colleagues." As an alternative, one teacher commented: "I believe we have done a great job of meeting learning objectives and developing creative ways to engage students in different ways that make online learning more diverse and meaningful."

"I believe we have done a great job of meeting learning objectives and developing creative ways to engage students in different ways that make online learning more diverse and meaningful."

Teachers' and students' perceptions differed on Likert scale items regarding the use of Zoom in creating a supportive learning environment (U = 44.50, p = 0.001). 44% of students stated that they felt they had teacher support (M = 2.9) compared to 88% of teachers who felt they created a supportive environment for students (M = 2.2). There were no statistically significant differences between teachers and students on survey items addressing feelings of respect and inclusivity, convenience in sharing and discussing ideas, or opportunities for equal participation during Zoom classes

Obstacles related to learning with Zoom
The results of the survey on teachers and students showed that they experienced obstacles including poor internet connectivity or lack of equipment and psychological obstacles, including increased stress or anxiety with the use of Zoom, were not statistically significant. 52% of students and 47% of teachers face technological obstacles when using Zoom, with one teacher stating: "My students and I are having internet connection issues. Even in Jakarta, the internet connection is not stable."

Similar problems existed between the groups in terms of experiencing psychological obstacles, including increased stress or anxiety, with 54% of students and 47% of teachers agreeing with this item. There were some honest confessions from students, including: "I wished for Zoom's stock price to fall and go bankrupt. I would rather take the risk of COVID than have to go through Zoom again." Another student felt that "the teachers did not understand the psychological impact of this and it resulted in so much emotional disturbance." Another student mentioned: "I paid a heavy price for my mental health and confidence as a student while using Zoom."

The Mann-Whitney U-Test showed a statistically significant difference (U = 414.00, p = 0.005) between groups on Likert scale items overcoming psychosocial obstacle, such as a home life that is not conducive to do online learning or competitive demands. Many teachers answered that they did not experience psychosocial obstacle when teaching via Zoom (M = 4.0), while 45% of students (M = 3.1) indicated that they had psychosocial obstacles. One student revealed that "Being at home, does not mean we have more time. We cannot go to school because there is a policy about it." Comfort with their camera also differed significantly between groups (U = 414.00, p = 0.005), with 48% of students showing discomfort with the camera (M = 2.35), compared to most teachers (70%, M = 3 ,31).

Desire to Use Zoom
The preference for virtual classrooms using Zoom over traditional face-to-face classes in practical learning differed between teacher and student responses (U = 320.00, p < 0.001). Almost all students (89%) indicated that they disliked Zoom over classroom learning (M = 4.55) and 88% of teachers also preferred traditional learning to virtual platforms such as Zoom (M = 3.9). One student mentioned that "the quality of learning decreased significantly." More than half of students (58%) did not accept the use of Zoom for future practical learning (M = 3.5), compared to 47% of teachers (M = 3.2), which resulted in a statistically

significant difference (U = 470, 00, p = .005). One student summarized these findings by stating: "Hopefully the Zoom class only applies during the Covid-19 pandemic and does not last forever."

The preference for Zoom for practical learning was also shown to have a statistically significant difference (U = 320.00, p < .001). Students were more likely to choose hands-on experience (M = 4.9) than teachers (M = 4.0). 85% of students feel that Zoom does not enhance the practical skills expected of practical subjects. This finding was extended by a student who stated that "virtual practice does not give us sufficient skills to apply in real life."

There is no statistically significant difference in the acceptance measure for future practical learning using Zoom. Most students (84%) did not accept the use of Zoom for future practical learning and one student clearly expressed concern that: "I am bored at home. I miss meeting and interacting with classmates and other people outside." Teacher responses to using Zoom for practical learning varied, with 41% of teachers saying they would accept it and 41% reporting disagreeing. One teacher mentioned that "practical learning with Zoom is cost- effective because it eliminates the cost of traveling to various facilities", while another respondent commented: "I feel this teaching medium will be a great addition or complement to clinical practice in the future." There was no statistically significant difference between the two groups for this item.

Discussion

The survey data and the Mann-Whitney U-Test revealed some statistically significant differences between teacher and student attitudes towards the use of Zoom. Both groups showed varying levels of enjoyment of using Zoom in theoretical and practical learning and feelings that the online learning experience was inferior to classroom learning expressed by both teachers and students. According to Broussard and Wilson (2018) this perception is common in academia; however, it is not necessarily accurate and depends on teacher readiness and student characteristics.

Most teachers and students prefer face-to-face classes to online learning, such as Zoom. This sentiment was also expressed by Roth et al. (2020), that there is a decrease in student satisfaction with video conferencing compared to traditional learning environments. Students were more receptive to the delivery of theoretical learning in an online format than practical learning, while teachers reported equal acceptance of the online learning environment for theory and practice. Published researches reveal the sentiments of students and teachers that online learning in practical subjects can hinder the development of psychomotor skills that have an impact on students' overall growth (Bramer, 2020). Furthermore, Sanderson et al. (2020) emphasizes the importance of interpersonal relationships cannot replace elements of direct relational practice.

Feelings of connectedness during Zoom classes also resulted in statistically significant differences between teachers and students. Most teachers feel connected to students during Zoom sessions, compared to just a quarter of student respondents. McDaniels et al. (2016) and Prince and Clayton (2020) found that online video platforms can increase the connectedness between teachers and students. In contrast, other researchers have found that feelings of isolation and lack of interaction with peers and teachers can be felt in an online environment (Adedoyin & Soykan, 2020; Almarzooq et al., 2020; Klemm et al., 2020).

Although not statistically significant, about half of students and teachers experience technological and psychological obstacles to using Zoom. Although East Jakarta is an urban area, poor internet networks are common. The published literature also identifies challenges with online learning, such as lack of necessary equipment, unreliable internet connectivity, and technology ignorance, which impact on the successful implementation of online learning (Jackson et al., 2020; Morin, 2020; Wahab & Ali). , 2020). Furthermore,

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the disorder of excessive use of Zoom, which leads to psychological symptoms, such as depression (Anderson & Looi, 2020).

Related to Likert scale items regarding psychosocial obstacles, the results showed statistically significant differences. A larger number of students than teachers indicate that they experience psychosocial obstacles, such as a home life that is not conducive to do online learning. Responsibilities and personal workspaces for learning are also identified in the literature as hindrance to quality online learning experiences (Bramer, 2020).

The teachers highlighted the benefits of using Zoom, efficiency, cost-effectiveness, and reduced travel expenses. A number of literatures have several advantages of online learning, such as increased flexibility and engagement (Cravener, 1999; Wilson et al., 2021). Most teachers feel that Zoom is an-opportunity for professional and personal growth, compared to half of student respondents. These findings suggest that systematic planning is required when transitioning to online learning to promote personal and professional growth. Online learning experiences can create unique learning opportunities for teachers and students (Hanbidge et al., 2018; Sanderson et al., 2020).

The current research results as a whole show that teachers and students prefer direct learning strategies over using Zoom. Learning in SMK (Vocational High School) should carefully examine the best learning opportunities for students, especially in practical learning, which may not be feasible when educating students only in an online format. There may be unique opportunities to augment the traditional classroom learning experience with online learning strategies to meet the needs of both teachers and students. The incorporation of digital platforms, such as hands-on practice and virtual simulations, can provide enhanced learning outcomes and student satisfaction. Adequate support for teachers and students is needed when vocational education switches to online learning, as this can have an impact on success. Moreover, given the substantial changes in vocational learning, educators should wisely reconsider the content included in their curriculum and entry-level competencies (Jackson et al., 2020; Lemay et al., 2018).

Limitations
There are some limitations of this study apart from the findings, it may be worth considering online learning for vocational education. The sample size of students and teachers is small, it may not represent the attitudes of teachers and vocational students in general. The vocational school where this research was conducted was primarily involved in face-to-face learning strategies and the transition to online learning during the COVID-19 pandemic was a significant change for both teachers and students. Other educational institutions may have successfully implemented online learning before the pandemic and the results of this study may not be generalizable. In addition, "emergency online learning", as has happened over the past year, may not be an accurate representation of a successful online learning strategy. A further limitation is that Zoom represents only one video conferencing platform and there are many other strategies for engaging students in online learning.

Conclusion
The current study presents a comparison of the attitudes of students and teachers at vocational schools (SMK) in East Jakarta, DKI Jakarta, Indonesia towards the use of Zoom during the COVID-19 pandemic. The research findings show that there are similarities and differences between teachers' and students' perceptions of using Zoom. The results of this study offer valuable insights for vocational education programs to consider when planning and implementing future online learning. The future of learning is uncertain and there are opportunities to evaluate traditional teaching methods and consider innovative learning experiences to educate SMK students to ensure positive outcomes.

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BIBLIOGRAPHY

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. Interactive Learning Environments. https://doi.org/10.1080/10494820.2020.1813180

Almarzooq, Z. I., Lopes, M., & Kochar, A. (2020). Virtual Learning During the COVID-19 Pandemic: A Disruptive Technology in Graduate Medical Education. Journal of the American College of Cardiology, 75(20), 2635–2638. https://doi.org/10.1016/J.JACC.2020.04.015

Anderson, K., & Looi, J. C. L. (2020). Chronic Zoom Syndrome: emergence of an insidious and debilitating mental health disorder during COVID-19. Australasian Psychiatry, 28(6), 669. https://doi.org/10.1177/1039856220960380

Angrist, N., de Barros, A., Bhula, R., Chakera, S., Cummiskey, C., DeStefano, J., Floretta, J., Kaffenberger, M., Piper, B., & Stern, J. (2021). Building back better to avert a learning catastrophe: Estimating learning loss from COVID-19 school shutdowns in Africa and facilitating short-term and long-term learning recovery. International Journal of Educational Development, 84. https://doi.org/10.1016/j.ijedudev.2021.102397

Azevedo, J. P., Hasan, A., Goldemberg, D., Geven, K., & Iqbal, S. A. (2021). Simulating the Potential Impacts of COVID-19 School Closures on Schooling and Learning Outcomes: A Set of Global Estimates. World Bank Research Observer, 36(1). https://doi.org/10.1093/wbro/lkab003

Bramer, C. (2020). Preregistration adult nursing students' experiences of online learning: a qualitative study. Https://Doi.Org/10.12968/Bjon.2020.29.12.677, 29(12), 677–683. https://doi.org/10.12968/BJON.2020.29.12.677

Broussard, L., & Wilson, K. (2018). Nursing Faculty Attitudes and Practices Related to Online Teaching. Nursing Education Perspectives, 39(1), 40–42. https://doi.org/10.1097/01.NEP.0000000000000208

Cravener, P. A. (1999). Faculty experiences with providing online courses thorns among the roses. Computers in Nursing, 17(1), 42–47.

Crisanti, A. S., Earheart, J. A., Rosenbaum, N. A., Tinney, M., & Duhigg, D. J. (2019). Beyond crisis intervention team (CIT) classroom training: Videoconference continuing education for law enforcement. International Journal of Law and Psychiatry, 62, 104–110. https://doi.org/10.1016/j.ijlp.2018.12.003

Dong, C., Cao, S., & Li, H. (2020). Young children's online learning during COVID-19 pandemic: Chinese parents' beliefs and attitudes. Children and Youth Services Review, 118(September), 105440. https://doi.org/10.1016/j.childyouth.2020.105440

Ellington, D. R., Shum, P. C., Dennis, E. A., Willis, H. L., & Richter, H. E. (2019). Female Pelvic Floor Immersive Simulation: A Randomized Trial to Test the Effectiveness of a Virtual Reality Anatomic Model on Resident Knowledge of Female Pelvic Anatomy. Journal of Minimally Invasive Gynecology, 26(5), 897–901. https://doi.org/10.1016/j.jmig.2018.09.003

Fatani, T. H. (2020). Student satisfaction with videoconferencing teaching quality during the COVID-19 pandemic. BMC Medical Education, 20(1), 1–8. https://doi.org/10.1186/S12909- 020-02310-2/TABLES/1

Hanbidge, A. S., Tin, T., & Sanderson, N. (2018). Student Learner Characteristics and Adoption of M-learning: Are We Effectively Supporting Students? (pp. 305–321). https://doi.org/10.1007/978-981-10-6144-8_18

Henriksen, D., Henriksen, D., Creely, E., & Henderson, M. (2020). Folk Pedagogies for Teacher Transitions: Approaches to Synchronous Online... Journal of Technology and Teacher Education, 28(2), 201–209.

Jackson, D., Bradbury-Jones, C., Baptiste, D., Gelling, L., Morin, K., Neville, S., & Smith, G. D. (2020). Life in the pandemic: Some reflections on nursing in the context of COVID-19. Journal of Clinical Nursing, 29(13–14), 2041–2043. https://doi.org/10.1111/JOCN.15257

Klemm, P. R., Ruelens-Trinkaus, D., Allshouse, L. M., & Barnard, P. J. (2020). The COVID-19 Pandemic and Higher Education: Common Interdisciplinary Issues and Lessons Learned. Open Journal of Nursing, 10(12), 1195–1208. https://doi.org/10.4236/OJN.2020.1012086

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Lemay, D. J., Morin, M. M., Bazelais, P., & Doleck, T. (2018). Modeling Students' Perceptions of Simulation-Based Learning Using the Technology Acceptance Model. Clinical Simulation in Nursing, 20, 28–37. https://doi.org/10.1016/j.ecns.2018.04.004

McDaniels, M., Pfund, C., & Barnicle, K. (2016). Creating Dynamic Learning Communities in Synchronous Online Courses: One Approach from the Center for the Integration of Research, Teaching and Learning (CIRTL). Online Learning, 20(1). https://doi.org/10.24059/OLJ.V20I1.518

McDonald, E. W., Boulton, J. L., & Davis, J. L. (2018). E-learning and nursing assessment skills and knowledge – An integrative review. Nurse Education Today, 66, 166–174. https://doi.org/10.1016/j.nedt.2018.03.011

Morin, K. H. (2020). Nursing education after COVID-19: Same or different? Journal of Clinical Nursing, 29(17–18), 3117–3119. https://doi.org/10.1111/JOCN.15322

Ramlo, S. (2021). The Coronavirus and Higher Education: Faculty Viewpoints about Universities Moving Online during a Worldwide Pandemic. Innovative Higher Education, 46(3), 241– 259. https://doi.org/10.1007/S10755-020-09532-8/FIGURES/3

Ramos-Morcillo, A. J., Leal-Costa, C., Moral-García, J. E., & Ruzafa-Martínez, M. (2020). Experiences of Nursing Students during the Abrupt Change from Face-to-Face to e-Learning Education during the First Month of Confinement Due to COVID-19 in Spain. International Journal of Environmental Research and Public Health 2020, Vol. 17, Page 5519, 17(15), 5519. https://doi.org/10.3390/IJERPH17155519

Rasmitadila, Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). The perceptions of primary school teachers of online learning during the covid-19 pandemic period: A case study in Indonesia. Journal of Ethnic and Cultural Studies, 7(2), 90–109. https://doi.org/10.29333/ejecs/388

Roth, J. J., Pierce, M., & Brewer, S. (2020). Performance and Satisfaction of Resident and Distance Students in Videoconference Courses. Https://Doi.Org/10.1080/10511253.2020.1726423, 31(2), 296–310. https://doi.org/10.1080/10511253.2020.1726423

Sabates, R., Carter, E., & Stern, J. M. B. (2021). Using educational transitions to estimate learning loss due to COVID-19 school closures: The case of Complementary Basic Education in Ghana. International Journal of Educational Development, 82. https://doi.org/10.1016/j.ijedudev.2021.102377

Sanderson, C. D., Cox, K., & Disch, J. (2020). Virtual Nursing, Virtual Learning. Nurse Leader, 1–5. https://doi.org/10.1016/j.mnl.2019.12.005

Wahab, A., & Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic. Higher Education Studies, 10(3), p16. https://doi.org/10.5539/HES.V10N3P16

Wilson, J. L., Hensley, A., Culp-Roche, A., Hampton, D., Hardin-Fanning, F., & Thaxton- Wiggins, A. (2021). Transitioning to Teaching Online During the COVID-19 Pandemic. SAGE Open Nursing, 7, 23779608211026136. https://doi.org/10.1177/2377960821102613

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VOCATIONAL EDUCATION ORIENTED IN EMPLOYABILITY AND ENTREPRENEUR SKILLS TO FACE CHALLENGES AND COMPETITIVENESS OF GRADUATES

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Abstract

 Each country is always trying to improve human resources through various innovations to keep up with the competition in science, technology, economy, and global business, including a competition to enter the working world. The low quality of workforce with vocational education graduates who have not responded to the development needs of labor market is one of the reasons why Indonesia's productivity and competitiveness are still lagging. The biggest challenge for vocational education institutions is to produce graduates who have academic skills, technical skills, and employability skills are balanced. Mastery of employability skills is one of the main characteristics needed by Indonesian human resources in the revolution industry 4.0. The constantly changing working world creates new challenges for employers and workforces. Employers expect the new workforce to have a wider range of competencies and abilities, strong job-specific skills, and employability skills. Employability skills can be interpreted as the ability to adjust a person's workforce to a job so that it is possible to survive and be aware of opportunities for success at work. In addition, they are expected to have entrepreneurial skills. These skills are defined as the entrepreneur's ability to be creative, innovative, and run a business.

Keywords: Employability Skills, Entrepreneurship Skills, and Vocational Education

INTRODUCTION

ECONOMIC competition as well as the emergence of the influence of new technologies and the effects of globalization will have an impact on changes in the dynamics of work and the structure of employment for the industrial sector in Indonesia. Changes in work dynamics and employment structures need to be accompanied by the emergence of new forms of skills to increase productivity and use technological innovations in the workplace [1]. Graduate employment patterns appear to have changed around the world. The labor market is flooded with graduates with various qualifications competing for jobs.

The results of Seth's research [2] stated that 85% of employers believe that the quality of the workforce can be improved by including job skills in the curriculum. Because of the importance of job skills, educators, employers, and students become partners in the development of a skilled workforce [3]. The Stanford Research Institute and the Carnegie Mellon Foundation at Fortune 500 CEOs found that 75% of long-term job success hinges on soft skills and only 25% on technical skills. According to a survey by Harvard University, 80% of career achievements determine by soft skills and only 20% by hard skills [2] The main challenge for graduates of vocational colleges in entering the workforce is the gap between graduate work skills and the skills needed in the workplace. The workforce in the 21st Century not only requires graduates with high academic qualifications as represented by subjects and degree levels but also equipped with several skills and attributes related to technical work. However, the aspect of employability skills remains a consideration in finding recruitment of new workers. The development of new technology based on vocational education is one of the aspects of successful economic development.

One of the examples of economic progress is the development of technology and industry in Japan. Vocational education and training in Japan are considered a vehicle for skills development for economic

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development [4]. Agrawal [5] also stated that Japan's experience as one of the industrial centers in East Asia with a relatively low unemployment rate but can achieve high economic growth rates because the people have vocational technology skills. Various sources reveal that almost two-thirds of the middle-level workforce (intermediate level) in developed countries are the vocational education talent [6]. Furthermore, Norbert & Guggenheim stated that the development of high-quality vocational education is a strategy that is inseparable from the competitiveness of graduates.

Bukit [7] formulates that significant improvement in the quality of vocational education has been carried out by various countries, both in developed countries and in developing countries including Indonesia. Thus, it can be said that the development of quality vocational education will have an impact on increasing the mobility and competitiveness of a country's industrial management.

Several research results state that currently for employers' special academic skills are no longer sufficient for graduates to meet the needs of the national labor market [8]. In addition to basic knowledge and specific skills, current workers are expected to have an additional set of skills. Several skills and attributes are also called job skills, which are needed by students to prepare themselves to meet the needs of various jobs after graduation. Job skills are considered one of the components related to education and training needed by the business world and the industrial world.

Therefore, the labor market has changed and has become competitive and flexible if employability skills are considered in vocational higher education. This change is caused by the expansion of the provision of employability skills in higher education, globalization, and the expansion of the global economy which affects the recruitment needs of employers [9], [10], reveals that the key factor in economic development and competition, and even social stability in many countries, including developed countries, is vocational education. Therefore, the main requirement for development in the modern era is that the community has vocational education and training so that it is easy to meet technological changes [11].

Vocational universities are expected (by employers, government, and the community) to produce graduates not only with knowledge and skills specific to disciplines, but also well-developed work skills so that they become assets for the organization where they work [12]. One of the skills that can be acquired and developed by students in vocational higher education is employability skills which are not limited to a particular job but are relevant to various jobs and are relevant for all levels of work from senior to junior level.

One of the causes of the lack of employability attributes of vocational higher education graduates is an understanding of low employability skills. Job skills are a very important issue in the national, regional, and international labor markets. Suarta [13] stated that work skills are considered as one of the links between education and training and the world of work. A book entitled "Lesson from The Top" by Neff and Citrin published in 1999 [14] contains sharing and interviews with the 50 most successful people in America, revealing that what determines one's success the most is not technical skills alone, but rather the quality of self which is included in employability skills. This statement implies that to compete in the world of work does not only rely on technical skills but must also be supported by employability skills.

These challenges include the lack of attention paid to the development of graduate job skills attributes, which negatively impacts the readiness of college graduates for high-skill jobs.

Discussion Employability Skill

Definition of Employability Skill
Common terminology used for employability skills is words such as transferable skills, key skills, soft skills, generic attributes, job skills, key competencies, core skills, and support skills. The term employability skills have many similar meanings such as: generic abilities, transferable skills, basic skills, essential skills, job skills, soft skills, core skills, core competencies and key skills [14]. Employability skills are used interchangeably with other terms such as generic skills, transferable skills, non-technical skills, core skills, key skills, essential skills, and 21st century skills [13].

Employability skills can be interpreted as a person's ability to adjust to a job so that it is possible to survive and be aware of opportunities for success at work [10]. This understanding shows that employability skills have implications for skills and knowledge that can improve the ability of the workforce. In addition, employability skills contribute to maintaining a good job, coping with changes and work dynamics, and securing various types of work in the workplace [14]. Thus, it can be said that employability skills are abilities that enable a graduate to easily compete for work and survive in the workplace.

According to Hillage and Pollard [15] employability skills are the ability to get an initial job, keep a job and get a new job if needed. Yorke [16] provides a clearer definition of employability skills as a set of soft skills consisting of skills, understanding, and personal attributes that make a person more likely to secure and succeed in a job chosen for his or her interests. themselves, the workforce, society and the economy".

Employability skills are an important aspect of competence possessed by all employees to become skilled workers to be able to explore the world of work [17]. Another understanding expressed by Weligamage [18] that employability skills are skills, understandings and personal attributes that make it easier for graduates to get a job and be successful in their chosen job. In most cases, the terms employability skills are used interchangeably to refer to the employability of graduates [19].
This means that one's ability in the form of employability skills can make it easier to get a job and benefit oneself so that it is important for prospective workers to have, especially vocational higher education graduates to survive and improve their performance in the workplace.
Based on this understanding, it can be concluded that one's ability in the form of employability skills can make it easier to get a job and benefit oneself so that it is important for prospective workers to be able to survive and improve their performance in the workplace. In addition, employability skills contribute to maintaining a good job, coping with job changes and dynamics, and securing various types of work in the workplace.

Employability Skill Aspects
Competition in seizing jobs and new management processes applied by the business world/industrial world require graduates, especially graduates of vocational education to have critical thinking, be able to solve problems in addition to being excellent in communication skills. So that respond to technological advances and competition in the world of work, it is necessary to prepare graduates to have the skills and ability to adapt to the work environment [20]. This means that it is important for graduates of vocational higher education to have skills and the ability to adapt to the work environment.

According to the American Management Association [21], job skills attributes such as critical thinking and problem solving, creativity and innovation, collaboration, and communication skills are becoming increasingly important in today's global economy. Skills such as communication, problem solving, decision making, analytical and critical thinking, synthesizing information, teamwork, interpersonal, and continuous learning are some of the job skills attributes required by graduates in entering the workforce, as

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well as being prerequisites for professional recognition [22]. Employability skills that employers are looking for are good communication and interpersonal skills, proficiency in English, the ability to speak constructively, the ability to identify and state problems and issues, solve problems, present ideas, and analyze problems and issues encountered [23].

In addition, employability skills such as good communication and teamwork skills are recognized as graduate skills that are consistently most desired by employers in developed countries today [24]. Work skills can be instilled in students before they enter the world of work. The modern world is characterized by innovation, where companies compete to bring innovative solutions to existing problems and introduce new skills products to the market based on employability skills. This rapid progress requires aspects of employability skills such as problem solving with creativity and identifying new problems and creating solutions for the workforce [25]. According to Shivoro [26] aspects of employability skills include, among others: self-management, leadership, interpersonal, mastery of information technology.

The group of employability skills according to the results of the identification of [27], [28], [29] are as follows: (1) communication skills contribute to a harmonious relationship between employees and customers; (2) teamwork skills contribute to working relationships; (3) problem solving skills can contribute well to problem solving; (4) initiative skills contribute to innovative work; (5) self-management skills contribute to the satisfaction of other employees; (6) continuous learning skills contribute to sustainable improvement and expansion for the company; and (7) information technology skills contribute to the effective execution of tasks.

Based on the various descriptions of employability skills, it can be said that for the purposes of education in vocational higher education in the context of developing human resources in the future, students should be equipped with employability skills attributes to anticipate the work requirements set by the manager of the industrial world in recruiting workers. The success of a graduate of vocational higher education in the workplace is not only determined solely by knowledge and technical abilities (hard skills), but also by the ability to manage oneself and others or what is often referred to as employability skills.

Entrepreneurial Skill
Definition of Entrepreneurship
Many definitions of entrepreneurship, in this study only coverage a few. Entrepreneurship is a multi-dimensional concept that includes being innovative, acting as a leader, owning a small business, or starting up a new company [30]. Furthermore, Syam [31] defines entrepreneurship is the ability to creative thinking and behave innovative as basic resources, purpose, and process of facing life's challenges.

Entrepreneurial Competencies
The entrepreneurial competencies developed at some level be the main purpose of most entrepreneurial education. These competencies have defined the ability and willingness to perform the new value innovation entrepreneurial job based on impact integration of knowledge, skills, dan attitudes [32], [33].

Knowledge have three competences are mental models, declarative knowledge, and self-insight. 1) mental models are knowledge about how to get things done without resources, risk, and probability models. 2) declarative knowledge is basics of entrepreneurship, value creation, idea generation, and opportunities. 3) self-insight is knowledge to identify characteristic of an entrepreneur [32], [33].

An entrepreneur has many skills such as marketing, resource, opportunity, interpersonal, learning, and strategic skills. Among six skills, we explain three skills 1) marketing skills are capability to communicate a vision, dealing with customer, and assessing the marketplace. 2) opportunity skills are ability to capture

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and realize opportunities. 3) interpersonal skills are leadership, motivating others, managing people, listening, resolving conflict, and socializing [32], [33].

Finally, entrepreneur attitudes are entrepreneurial passion, self-efficacy, entrepreneurial identity, proactiveness, uncertainty/ambiguity tolerance, innovativeness, and perseverance [32], [33].

CONCLUSION

The preparation of human resources, especially for workers in vocational field, requires strategies so that they can compete in the working world. Students who have employability and entrepreneurial skills. They have dual skills, not only can be work in industry but also independently running a business or creating jobs. Dual capability requires a strategic step stat starts with revision curriculum by involving stakeholders from industry practitioners and entrepreneurs. So that this concept can be realized and can improve the quality of human resources, the nation's competitiveness, and overcome the problem of unemployment.

References

R. N. Naanda, "The Integration of Identified Employability Skills into The Namibian Vocational Education and Training Curriculum," Dissertation, Department of Curriculum Studies Faculty of Education Stellenbosch University, Namibia, 2010.

S. Deepa. and M. Seth, "Do soft skills matter? – Implications for educators based on recruiters' perspective," IUP Journal of Soft Skills, vol. 7, no. 1, pp.7–20. 2013

J. Furnell and G. Scott, "Are we all on the same page? Teacher, graduate and student perceptions of the importance of skills thought to enhance employability," Journal of Learning Development in Higher Education, vol. 667, no. 8, pp.1–10. 2015.

U.E. Kennedy, "Entrepreneurial, Technical and Vocational Skills Required for Self-Reliance and Job Creation in Nigeria," British Journal of Education, vol. 2, no. 5, pp. 48-56, 2014

T. Agrawal. "Vocational Education and Training Programs (VET): An Asian Perspective," Asia Pacific Journal of Cooperative Education, vol. 14, no. 1, pp.15 - 26, 2013.

N. Wollschlager and E.F. Guggenheim, "A History of Vocational Education and Training in Europe – from Divergence to Converegence," European Journal: Vocational Training, no. 32, pp. 1-3, 2004.

M. Bukit, Strategi dan Inovasi Pendidikan Kejuruan dari Kompetensi ke Kompetisi, Bandung: Alfabeta. 2014.

OECD. OECD Skills Outlook 2013: First Results from the Survey of Adult Skills. 2013. Available: http://skills.oecd.org/skillsoutlook.html

H.K. Al-Harthi, "University Student Perceptions of The Relationship Between University Education The Labour Market in Egipt and Oman," Prospects, vol. 41, pp. 535-551, 2011.

I. Hanafi, "Re-orientasi Keterampilan Kerja Lulusan Pendidikan Kejuruan," Jurnal Pendidikan Vokasi, vol. 2, no. 1, pp.107-116, 2012.

B.A. Oluwale, O.O. Jegede, and Olamade, "Technical and Vocational Skills Depletion in Nigeria and The Need for Policy Intervention," International Journal of Vocational and Technical Education, vol. 5, no. 6, pp. 100-109, 2013.

S. Lane, "Developing Employability Skills by Using Blended Learning," American Journal of Educational Research, vol. 4, no. 1, pp. 47-53, 2016.

I.M. Suarta, "Supervisors' Perceptions of the Employability Skills Needed by Higher Vocational Education Graduates to be Successful in the Workplace," Paper presented at 14th UNESCO APEID International Conference Education for Human Resource Development, Thailand. 2010.

Darmawang, "Tingkat Employability Skills Mahasiswa Jurusan Pendidikan Teknik Otomotif UNM," Laporan Penelitian, Lembaga Penelitian Universitas Negeri Makassar: Makassar. 2015.

J. Hillage and E. Pollard, "Employability: Developing a Framework for Policy Analysis", Research Brief, no. 85, 1998.

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

M. Yorke, and P.T. Knight, Embedding employability into the curriculum. York, United Kingdom: The Higher Education Academy. 2006.

H.A. Saari and A.M. Rashid, "Competency Level of Employability Skills among the Apprentices of the National Dual Training System: A Comparative Analysis of Industry Perception by Company Status", International Journal of Education and Research, vol. 1, no. 11, 2013.

Weligamage, "Graduates' Employability Skills: Final Year Undergraduates' Perspective," 10th International Conference on Sri Lankan Studies, Kelaniya, Sri Lanka, 16th -18th December 2005.

I. Tempone, M. Kavanagh, N. Segal, P. Hancock, B. Howieson, and J. Kent, "Desirable Generic Attributes for Accounting Graduates into the Twenty-first Century: The Views of Employers," Accounting Research Journal, vol. 25, no. 1, pp. 41-55, 2012.

V. Saunders and K. Zuzel, "Evaluating Employability Skills: Employer and Student Perceptions," Journal Bioscience, vol. 15, no. 2, 2010.

American Management Association (AMA), Executives say the 21st century requires more skilled workers. 2010. Available: http://www.p21.org/news-events/press-releases/923-executives-say-the-21st-century-requires-more-skilled-workers

N. Abayadeera and K. Watty, "Generic skills in accounting education in a developing country: Exploratory evidence from Sri Lanka," Asian Review of Accounting, vol. 24, no. 2, pp. 149-170, 2016.

S.W. Chan, M.F. Ahmad, I. Zaman, and W.S. Ko, "Employers' perception on important employability skills in the manufacturing industry," International Journal of Engineering & Technology, vol. 7, pp 1-6, 2018.

Casner-Lotto J, Barrington L. Are They Really Ready to Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century US Workforce: ERIC; 2006.

P.E. Greenwood, K. O'leary, and P. Williams, The Paradigm Shift: Redefining Education, Deolitte, Australia. 2015.

R. Shivoro, R. K. Shalyefu, and N. Kadhila, "Perspectives On Graduate Employability Attributes For Management Sciences Graduates," South African Journal of Higher Education, vol. 32, no. 1, pp. 216–232, 2018.

Australian Government, Development of a Strategy to Support the Universal Recognition and Recording of Employability Skills, Department of Education, Science and Training, 2004.

S.V. Zolihgen, "The Role of key Qualifications in the Transition from Vocational Education to Work," Journal of Vocational Education Research, vol. 27, no.2, pp. 217-242, 2002.

K.B. Labarre, Through Competence-Based to Employment-Oriented Education and Training, A Guide for TVET Practitioners. 2009. Available: http://www.giz.de/akademie/de/ downloads/Employment-Oriented_Educa-tion_and_ Training.pdf)

S. Gideon, "What is Entrepreneurship?," Entrepreneurial Practice Review, vol. 1, no. 3, pp. 16-35, 2010.

H. Syam, Entrepreneurship Strategi Menuju Sukses.Edisi Revisi. Makassar: Badan Penerbit UNM, 2019.

M. Lackeus, "Entrepreneurship in Education: What, Why, When, How," OECD, 2015. Available online: https://www.oecd.org/cfe/leed/BGP_Entrepreneurship-in-Education.pdf,

H. Syam, M. Farid., and F. Najamuddin, "Integration of Educational and Enttrepreneurial Insight: A Concept Towards to Develop Human Resources," Proceeding of The 1st MARIC, Kualalumpur, Malaysia, pp 326-331, 2019.

COMPARISON OF TWO SCORING MODELS IN THE MULTIPLE CHOICE MATH TEST

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Abstract. Evaluation is the process of evaluating students who function to find out the results that have been achieved, determine grade progress, and compare achievements with student capacity. The evaluation process can be done through the acquisition of student scores on the questions tested. Student scores will illustrate the true abilities of students. But sometimes there is an imbalance of scores on students because of obstacles that occur when facing an exam, such as anxiety, carelessness, poor health, or students cheating. Based on these assumptions, it is necessary to study the acquisition of student scores through the comparison of two scoring models on a multiple choice mathematics test. The purpose of this study is to find out which scoring model is most appropriate for multiple choice tests. Research data were analyzed using the Donlon and Fischer methods. Research using experimental methods. The results of the data analysis show that the scoring model by giving 'punishment' to the wrong answer gives more reasonable results compared to the 'no penalty' scoring model. Thus it can be concluded that the scoring model by giving a 'penalty' on the wrong answer is more appropriate to be used on a multiple choice test.

Keywords: mathematical score, punishment score, correct score.

INTRODUCTION

Multiple choice test is one of the instruments that can be used to measure students' abilities in the learning process. There are many advantages to multiple-choice tests, however, there are also disadvantages, including the opportunity to speculate in answering difficult questions, so that there is a possibility that students with low abilities will get higher scores than students with high abilities because their speculations happen to be right. Incidents like this lead to the occurrence of score irregularities.

The scoring of the multiple choice test is highly dependent on the scoring model used. The application of different scoring models will have an impact on the score obtained by each student. When using the correct score model, students will answer the test items that they do not master by guessing. On the other hand, when using the punishment score model, students will not answer the test items that they do not master, and in the end there will be an irregularity in the score.

To deal with this problem, a pattern of detecting irregular scores on multiple-choice tests was developed, and based on this study, the formulation of the problem in this study is: "Is there a difference in scores between the correct score model and the punishment score model on the multiple-choice test?" Objectives This study was to obtain empirical data about the difference in the unfairness of scores between the multiple choice test with the correct score model and the multiple choice test with the punishment score model.

LITERATURE REVIEW

An objective test is a test that consists of one sentence statement or question sentence with several alternative answer choices that must be chosen by students.9 Popham7 calls it the selected answer test. Hagen3 states that objective tests are very practical and effective tests. In general, objective tests are

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presented in the form of multiple choice. The number of options on a multiple choice test is the number of alternative answer choices given. There is only one correct answer, while the other answer choices serve as a distraction. The probability of answering correctly on a multiple choice test depends on the number of options available in the test item. Indirectly the number of options on the multiple choice test can affect the scoring results. The more the number of options provided, the smaller the chances of students answering correctly the items selected by speculation. The existence of the opportunity to speculate or choose randomly available answers is a problem in the use of multiple choice tests, which in the end will produce scores that are not fair and do not match the students' actual abilities.

The correct score model on multiple choice tests is a way of obtaining scores through the addition of scores on test items with correct answers without taking into account test items with incorrect answers or test items not answered by students. As a result, students have the opportunity to answer the test items by guessing. If the guess is correct and occurs repeatedly on several test items, then the student will get a final score that is higher than his actual ability. The student's score became unnatural, because it was obtained from his guess that happened to be right. In the correct score model, for students with the same ability, the final score of students who guessed would be higher than the final score of students who did not guess. This is what is known as score irregularity.

Naga5 revealed that the score was not in accordance with the student's ability even though all the test items were good. Score irregularities occur when students manage to correctly answer difficult test items and cannot correctly answer easy test items. The impropriety of the score is the difference between the students' actual knowledge and the knowledge obtained from the score after taking the test. As a result of the inappropriateness of the score, students may get a score that is much higher than the score that should be obtained based on their ability.

To Answer The Problem Of Score Impropriety, A Pattern For Detecting Score Impropriety Was Developed On Multiple Choice Tests, Through The Calculation Of The Fairness Index Of Scores. The Fairness Index Score Is A Number That Shows How Much A Student's Score Can Describe The Actual Ability Of Students. The Higher The Fairness Index, The More Reasonable The Student's Score. The Fairness Index Score In This Study Was Calculated Through Classical Measurement Theory Using The Donlon And Fischer Method. Based On This Study, The Formulation Of The Hypothesis In This Study Is: "In The Multiple Choice Test, The Test Score With The Punishment Score Model Is More Reasonable Than The Multiple Choice Test Score With The Correct Score Model"

RESEARCH METHODS

This research was conducted in DKI Jakarta with the respondents being high school students in class XI IPA. Collecting data using research instruments that are carried out directly by students, in order to obtain primary data. There are two types of instruments used, namely: instrument A and instrument B. The points of instrument A and instrument B are the same, but differ in the scoring model provided. The instrument was given to two groups of students. The first group worked on instrument A in the form of multiple choice test questions with the correct score model and the second group worked on instrument B in the form of multiple choice test questions with the punishment score model. After data collection is complete, all data is checked, selected, and tabulated to facilitate further data processing and analysis.

After verifying and tabulating the data, the next step is to calculate the average fairness index score for each group and compare it to find out which group's score is more reasonable. Thus in this study used a comparative method. The score fairness index was calculated using classical measurement theory, using the Donlon and Fischer method.

The research variables consisted of the scoring model and the number of options on the multiple choice test, as independent variables and the fairness index score as the dependent variable. The research design is shown in Table 1. below:

Table 1. Research Design

Research Instrument	Scoring Model	
	Correct Score	Punishment Score
Five-Option Multiple Choice Test	Score Fairness Index (µCS5)	Score Fairness Index (µPS5)

The research sample amounted to seven hundred respondents who were divided into two groups, each group represented by three hundred and fifty respondents. The number of samples has met the requirements in the research sampling process, as stated by Tabachnick[9] that the minimum sample size is 200 respondents, in order to obtain reliable results. Gable[1] determined that the sample size was 5 to 10 times the number of items. Meanwhile, Muller[4] emphasized that there is no definite limit on the number of respondents in the item analysis, but the measurement results will be more stable when using 100 respondents rather than 10 respondents.

The research instrument is a multiple choice test of five options for Mathematics class XI IPA, with a total of forty items. After the preparation of the items, the content validation process was carried out through the expert match technique by calculating the percentage of items that matched the indicators based on expert judgment. The next step is to carry out empirical validation in the form of testing the instrument in the field. Item validity was tested using the biserial point correlation coefficient between item scores and total test scores.

   Naga[5] stated that the test items were declared valid if the correlation coefficient value was 0.20 or more. After the validity test, then the instrument reliability test was carried out using the internal consistency reliability coefficient formula (Kuder-Richardson 20). According to Nitko[6], the research instrument is said to be reliable if it has a high reliability coefficient, namely: 0.90 or more. While Guilford[2] wrote the formula as follows:

$$\rho_{KR-20} = \frac{N}{N-1} \frac{\sigma_A^2 - \sum p_i q_i}{\sigma_A^2}$$

The research hypothesis test was carried out using the t-test. For this reason, the research hypothesis is formulated in advance into statistical hypotheses, as follows:
Statistical Hypothesis:
 H0: µPS5 - µCS5 = 0

 H1: µPS5 - µCS5 > 0

RESEARCH RESULTS AND DISCUSSION

The results of the following research and discussion are obtained from the results of data description analysis and inferential analysis. Data description analysis was conducted to describe the general characteristics of research variables, while inferential analysis was used to test hypotheses which included testing requirements analysis and testing research hypotheses. Previously, the results of the research instrument trials were presented, as follows:

Test Results of Research Instruments

The research instrument was arranged based on the grid of Mathematics Subjects for class XI IPA. After the preparation of the instrument, a content validation process was carried out by mathematicians through the expert match technique, by calculating the percentage of items that matched the indicators based on expert judgment. The next step is to carry out empirical validation in the form of testing the instrument in the field. After obtaining valid items, then the instrument reliability test is carried out. The test results of research instruments in the form of validity and reliability tests can be described as follows:

4.1.1. Item Validity. Measurement validity indicates the validity of a measuring instrument, namely: how far the measurement results can be interpreted as the behavior or characteristics being measured. The instrument item validity test in this study was calculated using the biserial point correlation coefficient formula. Based on the calculation results, obtained 36 valid test items. Furthermore, 30 items were selected to be used in the study. While the 6 test items that were not selected were the test items with the lowest scores, even though the items were valid. This is in accordance with Muller4's statement, namely: the item selection process is carried out by selecting items that have item validity higher than others proportionally for each measured indicator.

4.1.2. Instrument Reliability. Instrument reliability describes the consistency of a measurement, that is, a measuring instrument is said to be reliable if the measuring instrument can show stability in the measurement results. In this study, instrument reliability was calculated using the internal consistency reliability coefficient formula (Kuder-Richardson 20). Of the 30 test items that were declared valid, then the instrument reliability was calculated, and the reliability coefficient value was 0.93. Nitko6 suggests that a research instrument is said to be reliable or trustworthy if it has a reliability coefficient greater than or equal to 0.90, meaning that the instrument already has a high level of confidence and can be used to collect research data. The calculation results show that this research instrument has a high level of reliability.

Description of Research Result Data

The research data consisted of two groups of students, the first group was given a five-option multiple-choice test with a correct score model and the second group was given a five-option multiple-choice test with a punishment score model. Each group numbered 350 people. Descriptions of research data from the two treatment groups are summarized in Figure 1 and Figure 2 below:

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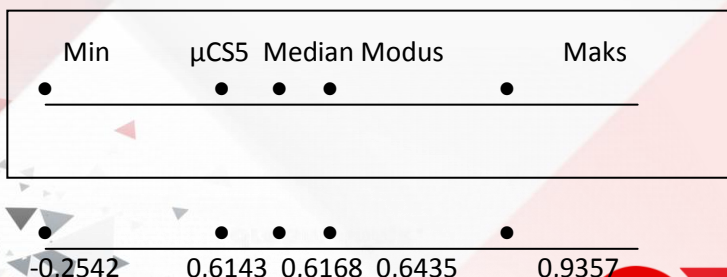
Figure 1. Relative Position of Average Score Fairness Index on Five-Option Multiple Choice Test with Correct Score Model

Min	Median µPS5 Modus			Maks
●	● ● ●			●
0,4745	0,7684 0,7712 0,8084			0,9976
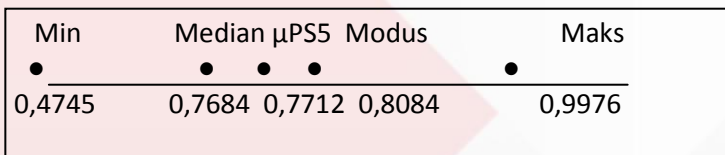
Figure 2. Relative Position of the Average Score Fairness Index on the Five-Option Multiple Choice Test with the Punishment Score model

Figure 1 and Figure 2 show that the index of fairness of the highest respondent scores is in the five-option multiple-choice test group with a punishment score model.

Normality Test

The normality test is used to determine whether all the data groups being tested come from populations whose distribution characteristics are normally distributed or not. This study uses the Lilliefors test. The results of the normality test of the fairness index of the five-option multiple choice test with the correct score model are: L0 = 0.0543 while the Ltab value = 0.0551 for the significance level = 0.01. Because L0 Ltab then H0 is accepted, meaning that the sample comes from a normally distributed population. The results of the normality test of the fairness index of the five-option multiple choice test with the punishment score model were L0 = 0.0549 while

the Ltab value = 0.0551 for the significance level = 0.01. Because L0 Ltab then H0 is accepted, meaning that the sample comes from a normally distributed population.

Research Hypothesis Testing

The research hypotheses were tested using the t-test formula through the test of the mean difference between the

$$\sqrt{\frac{(n_X - 1)s_X^2 + (n_Y - 1)s_Y^2}{(n_X - 1) + (n_Y - 1)}} \sqrt{\frac{1}{n_X} + \frac{1}{n_Y}}$$

two groups of data. Potochnik10 write the t-test formula as follows:

$$t = \qquad db_{\overline{X} - \overline{Y}} = (n_X - 1) + (n_Y - 1)$$

The calculation of the hypothesis test is shown below:
Statistical Hypothesis Formulation:
       H0: µPS5 - µCS5 = 0
       H1: µPS5 - µCS5   > 0

Testing Criteria:
Accept the hypothesis H0 if thit ≤ ttab
Reject the hypothesis H0 if thit > ttab

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The Calculation Results

The results of the t-test calculation show that the value of t_{hit} = 13.075, while the value of t_{tab} at the significance level = 0.05 is t_{tab} = t(0.95)(698) = 1.645 and at the significance level = 0.01 is t(0.99)(698) = 2,326. Based on the calculation results, it appears that $t_{hit} > t_{tab}$, thus it was decided to reject H0. That is, in the analysis of the impropriety of the mathematical score, there is a very significant difference between the five-option multiple-choice test scores with the correct score model and the five-option multiple-choice test scores with the punishment score model.

CONCLUSIONS AND SUGGESTIONS

CONCLUSION

The results of testing the research hypothesis decided to reject H0. Thus, it can be concluded that the five-option multiple-choice test score with the punishment score model is more reasonable than the five-option multiple-choice test score with the correct score model.

SUGGESTIONS

Inappropriate math scores should be minimized through the provision of multiple choice tests with a punishment score model. Based on the results of the study, the test resulted in a high score fairness index, so that it had a reasonable level of student score acquisition and could describe students' actual abilities.

References

Gable RK 1986 Instrument Development in The Affective Domain (Kluwer-Nijhoff Publishing, Boston) p 139.

Guilford JP 1982 Psychometric Methods (Tata-McGraw Hill, New Delhi) p 380.

Hagen Elizabeth 1955 Measurement and Evaluation Psychology and Education (John Wiley & Sons, Inc., New York) p 58.

Muller Daniel J 1986 Measuring Social Attitude (Teachers College, Columbia University, New York) p 17.

Naga Dali S 2012 Teori Sekor Pada Pengukuran Mental (PT. Nagarani Citrayasa, Jakarta), pp. 15-44.

Nitko Anthony J 1996 Educational Assessment of Student (Prentice Hall, Inc., New Jersey) p 75.

Popham W James 1981 Modern Educational Measurement (New Jersey: Prentice Hall, Inc) p 235.

Tabachnick Barbara G and Linda S Fidell 1989 Using Multivariate Statistics (Harper Collins, Publisher, Inc., New York) p 603.

Ackermann N, Siegfried C. Does a balanced test form regarding selected-response and constructed-response items overcome gender gap in test scores? An analysis of the format-gender relation in the test of economic-civic competence. Citizenship, Soc Econ Educ. 2019;18(3):158-176. doi:10.1177/2047173419892531

Potochnik A, Colombo M, Wright C, Potochnik A, Colombo M, Wright C. Statistics and Probability. Recipes Sci. 2018;(Table 2):167-206.

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Stabilitas Transien Sistem Tenaga Listrik: Studi Penerimaan Aplikasi Simulink untuk Stabilitas Transien dalam Pembelajaran Penggunaan Komputer Dalam Sistem Tenaga Listrik

Daryanto dan Muksin.

Penggunaan program simulink Matlab untuk menganalisis sistem tenaga listrik memerlukan penerimaan dari penggunanya. Penelitian ini bertujuan untuk menyelidiki pengaruh penerimaan aplikasi Simulink untuk stabilitas transien dalam Pembelajaran Penggunaan Komputer Dalam Sistem Tenaga Listrik. Penelitian ini menggunakan pendekatan kuantitatif. Sampel penelitian sebanyak 60 orang Mahasiswa yang menggunakan Aplikasi Simulink untuk stabilitas transien. Analisis data menggunakan analisis jalur dengan pendekatan Partial Least Square. Hasil penelitian menunjukkan bahwa persepsi kemudahan, berpengaruh langsung terhadap persepsi kegunaan, sikap dan niat dalam menggunakan Aplikasi Simulink untuk stabilitas transien dengan koefisien jalur secara berurutan sebesar 0,581; 0,574 dan 0,249; persepsi kegunaan dan kemudahan dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap sikap untuk menggunakan Aplikasi Simulink untuk stabilitas transien dengan kofisien jalur secara berturut-turut sebesar 0,218 dan 0,574; sikap dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap niat untuk penggunaan Aplikasi Simulink untuk stabilitas transien dengan koefisien jalur sebesar 0,581, dan niat dalam menggunakan Aplikasi Simulink untuk stabilitas transien berpengaruh langsung terhadap penggunaan Aplikasi Simulink untuk stabilitas transien yang sebenarnya dengan koefisien jalur sebesar 0,491. Penelitian ini menyimpulkan bahwa penggunaan Aplikasi Simulink untuk stabilitas transien dipengaruhi oleh kemudahan dan kegunaan program aplikasi simulink tersebut serta perilaku pengguna.

Kata kunci: Penerimaan TIK, Simulink, Matlab.

Pendahuluan

Program simulink dari Matlab dapat membantu mahasiswa program studi teknik elektro dalam menganalisis perilaku sistem tenaga listrik. Walaupun banyak manfaat yang diperolah dalam menggunakan program aplikasi Simulink tersebut, namun jika tidak direncanakan dengan baik akan mengalami banyak hambatan dan bahkan kegagalan.

[1] Chapnick dan Gold dalam Aydm dalam penelitiannya menyimpulkan bahwa pemanfaatan TIK yang tidak direncanakan dengan baik akan berakhir kegagalan.

[2] Aydin dan Tasci menyimpulkan bahwa dalam menerapkan e-learning diperlukan peningkatan sumber daya manusia. Program aplikasi simulink sangat tergantung pada orang yang menggunakannya, oleh karena itu harus mempertimbangkan aspek sosio-kultural mereka yang menggunakan.

[3] Daryanto dkk. dalam penelitian tentang penggunaan ICT dalam pengelolaan sekolah menemukan bahwa motivasi pengguna sangat menentukan keberhasilan sekolah tersebut. Sejalan dengan hal tersebut,

[4] Mohammad Chuttur dalam penelitiannya menyimpulkan bahwa penggunaan TIK adalah respon yang dapat diprediksi dengan motivasi pengguna yang pada gilirannya secara langsung dipengaruhi oleh stimulus eksternal terhadap keterampilan dan fitur sistem yang sebenarnya. Selanjutnya [5] Daryanto dkk menemukan bahwa persepsi kemudahan dalam menggunakan ICT akan meningkatkan efektivitas

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manajemen sekolah. Adopsi ICT dalam pengelolaan sekolah juga dipengaruhi oleh model kepemimpinan, terutama kepemimpinan otentik.

Metode

Penelitian ini menggunakan analisis jalur dengan pendekatan partial least square (PLS). Simulink digunakan untuk menganalisis stabilitas transien ditunjukkan pada gambar 1 berikut ini.
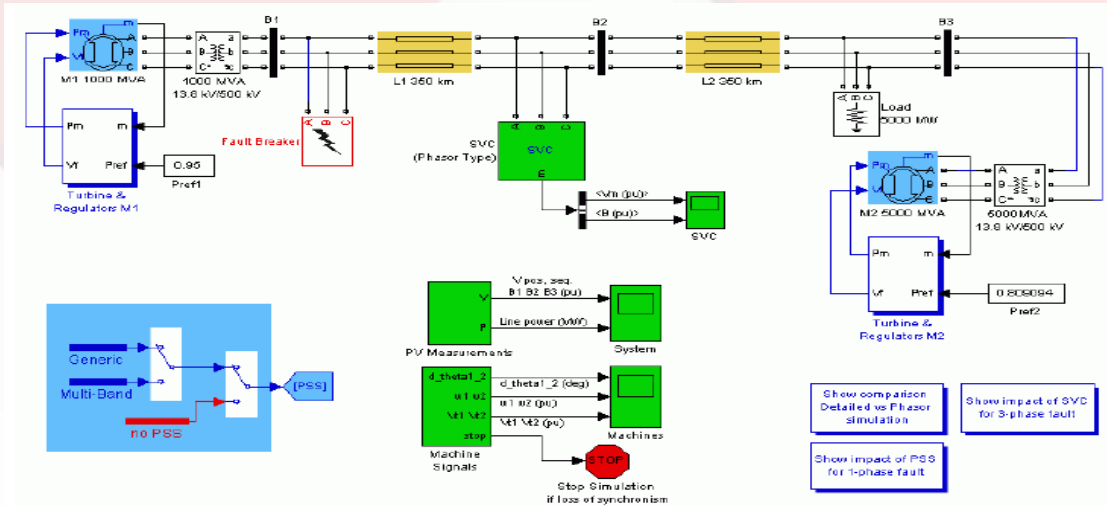
Gambar 1. Diagram garis tunggal Sistem Daya Listrik pada editor Simulink Matlab

Perilaku stabilitas transien sistem daya listrik diamati melalui scope yang menampilkan data numerik dan grafis setelah menjalankan simulasi pada simulink. Sedangkan perilaku pengguna simulink untuk analisis transien sistem tenaga listrik dapat dilihat dari koefisien jalur dengan nilai p-value dengan alpha 5% adalah kurang dari 0,05. Hipotesis penelitian diterima jika t-hitung > t-tabel. Nilai t-tabel, untuk tingkat kepercayaan 5% adalah 1,96. Kemudian koefisien jalur yang nilainya kurang dari 0,1 dikatakan memiliki pengaruh yang lemah dan tidak dapat memprediksi secara langsung.

Kesimpulan dan Diskusi

Grafik hasil simulasi transien tegangan pada system tenaga listrik terlihat pada gambar 2 berikut ini:
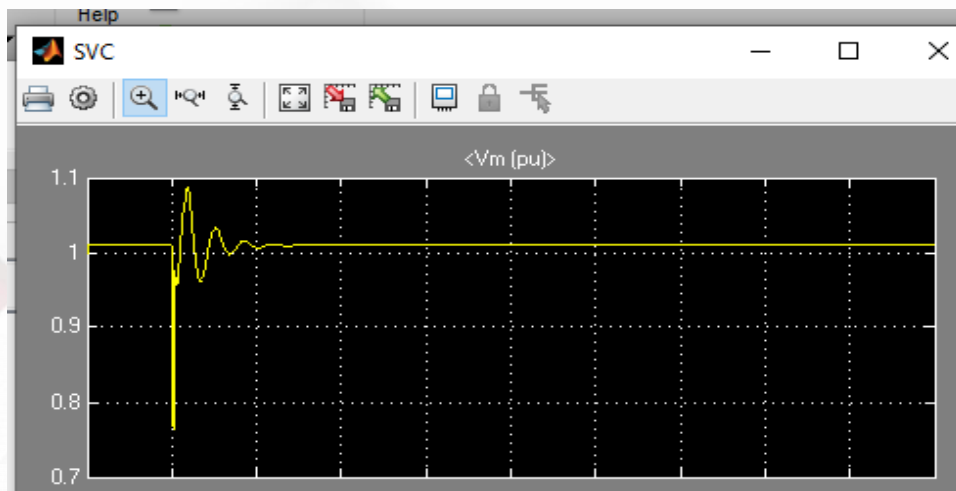
Gambar 2. Hasil simulasi transien tegangan melalui simulink Matlab

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Koefisien jalur dan tatahubung variabel laten penelitian yang menunjukkan model struktural ditunjukkan pada gambar 3 berikut ini:
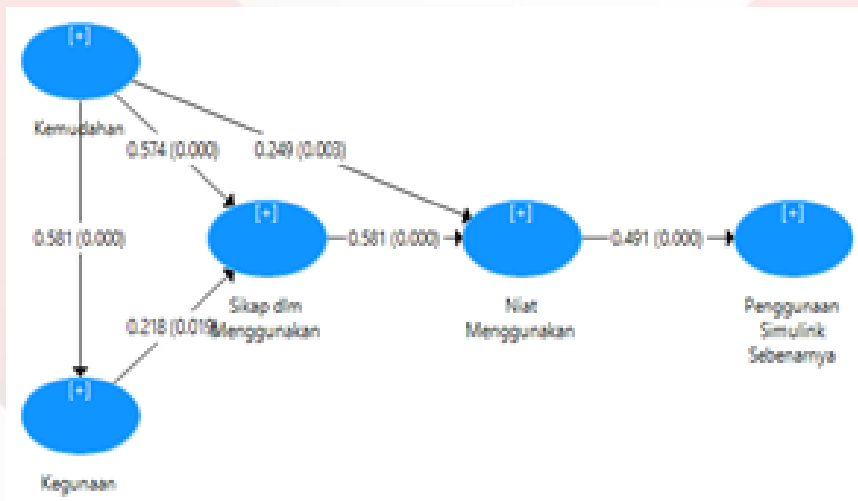
Gambar 3. Tatahubung Variabel Laten Penelitian dengan Koefisien Jalur

Berdasarkan tabel 1 menunjukkan bahwa persepsi kemudahan berpengaruh terhadap persepsi kegunaan, sikap, dan niat untuk menggunakan program Aplikasi Simulink Matlab untuk menganalisis stabilitas transien sistem tenaga listrik. Demikian juga persepsi kegunaan berpengaruh kepada sikap untuk menggunakan program aplikasi simulink (Aplikasi Simulink untuk stabilitas transien). Selanjutnya sikap dalam menggunakan program aplikasi berpengaruh terhadap niat menggunakan program aplikasi simulink. Niat menggunakan berpengaruh terhadap penggunaan yang sebenarnya program aplikasi simulink.

Persepsi kemudahan dalam penggunaan TIK didefinisikan sebagai tingkatan dimana seseorang percaya bahwa menggunakan TIK akan bebas dari segala upaya baik fisik maupun mental [6]. Hubungan antara sikap terhadap penggunaan TIK dengan niat berperilaku untuk menggunakan TIK mengandung implikasi bahwa semuanya sederajat, orang-orang membentuk niat untuk melakukan perilaku yang memiliki penga-ruh positif pada dirinya. Hubungan antara persepsi kegunaan dengan niat perilaku untuk menggunakan TIK berdasarkan pandangan bahwa didalam pengaturan organisasi, orang-orang yang memiliki niat untuk berperilaku akan meningkat kinerjanya. Sikap pada penggunaan sesuatu menurut Aakers dan Myers (1997) adalah, sikap suka atau tidak suka terhadap penggunaan suatu produk [7]. Sikap suka atau tidak suka terhadap suatu produk ini dapat digunakan untuk memprediksi niat seseorang untuk menggunakan suatu produk atau tidak menggunakannya. Berdasarkan definisi tersebut, sikap seseorang terdiri atas komponen kognisi, afeksi, dan komponen yang berkaitan dengan perilaku seseorang. Sikap pengguna komputer dapat pula ditunjukkan dengan sikap optimistik bahwa komputer sangat membantu dan bermanfaat untuk mengatasi masalah atau pekerjaannya [8] Triandis menyimpulkan bahwa seorang pemimpin hendaknya memotivasi bawahannya dalam penggunaan TIK melalui perbuatan yang positif.

[9] Jalaluddin menyimpulkan bahwa tertarik tidaknya seseorang dalam merespon stimulus dipengaruhi oleh faktor internal dan faktor eksternal (1985, hlm. 54). Faktor internal mencakup kebiasaan yaitu kecenderungan untuk mempertahankan pola pikir tertentu yang hanya hanya melihat masalah dari satu sisi saja, minat yaitu suatu kondisi yang terjadi jika seseorang melihat ciri-ciri sementara situasi yang dihubungkan dengan kebutuhan sendiri, emosi, keadaan biologis seseorang. Sedangkan eksternal meliputi gerakan, intensitas stimulus, kebaruan, dan perulangan. Seseorang secara visual akan tertarik pada obyek

yang bergerak, stimulus yang menonjol, hal-hal yang dianggap baru dan berbeda, dan ditampilkan secara berulang.

Minat seseorang dalam menggunakan TIK dapat dilihat dari tingkat penggunaan TIK pada seseorang sehingga dapat diprediksi dari sikap perhatiannya terhadap teknologi tersebut. misalnya keinginan menambah peralatan pendukung, motivasi untuk meng menggunakan serta keinginan untuk memotivasi pengguna lain. Seseorang akan melakukan suatu perilaku jika mempunyai keinginan atau minat untuk melakukannya. Seorang kepala sekolah akan dengan senang hati mengajak serta memfasilitasi seluruh warga sekolah agar senang terhadap penggunaan TIK.

Actual system usage adalah kondisi nyata penggunaan system [10] (Wibowo, 2006, hlm. 3). Dalam konteks penggunaan system teknologi informasi, perilaku dikonsepkan dalam penggunaan sesungguhnya yang merupakan bentuk pengukuran terhadap frekuensi dan durasi waktu penggunaan teknologi. Dengan kata lain pengukuran penggunaan sesungguhnya diukur sebagai jumlah waktu yang digunakan untuk berinteraksi dengan suatu teknologi dan besarnya frekuensi penggunaannya. Seseorang akan puas menggu-nakan system jika meyakini bahwa system tersebut mudah digunakan dan akan meningkatkan produktifitasnya yang tercermin dari kondisi nyata penggunaannya.

Kesimpulan

Berdasarkan penelitian yang telah dilakukan, maka diperoleh berbagai fakta empirik dari penerimaan Aplikasi Simulink untuk stabilitas transien. Penerimaan Aplikasi Simulink untuk stabilitas transien dipengaruhi oleh kemudahan dan kegunaan program tersebut untuk menganalisis sistem daya listrik. Motivasi pengguna menjadi peranan yang sangat menentukan dalam penggunaan aplikasi simulink untuk menganalisis stabilitas transien sistem tenaga listrik.

Daftar Pustaka

Aydm, Hakan.C. (2005). "Measuring Readiness for e-Learning: Reflection from Emerging Country". Educational Technology and Society Journal, 8 (4), pp. 244-257.

Aakers & Myers. (1997). Advertising Management. New Jersey: Prentice Hall.

Wibowo.A. (2006). Kajian tentang Perilaku Pengguna Sistem Informasi dengan Pendekatan Technology Acceptance Model (TAM). Universitas Budi Luhr Jakarta.

Chapnick, S. (2000). Are you ready for e-learning? Learning Circuits: ASTD's Online Magazine All About ELearning, Retrieved July 25, 2005,

Aydm, Cengiz Hakan. (2005). "Measuring Readinesss for e-Learning: Reflection from Emerging Country". Educational Technology and Society Journal, 8(4), pp. 244-257

Daryanto, et.all. 2019. Effect of perceived ease of use of ICT on stakeholder service quality in Vocational High School in West Java. Journal of Physics: Conference Series.

Mohammad Chuttur. (2009), Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. USA. Sprouts: Sprouts: Working Papers on Information Systems, 9, (37), Hlm. 9-37

Daryanto, et.all. 2017. The Influence of the Authentic Leadership, School Culture, Information and Communication Technology Acceptance on the School Management Effectiveness in the Public Accredited Vocational High School in West Java International Journal of Applied Business and Economic Research 15 (17) 75-84

Davis, F.D. (1986). Technology Acceptance Model for Empirically Testing New End-User Information Systems Theory and Results; Unpublished Doctoral Dissertation MIT

Aakers M 1997 Advertising Management (New Jersey: Prentice Hall)

Harry C T 1989 The Self and Social Behavior in Differing Cultural Contexts University of Illinois, Urbana-Champaign 96(3) 506-520

Jalaludin, Rakhmat. 2007. Persepsi Dalam Proses Belajar Mengajar. Jakarta: Rajawali Pers

Wibowo, Arif. 2006. Kajian Tentang Perilaku Pengguna Sistem Informasi Dengan Pendekatan Technology Acceptance Model (TAM). Jakarta

Development of Statistic Teaching Materials

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During pandemic Covid-19, all teachings and learnings have to perform by either online or hybrid system. It impacts on the availability of textbooks to assist students in achieving the needed competencies is the biggest impediment in this lecture. This study aims to evaluate the feasibility of the Statistic teaching materials for undergraduate students within the home economic department. This study employs the nine-stages descriptive R & D approach. Further, the study focuses on student teaching and learning viability, including readability, material quality, language quality, illustration, and literature. Peer groups, media specialists, and linguists are involved as validators. A questionnaire is also utilized for collecting data, and statistical descriptive. Based on the our results, we conclude that: material quality (4.56), language quality (4.76), readability (4.49), illustration (4.67), and literature (4.63). Therefore, all five indcators recommended that the student teaching material are caterogized viable and significantly applicable.

Keywords: textbook, feasibility, book development procedures

INTRODUCTION

Statistics plays an important role and is as a major course for every student of the home economics' department. It is required also for other major courses such as Learning Evaluation and Research Methodology courses. Based on semi–structured interviews from the preliminary research that involved 70 undergraduates' students of the class undergraduates 2019, it can be underlined that 82% of students can understand the given topics, however about 66% of students were not well-performed when they faced to solve some chosen realistic-statistics' problems. Further interviews revealed that 73% of students believe that the contents of the statistics' course were not easy to comprehend directly. Two compulsory books and two optional books are utilized in the Statistics course. The first compulsory book covers all of subjects for one semester yet was regarded as too difficult to comprehend. If the topic in the first obligatory book is still difficult for undergraduate students to understand, the second compulsory book can be chosen as a second opinion. Students are provided other alternative books that have been incorporated in the learning plan and e-books, via the internet as an additional insight, or students are

still having issues understanding the two necessary books. Even after the lecturer has continuously suggested that the necessary material and some of the supplementary literature be read and reread, students' knowledge is still quite low. Students must utilize the required book during the lesson, which has the disadvantage of being difficult to understand due to a large number of thick pages. During teaching and learning process, lecturer develop power point presentations to help students understanding the topic more easily. Students must, however, read literature to have a deeper comprehension. Lecturers have intended to purchase textbooks that are simple to comprehend. According to Lestari (2013), MoNE (2006), and Sungkono (2006), the development of students' teaching materials in question comprises teaching resources that are suited to the components of the lesson plan to make it easier for students. Validity, relevance, breadth and depth, attractiveness, enjoyment, time savings, and fostering independent learning at their speed are all principles of textbook usefulness. Mulyasa (2006), Hamim (2012), and MoNE (2006).

Students' teaching materials that have been modified to the components of the lesson plan to make it easier for students to learn are included in the development of the materials in question. Lestari (2013), MoNE (2006), and Sungkono (2006) all support this progress (2003). Validity, relevance, breadth and depth, attractiveness, satisfaction, time savings, fostering autonomous learning at their speed are the principles of textbook usefulness. Mulyasa (2006), Hamim (2012), and MoNE are among the authors of this book (2006)

Mustafa (2020) underlined that the production of remedial instruction textbooks in physical education is appropriate and can be used by students as a learning resource due to Pinton's research. The ADDIE's technique is utilized to the research (Ginting, 2021). It follows Borg and Gall's, but employs six steps to finish experts' validation and evaluation outcomes. The teaching materials prepared for the beauty program's class X students are appropriate. It is important to produce textbooks for Statistics courses based on the two prior studies and descriptions and the benefits of these textbooks.

The basic concepts of statistics are namely the role of statistics in research, descriptive statistics, including data, data presentation, central tendency, location size, deviation, skewness, kurtosis, population and sample, and normal distribution, test normality, and homogeneity test are all discussed in the Unesa's guidebook. The difference, correlation, and influence tests are examples of inferential statistics, including parametric and non-parametric statistics.

The implemented standard is students have to fulfill following competencies: (1) understanding statistics and statistics and the role of statistics in research; (2) understanding descriptive statistical concepts; (3) understanding population concepts, samples, and sampling techniques; and (4) understanding population concepts, samples, and sampling techniques. (4) concepts of normal distribution, normality tests, and homogeneity (5) have a basic understanding of hypothesis testing (6), comprehend the t-test, (7), comprehend the correlation test, (8), comprehend the chi-square test, (9), comprehend the ANOVA test, (10) comprehend the regression test, and (11) comprehend non-parametric statistics.

Several researchers have investigated some studies on teaching materials relevant to this research by taking student responders and vocational students. For instance, the following results: Mursanti (2020:76-87) concluded that developing make-up teaching materials was declared feasible after being validated by content and design experts as well as course lecturers. It is feasible after a small and large group field test, and student responses to teaching materials are very helpful in lectures, and learning is good and smooth. Furthermore, according to Siahaan's research (2021: 96-103), a jigsaw-based number theory textbook for mathematics education students was produced using extremely good criteria and was realistically employed by students with a score of 90.67%. Student responses are very useful in learning number theory for students of Mathematics Education, and they are practically used in learning number theory with a textbook value of 87.4%. The production of solo female bridal make-up teaching materials was stated suitable for use in cosmetology lectures with a confidence level of 94% (Hendra, 2020:129-136).

Furthermore, Febrianto (2020:1-18) studied teaching materials and concluded that the Learning Evaluation textbook was created using the ADDIE model design stage procedure, which includes Analyze (analysis), design (design), Development (Development), Implementation (implementation), and Evaluate (evaluation), and visual principles, linguistic rules, and layout arrangements are quite suitable for students to use as media to support th Further research is needed to test the usefulness of this textbook product and convert it into electronic-based media, given that students frequently utilize technology-based media, according to the study's findings. In addition, Mustafa (2020:1-12) emphasized that remedial instruction textbooks in physical education are appropriate and can be used by students as learning materials based on the findings of material experts and product trials. There are nine chapters in the textbook products for remedial teaching courses in physical education, and examples complement each chapter.

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According to the results of validation and evaluation from experts, teaching materials developed with the Genre Based Approach approach for class X students of the beauty program are suitable for use by students, according to the researchers who took the respondents of vocational students, including Ginting (2021) and Ekayani (2020:235-242:39-54). The Research and Development approach with the ADDIE model is also underlined in the textbook "Balinese Fusion Food." Only the textbook development analysis, design, and development stages are completed. Following the Development of the textbook prototype/draft, the learning design expert test, the content/material expert test, the material test by practitioners, and the request for student feedback on the textbook draft proceed. According to the learning design expert, the textbook draft satisfied the eligibility standards with minor adjustments, scoring 90.42% in the very good category. The material expert gave the draft textbook a very good rating, with an average percentage of 92.10%, and indicated that it fulfilled the content/material eligibility criterion but needed to be altered for improvement. Practitioners or teachers gave the draft textbook a score of 96.67% in the very good category, indicating that it was suitable for pupils to utilize. In each learning unit, the teacher provides advice and suggestions for improvements in offering examples in visuals. Based on the distribution of the percentage values collected from 39 students filling out surveys using Google Form, students gave favourable replies in the good to very good categories. Further updates to the textbook product are produced based on feedback and suggestions from experts, practitioners, and students.

Considering the selected research methods, such as the strategy employing the four D design development model, which includes defining, designing, developing, and disseminating. You can see the results of these researchers (Evi, 2020). Other scholars follow Borg and Gall's. the R and D approach but only employ six out of 10 steps (Monika, 2021 and Ginting, 2021). In the meantime, Hendra (2020) employs a development research strategy. On the pther hand, Febrianto (2020) and Mustafa (2020) utilized the ADDIE, but Ekayani (2020) employed the steps of preliminary research, prototyping or development, and assessment.

According to the above description, this teaching material will be at its best in the third year, which may be disseminated and implemented. The researcher and team organized the product plan based on needs analysis, scenario analysis, and market analysis throughout the first year of research and product planning. According to the first step, the next stage is material analysis. The Statistics course has been tried utilizing the STAD type cooperative learning technique and the peer tutor method based on field experience. When there is an improvement in learning outcomes, the results are positive. The lack of student handbooks is the most significant stumbling block. As a result, this research aims to see weather teaching materials for Statistics courses at the PKK FT Unesa are feasible or not.

RESEARCH METHOD
The study is classified into the Research and Development (R & D) approach Sugiyono (2019: 409). This study implements the eleven-stage processes, however the final one is disseminated in a limited and within the department. It is because the students' teaching materials are still subjected to internally adjustments until the material are deemed sufficient for a high-thinking skills. The development process consists of the following steps: data collection, planning, initial product development, trial I, revision, field test (limited class), revision, interview or questionnaire field test, revision, and field test (class group).

The feasibility of students' teaching material includes content feasibility, language feasibility, readability, illustration feasibility, and literature feasibility. The content feasibility refers to the degree to which the material content, the depth of the information, and the examples offered, are acceptable and fit for consumption by undergraduate students. The material fulfills the standard Indonesian language with preferably no errors. The material is presented rationally, promoting critical, creative, and innovative

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thinking, processes metacognition, and readers are encouraged to self-evaluate. Presentation of images, graphics or diagrams, as well as bibliographical references.

The process of validations involved some group of respondents. The first group is validators, who are colleagues who are competent to provide input on the material development. The second is 13 undergraduate students of the class 2019, who had taken the Statistics course in the previously year. These respondents were chosen because they had already possessed and passed the statistics' course. The third is the undergraduate class 2020 of the Fashion Design's study program who are currently programming the Statistics course on the odd semester 2021/2022.

The data is obtained using an ordinal measurement scale based on the instrument for the collecting data. Then it will perform a descriptive statistical analysis to obtain the mean value, standard deviation, standard error of the mean, and skewness.

RESULT AND DISCUSSION

Based on the data collection process, the obtained data consists of validation results from the validator, limited group test, and class group test. Each of these results is presented as follows:

Table 1. First and Second Validation Result

Indicator	First Validation			$\bar{x}$	Second Validation			$\bar{x}$	$\bar{x}$
	I	II	III		I	II	III		Total
Content egibility	4,3	4	4,7	4,3	5	4,8	5	4,93	4,42
Language	4,5	4,5	5	4,67	4,5	5	4,7	4,8	4,74
Legibility	3,3	4	4.3	3,9	4,7	5	4,7	4,42	4,16
Illustration	4	4	4	4	5	5	5	5	4,5
References	4	4	3	3,7	5	5	5	5	4,35

Based on the Table 1, it demonstrated that all five indicators reached the average value more than 4, which indicates the feasibility of the students' teaching material. Then it can be continued by testing a limited group.

Limited Group Testing Result
The limited group is the undergraduate students of the class 2019, who had programmed and passed the Statistics courses. It involves 13 students. The given instrument is a questionnaire using a google form. All 13 respondents received the students' teaching material and had to returned back their responses within five days in the same week. The data from the this second group is then processed using the SPSS 24 application, as follows.

Table 2 Limited Group Trial Results 10 Indicators

Indicator	N	$\bar{x}$	SEM	s	Skewness	Kurtosis
Content eligibility	13	4.54	.268	.967	-2.085	3.575
Material Depth	13	4.38	.241	.870	-1.828	4.133
Example	13	4.69	.175	.630	-2.051	3.711
Language	13	4.77	.122	.439	-1.451	.095

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Correction	13	4.85	.104	.376	-2.179	3.223
Herkhry Lgis	13	4.54	.183	.660	-1.191	.645
Empowering	13	4.77	.122	.439	-1.451	.095
Evaluation	13	4.69	.175	.630	-2.051	3.711
Illustration	13	4.77	.122	.439	-1.451	.095
References	13	4.77	.166	.599	-2.682	6.964
ValidNlistwise	13					

Table 3 Limited Group Trial Results 5 Indicators

Indicator	N	$\bar{x}$	SEMean	s	Skewness	Kurtosis
Content eligibility	39	4.54	.132	.822	-1.926	3.230
Language	26	4.81	.079	.402	-1.659	.807
Legibility	39	4.67	.092	.577	-1.569	1.617
Illustration	13	4.77	.122	.439	-1.451	.095
References	13	4.77	.166	.599	-2.682	6.964
Valid N listwise	13					

Tables 2 and 3 shows that all five indicators have a mean above 4.5, with the standard error of the mean having an average value of 0.118. based on the result, the deviation is 12%. The value of skewness is found that the distribution of the curve is negative and indicates that the respondents' answers are in a decent and very appropriate opinion with a high frequency; however, there are still opinions of respondents who choose the disagree and neutral option even though the frequency is very small. Those findings needs to be considered for improving the feasibility of the content of the material. Based on Table 3 with the mean 4.54 when observed the standard deviation of the material content of 0.132, this shows that the responses of respondents are more heterogeneous, in the sense that the understanding of the material content of the respondents is more varied. Which is in line with the following diagram.

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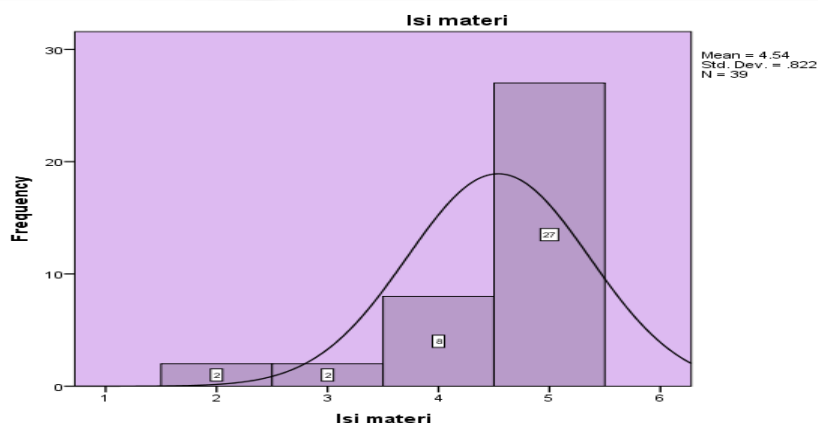
Diagram 1. Eligibility Result of Teaching Material Content

From Tables 2 and 3, it reveals that all five indicators have a mean above 4.5, with the standard error of the mean having an average value of 0.118. Based on this result, the deviation is 12%. The value of skewness emphasizes that the distribution of the curve is negative and indicates that
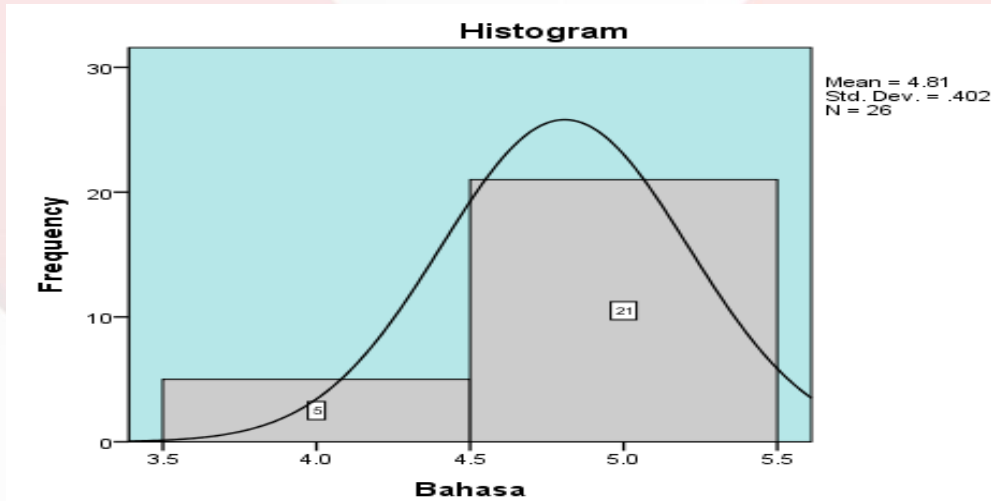
the responses of respondents are in a decent and very appropriate opinion with a high frequency. It is however, there are still respondents who choose the disagree and neutral option though the frequency is very small. Thus it needs to be revise the feasibility of the content material. Moreover, from Table 3 it shows that the mean value of 4.54 when observed the standard deviation of the material content of 0.132 .This shows that the responses of the respondents are more heterogeneous, in the sense that the understanding of the respondents is vary. This finding is in line with the following diagram

Diagram 2. Language Feasibility

The legibility of teaching materials is an important factor in realizing the book's objectives. The legibility of Statistics teaching materials includes a. the hierarchy of readings is presented logically, b. Teaching materials can encourage critical, creative, innovative, and metacognitive thinking processes, and c. readers can self-evaluate. Based on Tables 2 and 3, the mean readability is 4.67 with a mean, standard error of 0.092 with a negative skewness value of 1.569, indicating that the highest respondent's answer to the option agrees and strongly agrees with the readability feasibility. This is in line with the following diagram.

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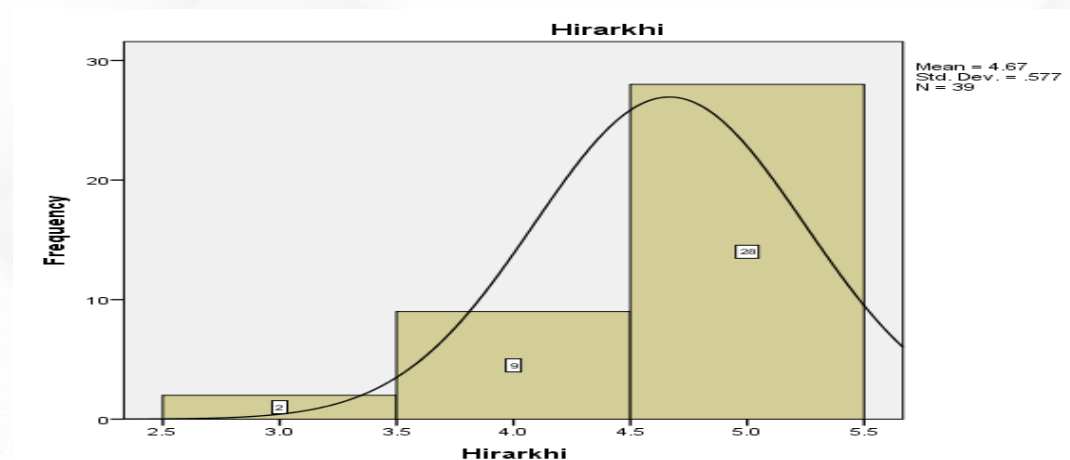
Diagram 3. Legibility Result

Illustrations or pictures have a function to clarify the description of teaching materials. Respondents' opinions for the illustration of Statistics course teaching materials following table 4.6 obtained a mean of 4.77 with a standard error of the mean of 0.122 and a negative skewness value of 1.451, indicating a negatively distributed curve with a high frequency of respondents' opinions on the answer options agree and strongly agree. There are only agree and strongly agree with answers for the illustration on the results of the limited group trial.

The development of teaching materials cannot be separated from the support of the referenced library. The literature review is prioritized on previously used mandatory books, plus related and current literature. Some literature is referred to in the development of this teaching material. Respondents' responses to the literature in the development of teaching materials obtained a mean of 4.79, the highest value of the five indicators in this research instrument. The standard error of the mean obtained is 0.57 with a slope of negative 3.044, which indicates the curve is negatively distributed, which means that the respondents' responses to this option are agreed and strongly agree with the literature referred to for the development of this teaching material.

Based on the description of the feasibility test results in a limited group of Statistics course teaching materials in terms of the five indicators, it shows a high level of feasibility. Thus, the researchers carried out a feasibility test in the class group. The following description follows.

Class Group Trial Result

Class group trials were applied to 76 students currently taking/programming Statistics courses. Teaching materials are distributed to all students through WhatsApp groups, and instruments are distributed via google forms. The feasibility indicators consist of five kinds: the feasibility of the content or the content of the material, the appropriateness of the language, the feasibility of legibility, illustrations, and the referenced literature. The five indicators consist of ten statements, each with five answer options: strongly disagree, disagree, neutral, agree, and strongly agree. The following is a presentation of the data from the class group test results.

Table 4 Class Group Trial Result

Indicator	N	$\bar{x}$	SEMean	s	Skewness
Content eligibility	228	4.74	.037	.564	-2.795
Language	152	4.71	.053	.647	-2.608
Legibility	228	4.66	.039	.582	-2.209
Illustration	76	4.66	.085	.740	-2.996
References	76	4.79	.057	.498	-3.044
Valid N (listwise)	76				

The results of the class group trial are presented using descriptive statistics. The mean (mean) feasibility for all indicators is greater than 4.65, the standard deviation is between 0.498 and 0.740, with the content feasibility having the smallest mean standard error (0.37), and the level of readability of teaching materials (0.39) is relatively similar to the population (does not deviate much). The skewness values for the five indicators indicate that the distribution model is negative, indicating that respondents agree or strongly agree on the practicality of teaching materials. Each indicator is described below.

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The feasibility of the material content achieved the mean 4.74 and the standard error of 0.37, which indicate that respondents at least agree or with the material's feasibility. This is also indicated by a skewness value of -2.795 (negative squint curve), which describes that respondents are at least agree with the material's feasibility. Respondents' perspectives on the feasibility of teaching material content -are consistent and significantly strong.

Language feasibility gives that the mean 4.71 and the standard deviation of 0.53, which indicate that respondents are at least agree on the feasibility of language in teaching materials. The skewness value is -2.608 (negative squint curve) indicates that respondents at least agree on the appropriateness of using good and correct language and avoiding typographical errors in the proposed teaching materials. The mean for the readability of teaching materials is 4.66, with a standard error of 0.39, suggesting that respondents agree or strongly agree with the readability of teaching materials. Its skewness value of -2.209 indicates that respondents' opinions concur. Additionally, I concur with the readability of the instructional materials.

The possibility of incorporating illustrations into instructional materials received the mean of 4.66 and standard error of 0.85. The shown indicators have the highest standard deviation, that is 0.740, showing that respondents' opinions vary more than the other four indicators. The skewness value of negative 2,996 indicates (negative squint curve), which indicates that most respondents agree or strongly agree with the feasibility of incorporating illustrations into teaching materials. Although three respondents disagree, as many as 73 students agree or strongly agree, indicating that the standard value deviation is greater than the other four indicators.

The practicality of the literature in developing teaching materials obtained a mean of 4.79, which is the highest mean value, and a mean standard error of 0.57 with a standard deviation (0.498), which is the view of the five indicators' most homogeneous respondents. The skewness value is -3.044 (negative squint curve), indicating that respondents agree or strongly agree that the relevant material is feasible. However, one individual takes a contrary position to the cited literature.

According to the class group feasibility test findings for Statistics courses, it demonstrates a high level of feasibility in terms of substance (material content), language, legibility, illustrations, and literature. This result, compared to peer validation test results, limited group validation test results, and class validation test results.

The following describes the feasibility indicators' success based on test results from the three groups. The following indicators pertain to the material content (content), the language, legibility, illustrations, and literature:

Table 5. Final Feasibility Results of Teaching Materials in Five Indicators

Indicator	1st group validator		2nd group limited trial		3rd group of testing class		$\bar{x}$	SE
	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE		
Content Eligibility	4,42	0.089	4,54	0.132	4,74	0,037	4,56	0.089
Language	4,74	0,156	4,81	0,079	4,71	0,053	4,76	0,096
Legibility	4,16	0,082	4,67	0,092	4,66	0,039	4,49	0,071
Illustration	4,5	0	4,77	0,122	4,74	0,085	4,67	0,069
References	4,35	0	4,77	0,166	4,79	0,057	4,63	0,074

After compiling and validating teaching materials with peer validators, limited courses, and class groups, it is determined that the mean of the three groups is 4.74, with an average standard error of 8.6 percent. This

demonstrates that the training materials' content is feasible. The preceding is based on Mustafa's (2020:1-12) and Hendra (2020:129-136).

Employing the results of three groups, the feasibility of teaching materials in terms of language is the mean of 4.78, with standard error of 9.6%. The average readability of instructional materials is 4.74, with standard error of 7.1 percent, showing that it is possible. Using images or illustrations in teaching materials to provide an overview and clarify the topic receives a mean score of 4.83 with a standard error of 6.9 percent, showing practicality. Certainly, the construction of instructional materials cannot be separated from the reference library. Libraries are alluded to in these teaching materials from various sources, although the primary literature sources are obligatory books. The mean of 4.85 with standard error of 7.4% indicates that the literature is practically based on the opinions of the three groups of respondents. Furthermore respondents believe that the teaching material for the Statistics course is reasonably acceptable. It is also consistent with research by Siahaan (2021: 96-103), Hendra (2020:129-136), Febrianto (2020:1-18), Mustafa (2020:1-12), Ginting (2021:39-54), and Ekayani (2020:235-242).

CONCLUSION

Based on previous research that has been compiled, validated, and analyzed, it is determined that the mean content feasibility is 4.56 with an average standard error of 8.9 percent, the mean language eligibility is 4.76 with an average standard error of 9.6 percent, the readability of teaching materials is 4.49 with standard error 7.1%, illustrations are 4.67 with standard error of 6.9%, and the feasibility of the literature is 4.63 with standard error 6.9%.

References

Depdiknas. (2006). Pedoman Memilih dan Menyusun Bahan Ajar. Jakarta: Direktorat Sekolah Menengah Pertama, Direktorat Jenderal Manajmen Pendidikan Dasar dan Menengah, Departemen Pendidikan Nasional.

Ekayani, I. H., Sukerti, N. W., Ariani, R. P., & Marsiti, C. I. R. Pengembangan Buku Ajar Pangan Lokal untuk Meningkatkan Balinese Food Skills pada Remaja SMK.

Febrianto, R., & Puspitaningsih, F. (2020). Pengembangan buku ajar Evaluasi Pembelajaran. Education Journal: Journal Educational Research and Development, 4(1), 1–18. https://doi.org/10.31537/ej.v4i1.297

Ginting, T. E. Br (2021). Pengembangan Bahan Ajar Membaca Bahasa Inggris Berbasis Pendekatan Genre Untuk Siswa Kelas X Jurusan Tata Kecantikan SMK Pariwisata Imelda Medan, Volume 32 Nomor 1, 39–54. https://jurnal.unimed.ac.id/2012/index.php/bahas/article/download/25443/15871

Ghozali, Imam. 2007. Aplikasi Analisis Multivariate dengan Program SPSS. Semarang: Badan Penerbit Universitas Diponegoro Hamim, Nur. 2012.

Buku Ajar Pendidikan dan Latihan Profesi Guru. Surabaya:

Harinaldi. 2005. Prisip-Prinsip Statistik untuk Teknik dan Sains. Jakarta: Bumi Aksara

Hendra, M., Subandowo, S., & Wiyarno, Y. (2020). Pengembangan bahan ajar tata rias pengantin solo putri. Edcomtech Jurnal Kajian Teknologi Pendidikan, 5(2), 129–136. https://doi.org/10.17977/um039v5i22020p129

Indawati, Rahma., Mahmudah., Indriani., Diah. 2008. Bahan Ajar; Pengantar Biostatistika. Surabaya: FKM Unair

Kuntoro. 2008. Populasi, Sampel, dan Teknik Sampling, Menghitung Besar Sampel. Surabaya: Melati

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Kuswanto, Dedy. 2012. Statistik untuk Pemula, dan Orang Awam. Jakarta Timur: Laskar Aksara

Lestari, Ika. (2013). Pengembangan Bahan Ajar Berbasis Kompetensi. Padang: Akademia

Lutfiati, Dewi. 2014. Penerapan Model Pembelajaran Kooperatif Tipe STAD untuk Meningkatkan Hasil Belajar Mahasiswa (Laporan Penelitian). Surabaya: Lembaga Penelitian Unesa

Maudi, N. (2016). Implementasi Model Project Based Learning Untuk Meningkatkan Kemampuan Komunikasi Matematis Siswa. Jurnal Pendidikan Matematika Indonesia, 1(1), 39–43.

Mursanti, A., Fatirul, A., & Hartono, H. (2020). Pengembangan Bahan ajar dasar tata Rias Wajah Untuk Mahasiswa prodi pendidikan vokasional Kesejahteraan Keluarga (PVKK) Tata rias. Edcomtech Jurnal Kajian Teknologi Pendidikan, 5(1), 76–87. https://doi.org/10.17977/um039v5i12020p076

Mustafa, P. S., & Winarno, M. E. (2020). Pengembangan Buku ajar Pengajaran remedial Dalam Pendidikan jasmani untuk MAHASISWA S1 Pendidikan Jasmani Dan kesehatan Universitas Negeri Malang. Multilateral Jurnal Pendidikan Jasmani Dan Olahraga, 19(1). https://doi.org/10.20527/multilateral.v19i1.7629

Rosner, Bernard. 1986. Fundamentals f Biostatistics IInd Edition. Boston Massachusetts: PWS Publishers

Santoso, Gunawan. 2004. Statistik. Yogyakarta: Andi Offset

Siahaan, T. M., Sianipar, H. F., Simamora, R., Sijabat, A., & Sinaga, C. V. (2021). Pengembangan Buku ajar berbasis Kooperatif Tipe jigsaw untuk meningkatkan Kemampuan Berpikir kreatif mahasiswa. Jurnal Basicedu, 5(4), 2496–2503. https://doi.org/10.31004/basicedu.v5i4.1213

Siregar, Sofyan. 2013. Statistik Parametrik untuk Penelitian Kuantitatif dilengkapi dengan Perhitungan Manual dan SPSS 17. Jakarta: Bumi Aksara

Sugiyono. 2012. Statistika untuk Penelitian. Bandung: Alfabeta

Sungkono, dkk. (2003). Pengembangan Bahan Ajar. Yogyakarta: FIP UNY.

MAPPING ANALYSIS OF THE ENTREPRENEURIAL POTENTIAL OF STUDENTS

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The study aimed was to obtain a mapping analysis of the entrepreneurial potential of students. The method used is descriptive and correlative with the number of respondents are 83 students of the automotive engineering education program, Engineering Faculty, Universitas Negeri Makassar who have taken entrepreneurship course. This study adopts the model (Santos et al, 2013) which consists of entrepreneurial motivation, management competence, psychological competence, and social competence. Data collection techniques used were through documentation, focus group discussions, and distributing questionnaires. The results show that the four variables are entrepreneurial motivation, management competence, psychological competence, and social competence. These have positive effect on entrepreneurial potential. Management competence is the most dominant variable and Entrepreneurial motivation is a variable that still needs to be improved.

Keywords: Entrepreneurial potential, students, and mapping.

INTRODUCTION

Entrepreneurship is important to encourage a country to become a developed country. On average, a developed country requires the percentage ratio of entrepreneurs with a minimum population of 4% [1] In 2019, Indonesia has reached 3,1%, but is still far behind when compared to Malaysia 5% and Singapore 7% [2].

Effort made by universities in contributing to increasing the percentage of the number of entrepreneurs by encouraging students to become entrepreneurs. One of the missions of Universitas Negeri Makassar (UNM) is to teach entrepreneurship course in each study program. In addition to preparing students to have competence in the scientific field according to the study program, it also provides entrepreneurial insight [3].

After attending course, students are expected to get several alternatives for continuing their activities as professionals. These alternatives are continuing his education to higher level, becoming an educator in the automotive field, working in a relevant industry, or choosing to become an entrepreneur. Thus, alumni can be received in the job market or create jobs.

Entrepreneurship is one of the courses in the curriculum of the automotive engineering education (PTO) study program as a compulsory subject with a total of 3 credits. Several methods have been developed; the last five years have developed applicative entrepreneurship in the PTO study program.

The lecture process undertaken contributes to students having the knowledge and skills for entrepreneurship. The applicative entrepreneurship method targets at the end of the course to create a business and produce products each group [4]. However, after passing the course, generally they no longer continue their entrepreneurial potential to start and run a business until finish their studies.

The entrepreneurial potential is prior to the entrepreneurial intentions [5]. According to [6] entrepreneurial potential is expressing the most distinctive characteristics associated with the performance in

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entrepreneurial activities. In other words, it is the summative result of several individual entrepreneurial skills.

Based on the description above, it is necessary to mapping the entrepreneurial potential of students after attending entrepreneurship courses. Includes interest in entrepreneurship and required competences.

METHODOLOGY

The research method used is descriptive and correlative methods. Data collection techniques used the method of documentation, focus group discussion (FGD), and distribute questionnaire. Documentation method for data collection of students in the PTO department. The FGD invited alumni who had successfully run a business to provide information to the preparation of questionnaire. The distribution of questionnaire was address to the sample of study. The population in this study is students who have taken entrepreneurship courses from 2015-2017 totaling 123 student. Based on 5% sampling error using the Harry King Nomogram, 70% was taken from the population so that the number of samples/respondents was 86 students. Determination of the sample using the method of proportionate stratified random sampling [7]. The variables in this study adopted Entrepreneurial Potential Assessment Inventory (EPAI) by [6] which consisted of independent variables are entrepreneurial motivation, management competence, psychological competence, and social competence. Furthermore, the dependent variable is entrepreneurial potential. Each variable consists of indicators as shown in the Table I. The preparation of the questionnaire consists of information about the interest in entrepreneurship and the business to be run. Furthermore, items that measures entrepreneurial potential adopts the EPAI model and the results of input from the FGD which consist of 45 items in Indonesian.

The results of the validity test show that all items are declared valid because they have a corrected item value – total correlation >0,2. Furthermore, the reliability tests results have alpha Cronbach 0,963, this indicates that instrument is reliable.

RESULTS

Entrepreneurial Interest

Interest in entrepreneurship shows that students have been running a business since they were students by 53,8% by choosing a business in the automotive sector 20,9% and others 79.1%. Furthermore, 98% of students are interested in becoming entrepreneurs after they finish their studies from UNM and run a business in the automotive sector.

Table 1: Indipendent Variables and Indicators

No	Variable	Indicator
1	Entrepreneurial motivation (EM)	Desire for independence Economic motivation Entrepreneurial self-efficacy
2	Management competencies (MC)	Vision Resource mobilization capacity Leadership capacity
3.	Psychological competencies (PC)	Innovation capacity Emotional intelligence Resilience
4.	Social competencies (SC)	Persuasion and communication capacity Network development capacity

Entrepreneurship Potential (EP)

The entrepreneur potential was measured by four variables involve entrepreneurial motivation, management competence, psychological competence, and social competence.

The entrepreneurial motivation was measured by 13 items (mean = 3,84; SD = 0,927). The management competence was measured by 13 items (mean = 3,85; SD = 0,871). The psychological competence was measured by 11 items (mean = 3,89; SD = 0,949). The social competence was measured by eight items (mean = 3,75; SD = 1,002). Result evidenced that each independent variables are positively associated with the overall measure on entrepreneurial potential. The values are as follows r_{EM} = 0,857**; r_{MC} = 0,927**; r_{PC} = 0,918**; r_{SC} = 0,896**.

DISCUSSION

This study presented mapping the entrepreneurial potential of students using the EPAI model [6] by formulating a questionnaire item based on recommendations of the FGD results by involving alumni who have been successful in the entrepreneurship.

The results show that 98% of students are interested in entrepreneurship after completing their studies by running a business in the automotive sector by 70.6%. This shows that entrepreneurship courses have supported changes in student mindsets. Studying in the automotive field contributes to improving their skills and gives them confidence to open a business in the automotive sector.

Four variables that support entrepreneurial potential indicate that management competence has the largest contribution, then psychological competence, social competence, and entrepreneurial motivation. This provides a reference for entrepreneurship lecturers to provide material according to the needs and proportion of student competencies.

CONCLUSION

The entrepreneurial potential of PTO FT UNM students shows encouraging results by looking at the contribution of each variable, namely entrepreneurial motivation, management competence, psychological competence, and social competence. The support for entrepreneurship courses and practical courses in the automotive sector gives students confidence to dare to be entrepreneurs and choose the automotive field as their passion.

The weakness of this research is that it still uses one model of entrepreneurial potential, and the research sample is still limited to PTO majors. It is hoped that several models can be elaborated to dig deeper into the potential of entrepreneurship. Furthermore, the sample is wider to obtain information at the Faculty and University level.

Acknowledgment

References

Economi.bisnis.com. (2019). Rasio Jumlah Wirausahawan di Indonesia baru 2 persen idelanya 4 persen. [online] Available: https://ekonomi.bisnis.com/read/20191001/9/1154153/rasio-jumlah-wirausahawan-di-indonesia-baru-2-persen-idealnya-4-persen

Rri.co.id. (2019). Jumlah Wirausahawan di Indonesia Tembus 8 Juta. [online] Available: http://rri.co.id/post/berita/651422/ekonomi/jumlah_wirausaha_di_indonesia_tembus_8_juta_jiwa.html

H. Syam, Entrepreneurship Strategi Menuju Sukses.Edisi Revisi. Makassar. Badan Penerbit UNM, 2019.

I. Muis, M. Usman, H. Anwar, Irfan, M.J. Jangi, R. Syam, Diyahwati, M. Farid, H. Husain, R. Tawani, Kewirausahaan. Edisi Pertama. Makassar: Badan Penerbit UNM, 2016.

N. Kruger and D. Brazeal, "Entrepreneurial potential and Potential Entrepreneurs," Entrepreneurship: Theory and Practice Journal, vol. 18, no. 3, pp 91-104, 1994.

S.C. Santos, A. Caetani, and L. Curral, "Psychosocial Aspect of Entrepreneurial Potential," Journal of Small Business & Entrepreneurship, vol. 17, no. 5, pp 661-685, 2013.

Sugiyono, Statistika untuk Penelitian. Bandung: Alfabeta, 2008.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

WEB BASED LEARNING IN TEACHING BASIC PROGRAMING

Hiskia Kamang Manggopa

Abstract: The trend of change that needs to be anticipated in the education sector in the learning era and the current Covid-19 situation is the misuse of various science and technology innovations, which are related to electronic media, informatics and communication. When Covid-19 broke out throughout the world, including Indonesia, it did not directly impact the education process. Educational institutions are expected to find out ways of presenting learning that allow students to learn at home, by using an online learning system. Basic programming is a complex subject when compared to general courses and has been taught to students of the Information and Communication Technology Education Study Program. The Faculty of Engineering, Manado State University .The research objective is to obtain web learning products that can be used as learning media for Basic Programming courses. It is a type of development research, following the steps of Borg and Gall (1983). Product testing in the form of software by an expert of content area and the other one by an expert of media area, before being tested on students. The trial consisted of four students in an individual experimental session, 10 students in a small group trial session, and 25 students in a field trial session. Three questionnaires were used to obtain data: first, feasibility testing of the media field, second, feasibility testing of the material field, third, feasibility testing by students. Based on the results of the assessment of the material field, media experts and students can state that the value of web- based learning media products developed, feasible and effective in improving learning outcomes for Basic Programming courses.

Pendahuluan

Sumber Daya Manusia unggul adalah salah satu komponen penting yang menjadi andalan ketika menyelesaikan masalah yang dihadapi bangsa. Sumber Daya Manusia yang dibutuhkan adalah kapital intelektual yang yang kompetitif dan komperatif, serta sanggup menyelesaikan berbagai tantangan yang muncul di era globalisasi. Apalagi saat ini bangsa Indonesia diperhadapkan dengan berbagai tantangan eksternal dengan adanya Revolusi industri 4.0 yang mengacu pada cyber-physical system, dengan dukungan kemajuan teknologi berbasis system informasi, pengetahuan, terciptanya berbagai penemuan baru, komunikasi dalam jaringan, merupakan penegasan munculnya abad kreatif (Irfan Kamil,2020). Kementerian Pendidikan dan Kebudayaan selaku leading sektor pendidikan nasional memiliki peran sangat penting dalam menghasilkan kualitas SDM Indonesia. Merdeka Belajar adalah salah satu kebijakan pendidikan yang fokus utamanya ditujukan pada pembangunan sumber daya manusia. Merdeka Belajar sangat tepat dipakai sebagai filosofi perubahan dari cara penyampaian atau proses belajar. Merdeka Belajar, ada kesiapan serta kemampuan secara personal berdiri sendiri, ada kebebasan institusi pendidikan untuk memilih, menetapkan secara mandiri metode terbaik yang dapat diterapan dalam proses belajar.

Ketika Covid-19 mewabah diseluruh dunia termasuk di Indonesia secara tidak langsung memberi dampak pada proses pembelajaran di berbagai institusi pendidikan. Dalam upaya pencagahan dan penularan virus covid 19 terhadap peserta didik, maka institusi pendidikan diharapkan mencari cara penyajian pembelajaran yang memungkinkan peserta didik belajar dirumah yakni dengan menggunakan system pembelajaran dalam jaringan. Tujuanya adalah agar setiap peserta didik tetap mendapatkan haknya untuk memperoleh pelayanan pendidikan meskipun dalam situasi pandemi covid 19. Belajar dirumah juga dimaksudkan untuk melindungi pendidik dan tenaga kependidikan lainnya dari dampak negative yang mungkin saja terjadi, mencegah penularan dan penyebaran virus di institusi pendidikan, memberi dukungan psikologi dan sosial bagi orang tua, pendidik, dan peserta didik. Pelaksanaan belajar dirumah adalah untuk kesehatan lahir dan batin terutama keselamatan pemimpin, pendidik, peserta didik dan

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seluruh tenaga kependidikan yang berada dalam suatu institusi. Kegiatan Belajar di rumah diselenggarakan dengan harapan memberikan dampak positif dalam memotivasi partisipasi aktif peserta didik dalam proses belajar, serta mengutamakan interaksi dan komunikasi yang terjalin secara berkesinambungan antara orang tua dan pendidik menggunakan Metode dan media Pembelajaran daring.

Setiap institusi pendidikan diharapkan mengembangkan inovasi pembelajaran sebagai upaya baru dalam kegiatan pembelajaran, dengan memanfaatkan berbagai pendekatan, metode belajar, suasana belajar serta berbagai sarana yang menunjang pencapaian tujuan pembelajaran yang efektif. Namun kenyataannya tidak semua institusi pendidikan lebih khusus tenaga kependidikan memahami betul cara mengembangkan inovasi baru dalam bidang pendidikan yang dapat digunakan dalam proses pembelajaran daring selama pandemi. Sistem pembelajaran dalam jaringan adalah suatu system berbasis web yang dirancang dan dikembangkan untuk tujuan pembelajaran dan merupakan perpaduan dari berbagai komponen pembelajaran seperti materi, tugas, latihan dan lain lain dan bisa diakses oleh peserta didik dan pendidik, serta pihak terkait lewat jaringan internet tanpak tatap muka secara langsung. Membangun sytem web pembelajaran seorang pendidik dituntut untuk mengembangkan kreativitas, inovasi dan pengalamannya sehingga pendidik bisa memastikan proses pembelajaran berjalan meskipun peserta didik belajar di rumah. Alternatif untuk mengatasi permasalahan dalam upaya mengoptimalkan proses dan hasil pembelajaran, perlu kiranya dirancang dan dikembangkan system pembelajaran yang dapat diimplementasikan dalam bentuk media pembelajaran menggunakan web.

Mata kuliah Pemrograman Dasar adalah mata kuliah yang diajarkan dalam Prodi Pendidikan Teknologi Informasi dan Komunikasi di Fakultas Teknik Universitas Negeri Manado. Berdasarkan hasil observasi awal pada proses serta data hasil belajar menunjukkan 58 % belum mencapai krierian yang diinginkan, demikian juga berdasarkan pengalaman mengajar mata kuliah Pemrograman Dasar, hasilnya belum sesuai dengan apa yang diharapkan. Indikator dari gejala ini yakni adanya keluhan beberapa pengajar mengenai kurangnya daya serap ketika mengikuti kuliah, dimana perolehan nilai belum memuaskan secara merata. Beberapa permasalahan yang menjadi penyebab rendahnya kualitas proses pembelajaran seperti kurangnya sumber rujukan yang terkait isi materi perkuliahan, pengaturan waktu perkuliahan yang tidak seimbang dengan banyaknya materi, mahasiswa melebihi kapasitas ruangab serta minimnya ketersediaan media belajar. Hal ini memberi gambaran betapa penting upaya mencari berbagai alternatif pembelajaran yang dapat dikembangkan dalam rangka peningkatan kualitas proses dan hasil belajar.

Alternatif untuk mengatasi permasalahan dalam upaya mengoptimalkan proses dan hasil pembelajaran mata kuliah Pemrograman Dasar, perlu kiranya dirancang dan dikembangkan produk berupa paket web pembelajaran mata kuliah Pemrograman Dasar. Masalah yang diteliti dirumuskan sebagai berikut : (1) Bagaimana mengembangkan media berbasis Web untuk mengajarkan Pemrograman Dasar (2) Apakah Web pembelajaran hasil pengembangan layak digunakan untuk mengajarkan mata kuliah Pemrograman Dasar.

Tinjauan Pustaka

Kecendrungan perubahan yang perlu diantisipasi dibidang pendidikan di era merdeka belajar dan situasi covid-19 saat ini salah satunya adalah peralihan dari masyarakat industri beralih ke masyarakat informasi (Naisbit, 1996). Pendidikan akan mengalami perubahan salah satunya dari kegiatan memerangi buta aksara ke kegiatan menghadapi buta teknologi, budaya dan melek komputer (Makagiansar, 1996). Sementara itu, Surya (1998) menyatakan bahwa "pendidikan akan dipengaruhi salah satunya yakni pemanfaatan berbagai inovasi Iptek, yang berkaitan dengan media elektronik, informatika serta komunikasi". Menurut Nasanius (1998) kemerosotan pendidikan pada dasarnya bukan disebabkan perubahan kurikulum akan tetapi oleh kurangnya kapasitas professional pendidik dan sikap acuh tak acuh peserta didik untuk belajar. Sejalan dengan terjadinya perubahan cara pandang terhadap pendidikan, maka Buchari Alma (2007) telah mengingatkan bahwa "Peralihan situasi yang terjadi sangat cepat ini menghendaki pengelola institusi pendidikan untuk bersiap diri agar dapat mengantisipasi peningkatan ekspektasi masyarakat terhadap

institusi pendidikan". Bagi para pendidik pengintegrasian kehandalan komputer merupakan sesuatu kewajiban sekaligus tantangan untuk dapat mengaplikasikan dalam tugasnya sebagai pendidik dalam rangka meningkatkan kualitas pembelajaran dengan memanfaatkan aplikasi komputer. Nuryanto (2017) menyatakan bahwa, pendidikan mempunyai peran yang sangat signifikan dalam menghasilkan dan pembentukan pribadi-pribadi tertentu. Semuanya bergantung pada dasar filosofi serta sistem nilai atas mana lembaga pendidikan dibentuk serta praksis pendidikan apa yang hendak dikembangkan.

Menurut UU RI Nomor 18 Tahun 2002 "pengembangan merupakan suatu kegiatan Iptek yang bertujuan menggunakan aturan-aturan dan teori ilmu pengetahuan yang kebenarannya tampak dalam peningkatan fungsi dan manfaat, serta penerapan Iptek yang sudah ada, atau berupa teknologi baru yag dihasilkan". Menurut (Alim Sumarno, 2012) "pengembangan adalah suatu proses menafsir , mengurai suatu desi ke bentuk yang nyata. Lebih spesifik lagi pengembangan merupakan proses membentuk bahan-bahan ajar yang siap diajarkan". Pembelajaran menggunakan fasilitas komputer didasari pada teori yang di motori oleh beberapa ahli antara lain Skinner (1974), yang mengungkapkan bahwa belajar merupakan tingkah laku yang dapat diamati dan diakibatkan suatu rangsangan atau stimulus dari luar. Ally (2004:7) "Seseorang dapat disebut belajar nampak dari perilaku yang dapat diamati dan bukan dari apa yang dipikirkan mahasiswa". Sejalan dengam itu, Jollife (2001:21) mengemukakan bahwa, belajar terfokus pada scenario atau kegiatan berbasis masalah , mengutamakan kerja dalam tim, berbasis proyek, simulasi, serta memanfaatkan teknologi. Pembelajar pada dasarkan akan mempelajari dengan baik jika sesuatu yang dipelajari akan bermanfaat bagi kehidupan mereka sekaligus memiliki manfaat bagi mereka yang berkaitan dengan penerapannya sehari-hari. Itulah sebabnya dalam kegiatan pembelajaran, hendaknya memotivasi pembelajar dengan penggunaan berbagai teknik pengajaran dalam menerapkan konsep yang memiliki makna pada pembelajaran" Poedjiadi (2005:72). Pembelajaran merupakan suatu upaya yang giat dilakukan agar peserta didik secara sadar mau belajar atau suatu aktifitas dilakukan agar peserta didik belajar, Warsita (2008:85). Dengan kata lain, pembelajaran adalah penciptaan kondidi sedemikian rupa sehingga kegiatan belajar dapat terjadi. Terdapat beberapa interaksi yang dapat dilaksanakan dalam kegiatan pembelajaran antara lain: interaksi antara peserta didik dan pendidik, interaksi antara sejawat atau antara sesama anak didik, interaksi narasumber dengan peserta didik, interaksi antara pendidik, peserta didik dengan sumber belajar yang sengaja diciptakan , dan interaksi pendidik bersama peserta didik dengan alam dan lingkungan sosial "(Miarso, 2008: 3). Hakikat dari proses pembelajaran tersebut hendaknya dapat dituangkan atau diimplementasikan kedalam komponen-komponen pembelajaran. tidak terkecuali pada proses pengembangan pembelajaran dalam bentuk web pembelajaran.

Pembelajaran berbasis web adalah kegiatan belajar mengajar yang menggunakan fasilitas media website dimana pengaksesannya lewat jaringan internet. Pembelajaran berbasis web termasuk salah satu bagian aplikasi dari e- learning atau pembelajaran yang memanfaatkan media elektronik. e-learning adalah salah satu aplikasi teknologi internet yang bermanfaat untuk meningkatkan pengetahuan, ketrampilan dan hasil belajar. Teknologi e-learning memfasilitas kontrol terhadap isi , urutan pembelajaran, kecepatan belajar, waktu pengaksesan serta media untuk tercapainya tujuan pembelajaran . Lebih dari itu, penelitian Yi-ShunWanga dkk. (2007) menyampaikan bahwa, pembelajaran elektronik telah banyak diadopsi sebagai solusi yang menjanjikan. E-learning adalah konsep sangat menarik dengan variasi yang luas dan telah menjadi model umum pendidikan. Akeroyd (2015) menyatakan bahwa, "penggunaan teknologi internet dalam pendidikan untuk memfasilitasi seluruh siklus belajar mulai dari awal sampai berakhir studi, tanpa atau sedikit interaksi secara fisik dengan mahasiswa, karena mahasiswa dapat belajar kapan saja dan dimana pun mereka berada dengan biaya relative terjangkau". Kalinga (2010) menyatakan bahwa "e-learning dalam hal ini digunakan sebagai pendukung penggunaan teknologi informasi dan komunikasi yang menunjang proses pendidikan. Chang Nam, dkk. (2007) mengemukakan bahwa, untuk menerapkan aplikasi pembelajaran berbasis web perlu diperhatikan: (1) integrasi desain antarmuka pengguna, desain instruksional dan (2) pengembangan kerangka evaluasi untuk memperbaiki keseluruhan kualitas lingkungan

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pendukung pembelajaran berbasis Web. Pembelajaran berbasis web melibatkan lebih dari sekadar menyusun halaman web yang penuh warna. Menurut David dkk. (2004) langkah kunci dalam mengembangkan situs web pendidikan yang efektif adalah:

 Lakukan analisis apa saja yang dibutuhkan, tentukan tujuan serta sasaran yang ingin dicapai ; penentuan sumber daya , kebutuhan teknis; identifikasi perangkat lunak yang telah ada sebelumnya dan cara penggunaanya jika memenuhi kebutuhan anda; komitmen yang aman dari semua peserta, mengidentifikasi dan mengatasi hambatan potensial dalam implementasi; kembangkan konten dalam koordinasi yang erat dengan desain situs web dan ikuti alur program. Keberhasilan pembelajaran berbasis web bergantung pada loyalitas peserta didik, yaitu kelanjutan penggunaan (Chao-MinChiu, Eric T.G.Wang. 2008). Sistem pembelajaran berbasis web dapat dikembangkan untuk memfasilitasi aktivitas belajar menginterpretasikan, mengamati, melihat, dan mengajari latihan mata pelajaran, Yu, Fu-Yun, dkk (2005). Dibalik semua itu bagaimanapun hebat dan canggihnya fitur-fitur yang disiapkan untuk memfalisitasi pembelajaran melalui web, maka yang paling diutamakan adalah peserta didik, sebab web pembelajaran yang dikembangkan untuk memudahkan kegiatan pembelajaran hanya alat atau sarana penunjang pembelajaran.

Metode Penelitian
Penelitian ini menggunakan metode penelitian pengembangan, yaitu penelitian yang bertujuan untuk melaksanakan proses pembuatan dan melakukan pengujian kebenaran dari berbagai produk pendidikan yang dihasilkan (Borg & Gall, 1983). Metode penelitian dan pengembangan adalah suatu metode yang digunakan untuk mengadakan suatu poduk serta menguji efektif tidaknya produk yang di hasilkan tersebut. Sugiyono (2011:407). Adapun Produk pendidikan yang dihasilkan dalam penelitian ini adalah suatu media berupa web pembelajaran yang layak dipakai dalam kegiatan pembelajaran mata kuliah Pemrograman Dasar. Agar dihasilkan produk sesuai dengan apa yang diharapkan, maka diperlukan dasar pengembangan berupa model pengembangan. Model pengembangan yang digunakan yakni model prosedural. Tahapan untuk menyelesaikan suatu produk diadaptasi dari Borg & Gall (1983), yang terdiri dari analisis kebutuhan, desain instruksional, pengembangan produk, evaluasi produk, evaluasi formatif serta sumatif. Evaluasi formatif terdiri dari evaluasi individu, kelompok kecil, dan lapangan. Evaluasi sumatif dilaksanakan setelah pengujian program secara formal dilakukan.

Tahap awal penelitian pengembangan adalah pendefinisian masalah atau pengkajian pendahuluan terhadap masalah, mengkaji kurikulum dan SK-KD, mengkaji potensi lokasi pengembangan, mengkaji karakteristk dosen, mengkaji karakteristik mahasiswa, kemampuan awal, kegiatan mahasiswa serta komponen dan prosedur pengembangan web pembelajaran. Pada fase investigasi awal ini, peneliti juga melakukan observasi guna mendapatkan informasi yang berhubungan penggunaan web pembelajaran yang telah dilaksanakan. Bertolak dari tujuan observasi maka kegiatan yang dilaksanakan adalah:

Tahap pertama, mengkaji permasalahan menyangkut persiapan dan prosedur perkuliahan mata kuliah Pemrograman Dasar, ketersediaan jaringan internet penggunaan web pembelajaran, fasilitas laboratorium komputer, kesiapan dosen dan mahasiswa, penggunaan ruang praktikum serta evaluasi yang akan digunakan. Selanjutnya mengkaji komponen-komponen apa saja yang harus tercakup dalam web pembelajaran. Langkah selanjutnya merancang alternatif solusi menjadi sistem yang lengkap dan terintegrasi. Realisasi dilaksanakan dengan menyusun tahapan pelaksanaan, validasi ahli, evaluasi dan revisi serta implementasi penuh.

Tahap kedua, pengembangkan desain pembelajaran. Pada tahap ini dikembangkan silabus pembelajaran dengan cara berikut ini : menentukan SK, menentukan KD, melakukan kajian berbagai hal terkait pembelajaran, merumus kan indikator, menentukan bentuk dan jenis penilaian, pengembangan materi ajar

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menyusun cara penyajian materi ajar, menyusun strategi dalam kegiatan pembelajaran, dan mendesai alat evaluasi.

Tahap ketiga, memproduksi web pembelajaran dengan metode Multimedia Development Life Cycle Luther (1994), yang terdiri dari 6 tahap yaitu: konsep, disain, pengumpulan material, pembuatan , testing, dan distribusi.

Tahap keempat, melakukan evaluasi formatif yakni pengujian kebenaran produk, melaksanakan percobaan dan memperbaiki produk. Pengujian produk Web pembelajaran oleh ahli bidang materi meliputi aspek isi dan penyajian. Pengujian produk oleh ahli media meliputi aspek rekayasa perangkat lunak, pembelajaran serta komunikasi visual. Uji coba dilakukan melalui percobaan perorangan, kelompok kecil, lapangan. Selanjut melaksanakan pengolahan data, serta melakukan perbaikan produk berdasarkan data masukan dari hasil percobaan tersebut.
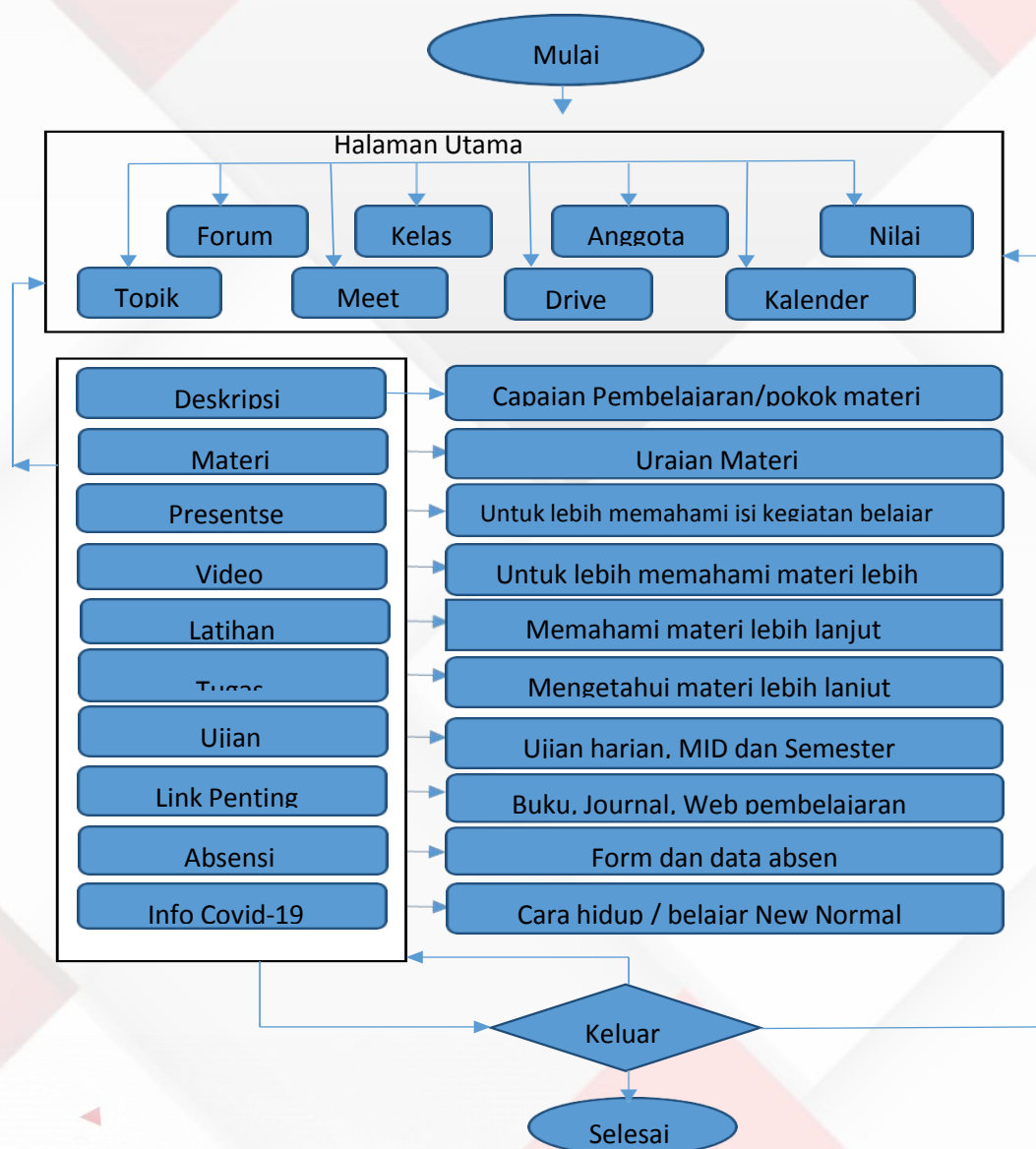
Gambar 1. Rancangan Pembelajaran Berbasis Web

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Tahap kelima, melaksanakan evaluasi sumatif, untuk mengetahui efektif tidaknya media pembelajaran yang dibuat berbasis web pembelajaran dalam meningkatkan capaian hasil belajar.

Pengujian produk web pembelajaran melibatkan 1 orang ahli bidang materi dan 1 orang ahli bidang media. Subjek uji coba pada tahap percobaan perorangan 4 mahasiswa, Subjek uji coba pada tahap percobaan kelompok kecil 10 mahasiswa, dan Subjek uji coba pada tahap percobaan lapangan 25 orang.

Data yang diperoleh dari hasil penelitian pengembangan berupa data kualitatif dan kualitatif. Data kualitatif berupa saran / masukan dari ahli bidang media, ahli bidang materi pembelajaran, dan mahasiswa digunakan untuk meningkatkan produk web pembelajaran. Data kuantitatif diperoleh melalui kuesioner menggunakan skala Likert diolah dengan statistik deskriptif. Sedangkan penilaian kualitas web pembelajaran didasarkan pada hasil konversi nilai dengan skala lima (Sukardjo, 2010)

Gambar 2. Implementasi Rancangan Pembelajaran Berbasis Web dengan Claasroom
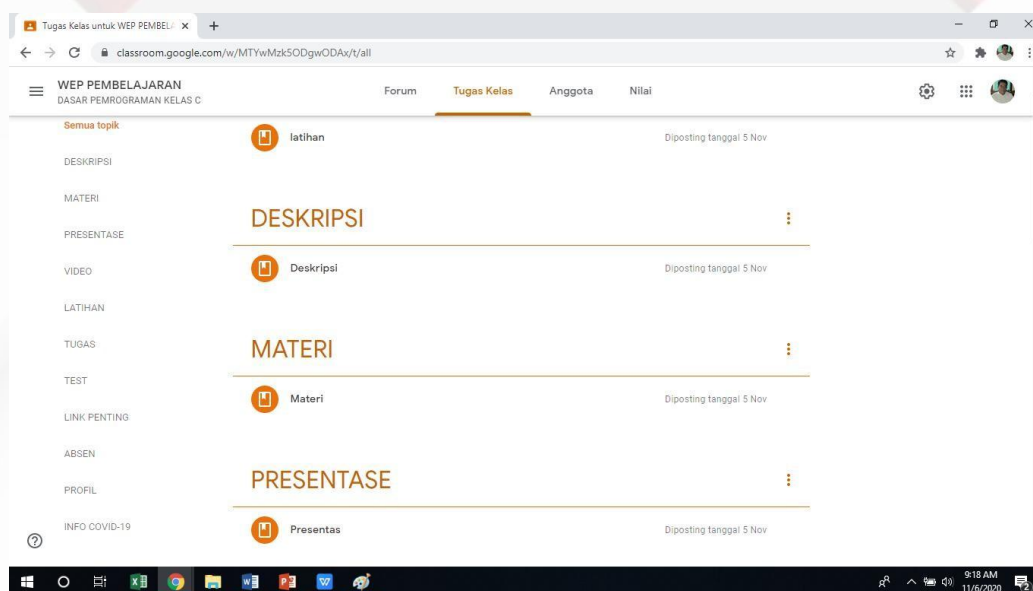
Hasil Penelitian dan Pembahasan

Analisis Hasil Validasi Ahli Materi
Hasil penilaian dari Ahli bidang Materi terkait kualitas produk Web Pembelajaran dilihat dari aspek Isi diperoleh hasil: rerata skor sebesar 3.3 (kategori baik) , dari aspek Penyajian sebesar 3.2 (kategori baik), dan rerata skor aspek isi dan penyajian sebesar 3.25 (kategori baik). Berdasarkan penilaian dari ahli materi, maka Web Pembelajaran hasil pengembangan dinilai baik dan layak digunakan dalam pembelajaran .

Analisis Hasil Validasi Ahli Media
Hasil penilaian dari ahli bidang media dilaksanakan sebelum uji coba bertujuan untuk memperoleh saran-saran, pendapat dan penilaian terhadap kesesuaian media, program yang dibuat atau digunakan oleh Web Pembelajaran yang terdiri dari aspek rekayasa perangkat lunak, pembelajaran, dan komunikasi Visual. Hasil penilaian Ahli bidang Media terkait kualitas produk Web Pembelajaran dilihat dari aspek Rekayasa perangkat lunak, menunjukkan bahwa rerata skor sebesar 3.32 (kategori baik) , dari aspek Pembelajaran sebesar 3.11 (kategori baik). Selain data hasil validasi, disarankan juga beberapa hal terkait materi yang perlu diperbaiki. Saran perbaikan segera ditindak lanjuti dengan merevisi Web Pembelajaran. Berdasarkan

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penilaian dari ahli bidang media, maka media Web Pembelajaran hasil pengembangan dinilai baik dan layak digunakan untuk mengajarkan Pemrograman dasar.

UJI COBA PRODUK

Uji coba Perorangan

Hasil penilaian terhadap kualitas produk Web Pembelajaran pada percobaan perorangan menunjukkan bahwa untuk aspek Pemanfaatan diperoleh skor 3.3 (kategori Sangat baik), aspek Komunikasi Visual sebesar 2.98 (kategori baik), aspek Rekayasa Perangkat lunak sebesar 3.43 (Kategori baik).

Uji coba Kelompok Kecil

Berdasarkan hasil percobaan perorangan, beberapa revisi telah dilakukan yang selanjutnya dilakukan percobaan kelompok kecil yang melibatkan 10 mahasiswa. Hasil penilaian terhadap kualitas produk Web Pembelajaran pada uji coba kelompok kecil menunjukkan, bahwa untuk aspek Pemanfaatan diperoleh skor 3.21 (kategori baik), aspek Komunikasi Visual sebesar 3.23 (kategori baik), aspek Rekayasa Perangkat lunak sebesar 2,98 (Kategori baik).

Uji coba Lapangan lebih luas

Pada percobaan lapangan lebih luas melibatkan 25 mahasiswa. Hasil penilaian terhadap kualitas produk Web Pembelajaran pada percobaan lapangan. Menunjukkan, bahwa untuk aspek Pemanfaatan diperoleh skor 3.2 (kategori baik), aspek Komunikasi Visual sebesar 3.3 (kategori baik), aspek Rekayasa Perangkat lunak   sebesar 3.24 (Kategori baik). Sesuai dengan hasil analisis uji kelayakan Web Pembelajaran   dari ahli bidang materi, ahli bidang media, dan percobaan pada mahasiswa, maka nilai yang diperoleh berada dalam kisaran kategori baik. Dengan demikian, dapat ditarik suatu kesimpulan bahwa media Web Pembelajaran hasil pengembangan layak digunakan untuk mengajarkan mata kuliah Pemrograman Dasar bagi mahasiswa

2. Pembahasan

Penelitian dan pengembangan telah dilaksanakan. Produk web pembelajaran untuk mengajarkan materi Pemrograman Dasar telah selesai dikembangkan sesuai dengan prosedur dan layak dipakai dalam pembelajaran,

Pemilihan media pembelajaran berbasis web yang tepat, akan meningkatkan hasil belajar mahasiswa. Karena itu, dosen dituntut agar dapat merancang ataupun memilih serta menggunakan web pembelajaran yang sesuai agar tujuan pembelajaran dapat tercapai secara optimal. Kegiatan pembelajaran menggunakan web pembelajaran merupakan salah satu alternatif yang layak digunakan dalam meningkatkan hasil belajar Pemrograman dasar.

Beberapa peneliti lain mengungkapkan bahwa hasil belajar mahasiswa menunjuk kan nilai yang signifikan. Sehingga pengembangan pembelajaran berbasis web dapat meningkatkan prestasi belajar (Rinaldi Dwi Nugroho, 2013). Media pembelajaran berbasis web layak untuk digunakan dan efektif meningkatkan kualitas pembelajaran (Manggopa et all, 2019a). Sistem pembelajaran berbasis web dapat dikembangkan untuk memfasilitasi aktivitas belajar menginterpretasikan, mengamati, melihat, dan mengajari latihan mata pelajaran, Yu, Fu-Yun, dkk (2005). Demikian juga hasil penelitian dari Pu-Shih . dkk. (2010) menyimpulkan bahwa terdapat hubungan positif antara penggunaan web pembelajaran dengan keterlibatan mahasiswa dan hasil belajar". media pembelajaran berbasis web layak untuk digunakan dan efektif meningkatkan kualitas pembelajaran. Hasil penelitian yang dilaksanakan oleh Insung Jung, dkk. (2010) mengungkapkan bahwa "pengalaman belajar yang dialami peserta didik membawa perubahan sikap positif sehubungan dengan penggunaan Web dalambelajar". Pembelajaran berbasis wen efektif dapat meningkatkan kualitas hasil pembelajaran (Manggopa et all, 2019b)

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Dari hasil penelitian tersebut dapat disimpulkan bahwa ada hubungan positif antara penggunaan web pembelajaran dengan keterlibatan mahasiswa dan hasil belajar, pengalaman belajar yang dialami mahasiswa membawa perubahan sikap positif, membuat mahasiswa merasa lebih mampu berkontribusi, memberikan hasil belajar yang lebih baik, dan dapat meningkatkan prestasi belajar.

Simpulan dan Saran

Simpulan
Pertama, prosedur pengembangan Web Pembelajaran untuk mengajarkan Pemrograman Dasar kepada mahasiswa dilakukan melalui beberapa tahapan yaitu menanalisis apa saja yang dibutuhkan, dilanjutkan dengan mengembangkan rancangan/desain pembelajaran, menghasilkan produk media web pembelajaran, dan melakukan evaluasi formatif. Semua tahapan pengembangan telah selesai laksanakan hingga mendapatkan suatu hasil produk kegiatan pembelajaran Pemrograman Dasar dalam bentuk Web Pembelajaran.

Kedua, web pembelajaran hasil pengembangan layak digunakan untuk mengajarkan mata kuliah Pemrograman Dasar serta efektif dapat meningkatkan hasil belajar.

Saran
Pemanfaatan dosen
Dosen yang akan memanfaatkan Web Pembelajaran kiranya mempersiapkan fasilitas pendukung dan kebutuhan mahasiswa
Membentuk tim pelaksana perkuliahan Pemrograman Dasar dengan melibatkan dosen ahli media.

Pemanfaatan untuk Mahasiswa
Mengikuti petunjuk cara memdalami materi kuliah yang disiapkan sebagai pendamping belajar Menyiapkan fasilitas pendukung seperti laptop dan koneksi internet

Daftar pustaka
Akeroyd, J. (2015). Information management and e-learning: Some perspectives.
In Aslib proceedings, 57(2): 157-167.
Ally, M. 2004. Foundations of Educational Theory for Online Learning, dalam Anderson, T dan Elloumi, F.
(Eds). Theory and Practise of Online Learning. Canada: Athabasca University
Alma, B. 2007. Manajemen pemasaran dan manajemen jasa. Edisi Revisi.
Bandung: Alfabeta.
Borg, W. R., & Gall, M. D. 1983. Educational Research. An Introduction (4th ed.) New York: Longman.
Chao-MinChiu, Eric T.G.Wang. 2008. Understanding Web-based learning continuance intention: The role of subjective task value. Jurnal Information & Management, 45(3): 194-201.
Insung Jung , Seonghee Choi , Cheolil Lim & Junghoon Leem., 2010. Effects of Different Types of Interaction on Learning Achievement, Satisfaction and Participation in Web-Based Instruction. Journal Innovations in Education and Teaching International, 39(2): 153-162.
IT Jolliffe. 2001. Principal Component Analysis, Sprynger, New York. ISBN 0- 387-95442-2.
Kalinga, E. 2010. Development of an Interactive e-Learning Management System (e-LMS) for Tanzanian secondary schools (Doctoral dissertation, Blekinge Institute of Technology).
Kamil Irfan, 2020. Pembelajaran Positif dari Covid-19: Penyerapan Teknologi dalam Pendidikan, Komas.com, https://edukasi.kompas.com/komentar/2020/06/09/223437171/pembelajaran
-positif-dari-covid-19-penyerapan-teknologi-dalam-pendidikan. Diakses 06
September 2020

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Luther. 1994. Arc C. Authoring Interactive Multimedia. Boston: AP Professional. Makagiansar, M. 1996. Shift in Global paradigma and The Teacher of Tomorrow,

17th. Convention of the Asean Council of Teachers (ACT); 5-8 Desember, 1996, Republic of Singapore.

Manggopa, H. K., Manoppo, C. T. M., Togas, P. V., Mewengkang, A., & Batmetan, J. R. (2019a). Web-Based Learning Media Using Hypertext Markup Language as Course Materials. Jurnal Pendidikan Teknologi dan Kejuruan, 25(1), 116-123.

Manggopa, H. K., Kenap, A. A., Manoppo, C. T. M., Batmetan, J. R., & Mewengkang, A. (2019b), February). The Development of Web Learning as Media to Deliver Web Programming Materials. In 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018). Atlantis Press.

Miarso, Yusufhadi. 2008. Menyemai Benih Teknologi Pendidikan. Jakarta: Prenada Media

Naisbitt, J. 1996. Megatrends Asia: delapan megatrend Asia yang mengubah dunia. Penerbit pt Gramedia Pustaka Utama.

Nam, C., & Smith-Jackson, T. (2007). Web-based learning environment: A theory-based design process for development and evaluation. Journal of Information Technology Education: Research, 6(1): 23-43.

Nasanius, Y. 1998. Kemerosotan Pendidikan Kita: Pengajar dan Siswa Yang Berperan Besar, Bukan Kurikulum. Suara Pembaharuan. (Online) (http://www.suarapembaharuan.com/News/1998/08/230898, diakses 7 Juni 2017.

Nuryanto, A. 2017. Kritik Budaya Akademik di PerPengajaran Tinggi. The Journal of Society & Media, 1(1): 35-42.

Poedjiadi, A. 2005. Sains Teknologi Masyarakat. Bandung: Remaja Rosdakarya Pu-Shih

Daniel Chena. D.Lambertb..Kevin R.Guidryb. 2010. Engaging online learners: The impact of Web-based learning technology on college student engagement. Jurnal Computers & Education, 54(4): 1222-1232.

Rinaldi Dwi, Nugroho. 2013. Pengembangan Pemrograman Dasar Berbasis Website Pada Mata Pelajaran Programmable Logic Controller (Doctoral Dissertation, UNY).

Sugiyono, 2011. Metode Penelitian Kuantitatif, Kualitatif dan R&D. Jakarta : Alfhabeta

Sukardjo. 2010. Evaluasi Pembelajaran. Buku Pegangan Kuliah: PPs Universitas Negeri Yogyakarta

Sumarno, A. 2012. Penelitian Kausalitas Komparatif. Surabaya: e-Learning Unesa.

Surya, H.M. 1998. Peningkatan Profesionalisme Pengajar Menghadapi Pendidikan Abad ke-21n (I); Organisasi & Profesi. Suara Pengajar No. 7/1998

Warsita, Bambang. 2008. Teknologi Pembelajaran: Landasan &Aplikasinya, Jakarta: Rineka.

Yi-ShunWanga. 2007. Measuring e-learning systems success in an organizational context: Scale development and validation. Jurnal Computers in Human Behavior . 23(4): 1792-1808.

Yu, Fu-Yun, dkk. 2005. A web-based learning system for question-posing and peer assessment. Journal Innovations in Education and Teaching International 42(4): 4

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The Batik Semanggi Project as A Collaborative Effort between Lecturers, Students and SMEs in the Ex-Locallization of Dolly

Indarti, Urip Wahyuningsih, Yuhri Inang Prihatina, Yulistiana, Amaliya Lailatur R. and Li Hsun Peng

Abstract

Collaboration is the ability to participate in an activity and build relationships with others to achieve a goal. In realizing one of the research activities and independent learning on independent campuses (Merdeka Belajar Kampus Merdeka), collaboration between lecturers and students and industry is carried out. The purpose of the study was to describe the pattern of collaboration between lecturers, students, and SMEs in the making of the Batik Semanggi Suroboyo Project. The research method used is descriptive by involving the role of students and batik SMEs in Putat Jaya Village. Putat Jaya is a sub-district in Surabaya whose economic growth was lacking after the closure of the Dolly localization. The research results can be used as best practice in conducting collaborative research involving several parties.

Index Terms—merdeka belajar kampus merdeka, collaborative model, textile product design project, natural dyes

INTRODUCTION

The 21st century skills have become a topic of much discussion lately. Educational institutions are challenged to find ways to enable students to succeed in work and life through mastering creative thinking skills, flexible problem solving, collaboration and innovation. In the 21st century skills, students need to think deeply about problems, solve problems creatively, work in teams, communicate clearly across multiple media, learn technology that is always changing [1]. It is important to explicitly teach students critical thinking and problem solving skills, effective communication, collaboration, and creativity and innovation [2]. Each individual must engage in inquiry-based learning that is meaningful, has true value and relevance to develop the higher order thinking skills they need. In the 21st century, every student will learn differently, so teachers are challenged to find ways to help all students learn effectively. The life of the 21st century demands students's skill to be ready to face the challenges that exist.

To face the life of the 21st century, the Indonesian government launched the concept of an independent learning campus at an independent university. Merdeka Campus is part of the Merdeka Learning policy by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, which provides opportunities for students to hone skills according to their talents and interests by going directly into the world of work as preparation for future careers. Independent learning provides opportunities for students to study by paying attention to their natural talents, without forcing them to study or master a field of knowledge outside of their hobbies and abilities, so that each has a portfolio that matches their passion [3].

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Freedom to learn gives freedom and autonomy to educational institutions and independence from bureaucratization, and lecturers are freed from complicated bureaucracy. Students are given the freedom to choose the fields they like. In realizing one of the independent research and learning activities on independent campuses (MBKM), students collaborate with lecturers and industry. This project involves industries/SMEs in Surabaya, especially SMEs in the Putat Jaya sub-district, famous for its former Dolly localization.

Since it was closed 7 years ago, the former Dolly localization in the Putat Jaya area of Surabaya has undergone many changes. The desire of the Surabaya city government to change the negative image of Putat Jaya, which used to be the largest prostitution business in Southeast Asia, into a creative industry and tourism area. Many SMEs have been established in this area, including creative industry SMEs that produce batik, sandals and shoes, and traditional foods and snacks. The area is now an SME area under the guidance of the Surabaya City Government. Batik House became a batik training center for local residents until several batik SMEs were finally in the Putat Jaya area. Several SMEs groups produce batiks such as Canting Surya, Alpujabar, Distance Arum, and Chawaty. One of the efforts to support the Surabaya city government program collaborates with SMEs in the Putat Jaya area. The purpose of the study was to describe the pattern of collaboration between lecturers, students, and SMEs in the making of the Batik Semanggi Suroboyo Project.

Independent learning on an independent campus (MBKM)
"Merdeka Belajar – Kampus Merdeka" is a policy of the Minister of Education and Culture, which aims to encourage students to master various sciences that are useful for entering the world of work. Learning in the freedom Campus provides challenges and opportunities for the development of creativity, capacity, personality, and student needs, as well as developing independence in seeking and finding knowledge through realities and field dynamics such as ability requirements, real problems, social interaction, collaboration, self-management, performance demands, targets and achievements. The Independent Learning Policy - Independent Campus is expected answer to these demands. An independent Campus is a form of learning in higher education that is autonomous and flexible to create a learning culture that is innovative, unfettered, and under the needs of students. The objective of the Independent Learning - Independent Campus policy is to improve the competence of graduates, both soft skills and hard skills, to be more prepared and relevant to the needs of the times, to prepare graduates as future leaders of the nation with excellent and personality. Along with lifelong learning, students become skilled and competent means having updated knowledge and skills. They contribute to improving their economic status and help their country be more competitive [4].

Various forms of learning activities outside of tertiary institutions, including conducting internships/work practices in the industry or other workplaces, implementing community service projects in villages, teaching in academic units, participating in student exchanges, conducting research, conducting entrepreneurial activities, conducting studies/ independent projects, and following humanitarian programs.

Independent studies/projects are carried out to complement the curriculum already taken by students. Colleges or faculties can also make independent studies to complete topics that are not included in the class schedule but are still available in the syllabus of the study program or faculty. Independent project activities can be carried out in the form of cross-disciplinary group work. The independent study program/project objectives include: 1) Realizing student ideas in developing innovative products that become their ideas. 2) Organizing research and development (R&D) based education. 3) Improving student achievement in national and international competitions.

21st century

The 21st century skills are termed 4 C's, which stands for critical thinking, collaboration working well together, communication skills, and creativity. Critical thinking is the ability to understand a complex problem, connect information with other information, emerge from various perspectives, and find solutions to a problem. Quality education equips students with higher-order thinking skills that can develop the ability to generate ideas and to solve problems in learning [5]. Critical thinking is also defined as the ability to reason, understand and make complex choices; understand the interconnections between systems, structure, express, analyze, and solve problems. Critical thinking skills are important for students during the rapid flow of information in the digital era. The ability to distinguish truth from lies, fact from opinion, or fiction from non-fiction, is one of the assets for students to make wiser decisions throughout their lives.

Communication is the activity of transferring information, both orally and in writing. Communication is an important thing in human civilization. The main purpose of communication is to send messages through the selected media so that they can be received and understood by the recipient of the message. Communication skills involve listening and speaking as well as reading and writing [6]. Communication can run effectively if the message conveyed by the communicator can be well received by the communicant so that there is no misperception. The presence of gadgets in the era of globalization can be used as an effective communication medium for students.

Creativity is the ability to develop, implement, and convey new ideas to others; be open and responsive to new and different perspectives. Creativity is also defined as a person's ability to create new combinations. Creativity is an often coveted quality of thinking and an important aspect of innovation and change [7]. Creativity will greatly depend on one's creative thinking, namely the process of creating new ideas. Creativity that can produce discoveries is often referred to as innovation. Creative thinking in creating innovations is one of the 21st century skills that will make a person survive and not be replaced by robots or machines in their field of work.

Collaboration is the ability to work together, synergize, adapt to various roles and responsibilities, work productively with others, put empathy in its place, and respect different perspectives. By collaborating, each party involved can fill each other's shortcomings with their respective strengths. More knowledge and skills will be available collectively to achieve maximum results. The technology available today allows students to collaborate wide open without having to be limited by distance. Therefore, our students need to be equipped with the ability to collaborate as one of the 21st century skills, which include the ability to work together effectively in diverse teams, be flexible and able to compromise to achieve common goals, understand their responsibilities in a team, and appreciate the performance of team members. Successful collaboration is the importance of ongoing opportunities for frequent and shared informal communication [8].

Collaboration between lecturers, students and SMEs

Collaboration is one of the 21st century skills that provides many benefits for all parties. The benefits obtained by collaboration include solving problems quickly, reducing workload, learning from each other, obtaining new ideas, practicing cooperation as a team and getting rid of selfishness, enriching the experience of working in a group, and increasing networking. The form of collaboration between lecturers, students, and SMEs in this study is to create new products. The product is in the form of batik art, one of the creative industries developing in Indonesia. Batik artists will continue to innovate to create new motifs, technology, coloring, and business models to preserve Indonesia's ancestral cultural heritage.

In this project, the collaboration between lecturers, students, and UKM provides a concrete example of a learning effort leading to 21st century skills. This project will be implemented starting in July 2021, involving
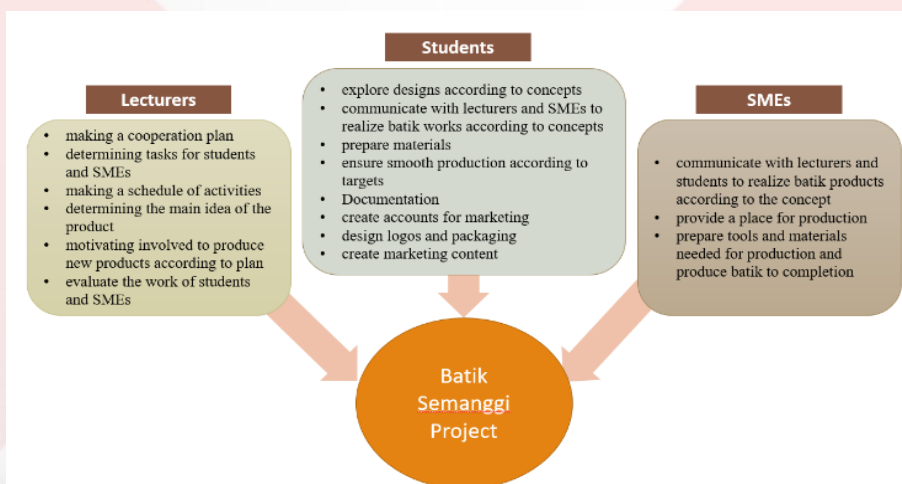
lecturers of fashion, fashion students, informatics students, and Chawaty batik UKM. The following describes the role of each party, as shown in Fig 1.

Fig 1. Collaboration model between lecturers, students and batik SMEs

Lecturers have a role as the person in charge of the program; their duties include making a cooperation plan, determining assignments for students and SMEs, making a schedule of activities, determining the main idea of the product being developed, motivating all parties involved to produce new products according to plan, and evaluate the work of students and SMEs to match the initial concept. The role of students in this project is to explore designs according to concepts, communicate with lecturers and SMEs to realize batik works according to concepts, help prepare materials, help ensure smooth production according to targets, take documentation, create accounts for marketing, design logos and packaging, create marketing content. Meanwhile, the role of SMEs is to communicate with lecturers and students to realize batik products according to the concept, provide a place of production, prepare tools and materials needed for production and produce batik for completion.

The result of the Semanggi Batik Project

Batik is an Indonesian cultural heritage whose existence still exists today. Recognition of batik as a world heritage since UNESCO established batik as a human heritage for non-material oral culture (masterpiece of the oral and intangible heritage of humanity) on October 2, 2009. Batik has been present in every stage of human life, especially in Javanese society [9].

Batik, known as drawing on cloth, uses written canting and stamps (copper) and hot wax as a color barrier. The first traditional technique used in batik is canting Tulis which functions as a pen for drawing on cloth. Then known as the stamp technique made of copper. This technique produces batik faster because the motif has been drawn on the stamp. All you have to do is stamp it on the cloth sheet repeatedly.

Currently, the development of batik has spread to various regions in Indonesia. At first, batik was only known in the palace area with its classic and standard batik motifs, and coastal batik, which was known as commercial batik, which was freer and more varied. Not only growing and developing on the island of Java, but the batik industry has also penetrated various parts of Indonesia. Thousands of motifs have been claimed as Indonesian batik motifs. Indonesian people's awareness of the preservation of batik has

encouraged this creative industry to develop rapidly. Currently, almost every region has batik motifs typical of the city or district in its area, including the typical batik of Surabaya.

Semanggi batik is proposed as one of the typical Surabaya batiks. Inspired by the semanggi Suroboyo, which is one of the typical foods of the Surabaya region, it consists of two kinds of vegetables, namely clover leaves and boiled sprouts served with a mixture of petis (black seasoning made of shrimp) and seasonings made from a combination of steamed cassava and then ground with peanuts, brown sugar, white sugar, and salt. And equipped with crackers pulley. The sellers carry their wares and say "Semanggi" with a distinctive intonation so that people are already familiar with the clover traders. In addition, there are clover sellers who have chosen a "ngetem" place. In other words, they stop at the place where they usually sell and the buyers who come to them. Clover plants grow a lot in rice fields in the Surabaya area. A cloverleaf is a group of water spikes from the Marsilea genus. The morphology of this plant is distinctive, with its leaf shape resembling an umbrella composed of three to four leaflets facing each other.

This clover batik project combines the stylized form of the clover plant and some of Surabaya's city icons with traditional batik patterns. Batik coloring uses natural dyes from secang, tingi, tegeran and indigo. The Semanggi batik motif has been registered as a copyright. The motifs that have been copyrighted are tambal semanggi suroboyo (EC00202143226), inspired by the shape of the cloverleaf combined with the motifs of sharks and crocodiles, sharp bamboo and the hero monument which is an icon of the city of Surabaya, arranged in a patchwork batik pattern which has meaning improve oneself towards a better life (Fig 2).

Fig 2. Tambal semanggi suroboyo motif

Kawung semanggi (EC00202143228), inspired by cloverleaf arranged in a kawung pattern. Kawung is is a

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geometric pattern in a circle, meaning purity and perfection. In this Kawung Semanggi motif, it is a combination of an oval-shaped geometric pattern with a spread of four cloverleaf inside (Fig.3). Lereng pecel semanggi (EC00202143227), inspired by the typical Surabaya food, pecel semanggi which consists of clover vegetables, sprouts, turi flowers, and pincuk from banana leaves, arranged in lereng pattern which means fertility and health. Sekar jagad semanggi suroboyo (EC00202143225), inspired by the shape of th

e cloverleaf which is a typical food of Surabaya combined with shark and crocodile motifs which are the symbol of the city of Surabaya, arranged in a Sekar Jagad batik pattern which means diversity.

Fig 3. Kawung semanggi motif

Latar semanggi (EC00202143229), inspired by the cloverleaf which is a typical food ingredient in Surabaya. There are three clover leaves and four clover leaves, arranged into a clover background combined with various kinds of filler pattern (isen-isen). The cloverleaf background spreads on the surface of the batik, which means harmony. Parang semanggi (EC00202160246), inspired by the shape of four-leaf clover strands arranged in a diagonal pattern along with traditional parang motifs that reflect advice that never gives up and never breaks, and udan liris semanggi (EC00202160247), a stylized cloverleaf combined with other shapes with small sizes arranged in a diagonal udan liris (little rain) pattern which means steadfastness in living life.

Conclusion

The existence of independent learning in higher education is expected to provide the widest opportunity for lecturers and students to explore according to the needs of the 21st century work field. Collaboration and cooperation between the academic world and industry benefit all parties to support advanced Indonesia. The Semanggi batik project has been implemented in collaboration between fashion design lecturers and students, informatics students, and SMEs in the ex-localization of Dolly. Collaboration is one of the 21st century skills that include the ability to work together effectively in diverse, flexible, and compromise teams to achieve common goals, understand their responsibilities in a team, and appreciate the performance of other team members. The Semanggi batik project, through this collaboration, has produced a typical Surabaya batik art product, an innovative work of economic value. Semanggi batik combines the stylized form of the clover plant and some of the icons of the city of Surabaya with traditional batik patterns, using natural dyes. The Semanggi batik project has managed to get 7 copyrights. Currently, the project is still running with the main focus on product marketing.

References

[1]   I. Sural, "21St Century Skills Level of Teacher Candidates," Eur. J. Educ. Stud., vol. 3, no. 8, pp. 516–529, 2017, doi: 10.5281/zenodo.841806.

[2]   C. Kivunja, "Teaching Students to Learn and to Work Well with 21st Century Skills: Unpacking the Career and Life Skills Domain of the New Learning Paradigm," Int. J. High. Educ., vol. 4, no. 1, pp. 1–11, 2014, doi: 10.5430/ijhe.v4n1p1.

[3]   A. Abidah, H. N. Hidaayatullaah, R. M. Simamora, D. Fehabutar, and L. Mutakinati, "The Impact of Covid-19 to Indonesian Education and Its Relation to the Philosophy of 'Merdeka Belajar,'" Stud. Philos. Sci. Educ., vol. 1, no. 1, pp. 38–49, 2020, doi: 10.46627/sipose.v1i1.9.

[4]   K. D. Regmi, "Lifelong learning: Foundational models, underlying assumptions and critiques," Int. Rev. Educ., vol. 61, no. 2, pp. 133–151, 2015, doi: 10.1007/s11159-015-9480-2.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

[5]   S. Mahanal, S. Zubaidah, I. D. Sumiati, T. M. Sari, and N. Ismirawati, "RICOSRE: A learning model to develop critical thinking skills for students with different academic abilities," Int. J. Instr., vol. 12, no. 2, pp. 417–434, 2019, doi: 10.29333/iji.2019.12227a.

[6]   A. Khan, S. Khan, S. Zia-Ul-Islam, and M. Khan, "Communication Skills of a Teacher and Its Role in the Development of the Students' Academic Success," J. Educ. Pract., vol. 8, no. 1, pp. 18–21, 2017.

[7]   D. Henriksen, P. Mishra, and P. Fisser, "Infusing creativity and technology in 21st century education: A systemic view for change," Educ. Technol. Soc., vol. 19, no. 3, pp. 27–37, 2016.

[8]   S. Morgan, S. Pullon, and E. McKinlay, "Observation of interprofessional collaborative practice in primary care teams: An integrative literature review," Int. J. Nurs. Stud., vol. 52, no. 7, pp. 1217–1230, 2015, doi: 10.1016/j.ijnurstu.2015.03.008.

[9]   Indarti, I. A. T. Rahayu, and L. H. Peng, "Sustainable Batik Production: Review and Research Framework," vol. 390, no. Icracos 2019, pp. 66–72, 2020, doi: 10.2991/icracos-19.2020.14.

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ANALISIS FAKTOR PENGARUH PENINGKATAN PRESTASI BELAJAR SISWA SMK NEGERI 2 MANADO

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Penelitian ini bertujuan untuk menganalisis: (1) hubungan kompetensi guru dan prestasi belajar siswa SMK N 2 Manado, (2) hubungan lingkungan sekolah dan prestasi belajar siswa SMK N 2 Manado, dan (3) hubungan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar siswa SMK N 2 Manado. Rancangan penelitian ini adalah penelitian kuantitatif dengan pendekatan penelitian korelasional. Dari hasil penelitian: 1) terdapat hubungan yang signifikan antara kompetensi guru dan prestasi belajar siswa SMK N 2 Manado, dan memberikan konstribusi sebesar 38.20%; 2) terdapat hubungan yang signifikan antara lingkungan sekolah dan prestasi belajar, dan memberikan konstribusi sebesar 32.95%; 3) terdapat hubungan yang signifikan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar, dan memberikan konstribusi sebesar 47.10%, maka secara langsung akan meningkatkan pretasi belajar siswa dalam hal dalam hasil atau taraf kemampuan yang telah dicapai siswa setelah mengikuti proses belajar mengajar dalam waktu tertentu baik berupa perubahan tingkah laku, keterampilan dan pengetahuan. Atau dalam meningkatkan prestasi belajar siswa harus memperhatikan kompetensi guru, dan lingkungan sekolah yang secara nyata memberikan sumbangan yang berarti.

Kata kunci: kompetensi guru, lingkungan sekolah dan prestasi belajar

Pendahuluan

Salah satu tujuan dalam proses pembelajaran adalah meraih suatu prestasi dalam belajar. Melihat fakta yang terjadi di lapangan, guru telah berupaya mencari solusi maupun mengadakan pendekatan pada siswa itu sendiri dengan memberikan pemahaman tentang masa depan mereka jika mereka tidak mengubah perilaku ke arah yang lebih baik. Kompetensi guru merupakan kemampuan guru dalam profesi keguruannya. Motivasi yaitu rasa yang timbul dari diri seseorang untuk mencapai tujuan tertentu. Sedangkan prestasi belajar adalah hasil atau kemampuan siswa yang telah dicapai dari proses belajar dari berbagai mata pelajaran dan akan diberikan nilai berupa rapot siswa. Guru merupakan salah satu faktor penentu keberhasilan pembelajaran, maka dibutuhkan guru yang memiliki 4 kompetensi yaitu (1) kompetensi Pedagogik merupakan pemahaman guru terhadap siswa dan guru yang mampu merancang serta melaksanakan pembelajaran yang menyenangkan bagi siswanya; (2) kompetensi pribadi yaitu kemampuan guru yang mencerminkan kepribadian dewasa, mantap, wibawa, dan menjadi teladan bagi siswanya; (3) kompetensi sosial adalah kemampuan guru untuk berkomunikasi baik dengan siswa maupun sesama pendidik atau pengajar; (4) kompetensi professional ialah kemampuan guru dalam menguasai materi pembelajaran secara mendalam untuk diajarkan kepada siswanya. Tugas guru tidak hanya mengajar, namun juga mendidik, mengasuh, membimbing, dan membentuk kepribadian siswa guna menyiapkan dan mampu menciptakan kondisi yang strategi yang dapat membuat peserta didik nyaman dalam mengikuti proses pembelajaran. Guru sebagai tenaga pendidikan secara subtantif memegang peranan tidak hanya melakukan pengajran atau transfer ilmu pengetahuan (kognitif), tetapi dituntut untuk mampu memberikan bimbingan dan pelatihan. Di dalam Undang-Undang No. 20 Tahun 2003 ditegaskan pada pasal 29 bahwa: tenaga pendidikan selainn bertugas melaksanakan administrasi, pengelolaa, pengembangan, pelayanan dalam satuan pendidikan juga sebagai tenaga professional yang bertugas merencanakan dan melaksanakan proses serta menilai hasil pembelajaran, bimbingan dan pelatihan. Menurut Moedjianto (2003), bahwa ukuran guru profesional, meliputi, (1) menguasai ilmu yang harus diajarkan kepada siswanya, (2) mampu

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mengjarakan materi pelajaran yang menjadi tanggung jawabnya dengan cara yang hidup, jelas, dan meresap pada siswa yang diajar, (3) mengikuti proses kemajuan zaman yang terkait dengan pengembangan materi, metode dan evaluasi pengajaran serta menyenangi pelajaran yang diampunya, dan (4) mengajarkan siswa supaya guru dapat menjadi teladan sebagai manusia yang berbudaya atau berbudi pekerti yang luhur, melalui mata pelajaran yang diajarkan tanpa menambah jam pelajaran dari yang dijatahkan.

Kompetensi guru mengajar merupakan kemampuan dan keahlian dasar yang ditunjukkan oleh profesi guru dalam menjalankan tugas-tugasnya secara baik antara lain, mengusai materi, kemampuan dalam menggunakan metode dan pemanfaatan sumber belajar. Hamalik (2009) mengemukakan terdapat sepuluh kompetensi dasar yang harus dimiliki seorang guru, meliputi: "(1) menguasai bahan, (2) mengelola program belajar mengajar, (3) mengelola kelas dengan pengalaman belajar, (4) menggunakan media/sumber dengan pengalaman belajar, (5) menguasai landasan-landasan kependidikan dengan pengalaman belajar, (6) mengelola interaksi belajar mengajar dengan pengalaman belajar, (7) menilai prestasi siswa untuk kependidikan dan pengajaran dengan pengalaman belajar, (8) mengenal fungsi dan program pelayanan bimbingan dan penyuluhan dengan pengalaman belajar, (9) mengenal dan melaksanakan adminstrasi sekolah dengan pengalaman belajar, dan (10) memahami prinip prinsip dan menasirkan hasil-hasil penelitian pendidikan guna keperluan pengajaran.

Selain kompetensi guru, yang mempengaruhi prestasi belajar keteknikan salah satunya adalah lingkungan sekolah. Menurut Syah (2007:185), lingkungan belajar sangat berpengaruh terhadap proses terjadinya pembelajaran dan hasil belajar. Lingkungan belajar siswa terbagi menjadi 3, yaitu: pertama, lingkungan keluarga, contohnya ketidakharmonisan hubungan antara ayah dan ibu, dan rendahnya kehidupan ekonomi keluarga. Kedua, lingkungan masyarakat. Dan Ketiga, lingkungan sekolah, contohnya kondisi dan letak gedung sekolah yang buruk seperti pasar, kondisi guru dan alat-alat belajar yang berkualitas rendah. Lingkungan belajar yang baik akan meningkatan hasil belajar siswa (Mulyasa, 2004:91). Lingkungan sekolah merupakan lingkungan pendidikan utama yang kedua. Siswa-siswa, guru, administrator, konselor hidup bersama dan melaksanakan pendidikan secara teratur dan terencana dengan baik (Hasbullah, 2013:36).

Menurut Dalyono (2010:131) lingkungan sekolah merupakan salah satu faktor yang turut mempengaruhi pertumbuhan dan perkembangan anak terutama untuk kecerdasannya. Lingkungan sekolah sangat berperan dalam meningkatkan pola pikir anak, karena kelengkapan sarana dan prasarana dalam belajar serta kondisi lingkungan yang baik sangat penting guna mendukung terciptanya lingkungan belajar yang menyenangkan. Lingkungan sekolah yaitu keadaan sekolah tempat belajar yang turut mempengaruhi tingkat keberhasilan belajar. Keadaan gedung sekolahnya dan letaknya, serta alat-alat belajar yang juga ikut menentukan keberhasilan belajar siswa (Syah, 2010:152). Lingkungan sekolah adalah sebagai tempat mengajar dan belajar (Hamalik, 2009:6). Sebagai suatu lembaga yang menyelenggarakan pengajaran dan kesempatan belajar harus memenuhi bermacam-macam persyaratan antara lain: murid, guru, program pendidikan, asrama, sarana dan fasilitas. Segala sesuatu telah diatur dan disusun menurut pola dan sistematika tertentu sehingga memungkinkan kegiatan belajar dan mengajar berlangsung dan terarah pada pembentukan dan pengembangan siswa.

Lingkungan sekolah dinilai mempunyai andil dalam menentukan keberhasilan siswa karena sekolah merupakan tempat kegiatan belajar dan proses pendidikan berlangsung. Lingkungan sekolah yang dapat menciptakan kondisi yang kondusif bagi proses pendidikan dengan koordinasi yang baik antara kepala sekolah dengan para guru, maka hal tersebut akan berdampak besar bagi perkembangan prestasi siswa. Sarana fisik dan segala fasilitas yang ada di lingkungan sekolah juga sangat mendukung kelancaran dalam melaksanakan proses belajar mengajar. Dengan fasilitas yang memadai siswa akan jauh lebih bersemangat untuk belajar.

Hamdani (2011: 138) mengemukakan prestasi belajar adalah hasil yang diperoleh berupa kesan-kesan yang mengakibatkan perubahan dalam diri individu sebagai hasil dari aktivitas dalam belajar. Dalam suatu lembaga pendidikan keberhasilan proses belajar mengajar dapat dilihat dari prestasi belajar yang dicapai oleh peserta didik. Prestasi belajar ini menunjukkan gambaran keberhasilan dalam upaya mengoptimalkan kemampuan yang dimilikinya dalam mengikuti mata pelajaran. Namun pada kenyataannya di lapangan secara umum masih ditemukan siswa yang belum sepenuhnya dapat mengembangkan potensi secara optimal sebagaimana yang diharapkan.

Prestasi belajarnya adalah penting, karena dengan mengetahui hasil-hasil yang sudah dicapai maka siswa akan lebih berusaha meningkatkan prestasi belajarnya. Rendahnya prestasi belajar keteknikan mengindikasikan ada sesuatu yang kurang tepat dan belum optimalnya pembelajaran di sekolah. Faktor penyebab rendahnya prestasi belajar keteknikan diantaranya kompetensi guru dirasa masih rendah. Pergantian menteri pendidikan dan pergantian kurikulum belum mampu menjawab permasalahan rendahnya kualitas pendidikan di Indonesia, khususnya yang terkait dengan profesionalitas guru.

Rendahnya prestasi belajar dapat disebabkan oleh berbagai macam faktor. Faktor tersebut dapat berasal dari faktor internal dan faktor yang berasal dari faktor eksternal. Faktor-faktor penyebab rendahnya prestasi belajar digolongkan dua golongan yaitu faktor internal yang bersumber pada diri siswa dan faktor eksternal yang bersumber dari luar diri siswa (Slameto,2010:54). Faktor internal dipengaruhi oleh jasmaniah kesehatan dan cacat tubuh, serta psikologi yang berupa inteligensi, perhatian, minat, bakat, motif, kematangan dan kesiapan. Sedangkan faktor eksternal dipengaruhi oleh faktor keluarga, faktor sekolah, dan faktor masyarakat.

Rancangan Penelitian

Penelitian ini menggunakan metode survey, rancangan penelitian yang digunakan adalah penelitian korelasional yang mempunyai arti penelitian hubungan, dengan menggunakan teknik analisis regresi. Penelitian sebagai representasi pemacahan masalah yang telah ditetapkan sebagai objek kajian dengan menggunakan pola pikir ilmiah.

Populasi dan Sampel

Populasi dalam penelitian ini yaitu seluruh siswa SMK Negeri 2 Manado, yang berjumlah 120 siswa. Untuk sampel adalah 93 siswa.

Instrumen Penelitian

Penelitian ini mengukur tiga variabel yang terdiri dari dua variable exogenous sebagai variabel bebas (penyebab), yaitu kompetensi guru (X1), lingkungan sekolah (X2), sedangkan variabel endogenous sebagai variabel terikat (disebabkan) yaitu variabel prestasi belajar siswa (Y). Instrumen penelitian untuk variabel beban menggunakan kuesioner Skala Likert terdiri empat opsi (5, 4, 3, 2, 1). Kuesioner dikembangkan oleh peneliti sendiri berdasarkan teori-teori yang digunakan. Kuesioner disebarkan kepada siswa yang menjadi responden dalam penelitian ini. Kemudian instrument tersebut dilakukan pengujian Validitas (ketepatan) dan Reliabilitas (data yang konsisten).

Teknik Analisis Data

Data yang diperoleh akan dianalisis dengan menggunakan analisis deskriptif dan analisis inferensial. Analisis deskriptif digunakan dalam hal penyajian data, ukuran sentral dan ukuran penyebaran. Analisis inferensial digunakan untuk menguji hipotesis dengan memakai metode statistik analisis regresi yang didahului dengan uji normalitas, dan uji signifikansi koefisien regresi dan linearitas data dengan bantuan program SPSS versi 24. Selanjutnya dihitung besar pengaruh antara variabel bebas dan variabel terikat.

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Besar pengaruh tercermin dari besarnya koefisien regresi (menggunakan analisis uji signifikansi "F"). Dalam rangka untuk memenuhi persyaratan instrumen penelitian, maka terlebih dahulu instrumen untuk memeriksa apakah instrumen tersebut sudah sesuai dengan indikator-indikator pada setiap variabel dengan aspek yang akan diukur. Kemudian instrumen diujicobakan pada 30 responden yang bukan menjadi anggota sampel.

Pembahasan Hasil Penelitian

1. Hubungan kompetensi guru dan prestasi belajar siswa SMK Negeri 2 Manado Berdasarkan hasil pengujian hipotesis, menunjukkan bahwa terdapat hubungan yang signifikan antara kompetensi guru dan prestasi belajar siswa SMK N 2 Manado. Hal ini berarti kompetensi guru memberikan konstribusi sebesar 38.20% pada kepuasan belajar siswa SMK N 2 Manado. Dari beberapa penelitian menyatakan bahwa kompetensi guru sangat penting untuk meraih keberhasilan dalam kegiatan pembelajaran. Keberhasilan belajar siswa adanya kompetensi guru yang menunjang dalam pembelajaran sehingga akan mempengaruhi prestasi belajar siswa. Semakin baik kompetensi guru, maka akan menambah prestasi belajar siswa dalam melaksanakan kegiatan belajar mengajar, sebaliknya bila kompetensi guru hanya apa adanya, hanya sebatas memenuhi syarat asal ada, tentunya akan mempengaruhi prestasi belajar siswa. Dalam penelitian Hapsari, dkk. 2017, menjelaskan bahwa salah satu tujuan proses belajar mengajar adalah adanya peningkatan pemahaman siswa yang pada akhirnya akan terefleksi pada prestasi mereka. Salah satu faktor penting untuk meningkatkan prestasi siswa adalah kompetensi pengajar. Pengajar yang kurang memiliki kompetensi di bidangnya dapat mengganggu pencapaian sasaran tersebut. Kompetensi guru ternyata berpengaruh positif dan signifikan terhadap prestasi siswa dengan nilai R^2 sebesar 0.129 dengan Sig. 0.000. Hal ini memperlihatkan bahwa organisasi pendidikan menengah perlu senantiasa melakukan pengembangan kompetensi tenaga pengajarnya. Dengan kompetensi yang selalu diperbaharui dan disesuaikan dengan perkembangan kebutuhan pendidikan terkini, para pengajar memiliki bekal lebih baik untuk membantu anak didiknya dalam mencapai prestasi yang membanggakan. Selanjutnya dalam penelitian Sutardi. 2016, mengemukakan bahwa kompetensi guru berpengaruh positif dan signifikan terhadap hasil belajar siswa. Dengan demikian, dapat disimpulkan bahwa guru memberikan kontribusi terhadap hasil belajar siswa. Oleh karena itu, guru selaku penyelenggara pendidikan harus senantiasa mengembangkan diri secara mandiri serta tidak bergantung pada inisiatif kepala sekolah dan supervisor, sehingga mampu melahirkan anak didik yang memiliki kecakapan hidup baik secara general maupun specific (general life skills dan specific life skills.

Hubungan lingkungan sekolah dan prestasi belajar siswa SMK Negeri 2 Manado Berdasarkan hasil pengujian hipotesis, menunjukkan bahwa terdapat hubungan yang signifikan antara lingkungan sekolah dan prestasi belajar siswa SMK N 2 Manado. Hal ini berarti lingkungan sekolah memberikan konstribusi sebesar 32.95%. pada kepuasan belajar siswa SMK N 2 Manado. Dari pernyatan Sukmadinata (2009:164) bahwa lingkungan sekolah memegang peranan penting bagi perkembangan belajar para siswanya. Menurut Dalyono (2010:131) lingkungan sekolah merupakan salah satu faktor yang turut mempengaruhi pertumbuhan dan perkembangan anak terutama untuk kecerdasannya. Lingkungan sekolah sangat berperan dalam meningkatkan pola pikir anak, karena kelengkapan sarana dan prasarana dalam belajar serta kondisi lingkungan yang baik sangat penting guna mendukung terciptanya lingkungan belajar yang menyenangkan. Lingkungan sekolah yaitu keadaan sekolah tempat belajar yang turut mempengaruhi tingkat keberhasilan belajar. Keadaan gedung sekolahnya dan letaknya, serta alat-alat belajar yang juga ikut menentukan keberhasilan belajar siswa (Syah, 2010:152). Lingkungan sekolah adalah sebagai tempat mengajar dan belajar (Hamalik, 2009:6). Sebagai suatu lembaga yang menyelenggarakan pengajaran dan kesempatan belajar harus memenuhi bermacam-macam persyaratan antara lain: murid, guru, program pendidikan, asrama, sarana dan fasilitas.

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Segala sesuatu telah diatur dan disusun menurut pola dan sistematika tertentu sehingga memungkinkan kegiatan belajar dan mengajar berlangsung dan terarah pada pembentukan dan pengembangan siswa Lingkungan Sekolah merupakan lingkungan yang meliputi semua hal yang berpengaruh dan bermakna bagi siswa dalam proses belajar mengajar yang ada disekolah, baik itu dalam lingkungan sosial (lingkungan fisik) maupun lingkungan nonsosial (lingkungan akademik). Keadaan sekolah tempat belajar turut mempengaruhi tingkat keberhasilan belajar. Kualitas guru, metode mengajarnya, kesesuaian kurikulum dengan kemampuan anak, keadaan fasilitas atau perlengkapan di sekolah, keadaan ruangan, jumlah murid per kelas, pelaksanaan tata tertib sekolah, dan sebagainya, semua ini turut mempengaruhi keberhasilan anak. Bila suatu sekolah kurang memperhatikan tata tertib (disiplin), maka murid-muridnya kurang mematuhi perintah para guru dan akibatnya mereka tidak mau belajar sungguh-sungguh di sekolah maupun di rumah.Hal ini mengakibatkan prestasi belajar anak menjadi rendah (Sri dan Djazari, 2012). Teori tersebut semakin memperkuat penelitian ini yaitu lingkungan sekolah tardapat hubungan yang signifikan dan prestasi belajar siswa SMK Negeri 2 Manado.

Hubungan kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar siswa SMK Negeri 2 Manado Hasil pengujian hipotesis menunjukkan bahwa terdapat hubungan yang signifikan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan kepuasan belajar siswa SMK N 2 Manado. Besar pengaruhnya kompetensi guru, dan lingkungan sekolah secara simultan memberikan konstribusi sebesar 47.10%, untuk prestasi belajar siswa SMK Negeri 2 Manado. Kompetensi, dan lingkungan sekolah merupakan salah satu faktor pendukung prestasi belajar siswa SMK N 2 Manado. Dengan hasil yang didapatkan diimplikasikan bahwa semakin tinggi kompetensi guru, dan lingkungan sekolah, maka semakin tinggi pula prestasi belajar siswa SMK N 2 Manado. Fakta tersebut membuktikan bahwa kompetensi guru, dan lingkungan sekolah secara simultan memberikan hubungan yang cukup besar dengan prestasi belajar siswa SMK N 2 Manado. Akan tetapi kompetensi guru, dan lingkungan sekolah bukan satu-satunya faktor yang mempengaruhi prestasi belajar siswa SMK N 2 Manado, karena masih terdapat faktor-faktor yang lain. Dari pernyataan Syah (2010:141) bahwa: prestasi belajar merupakan hasil interaksi dari sebagian faktor yang mempengaruhi proses belajar secara keseluruhan. Prestasi belajar adalah hasil usaha dari siswa yang berupa interaksi dalam kegiatan belajar yang menghasilkan kemajuan siswa dalam segala hal yang dipelajari menyangkut pengetahuan atau kecakapan/ keterampilan.

Menurut Wittig dalam Syah (2010), belajar sebagai any relatively permanen change in an organism behavioral repertoire that accurs as a result of experience Hamalik (2007), menyatakan bahwa belajar adalah suatu proeses perubahan tingkah laku individu melalui interaksi dengan lingkungan.. Semakin tinggi kompetensi guru dan lingkungan sekolah maka semakin baik pula pebelajar dalam pembelajaran sehingga akan cenderung semakin tingginya prestasi belajar yang diperoleh pebelajar, dan sebaliknya jika kompetensi guru dan lingkungan sekolah pebelajar rendah maka akan cenderung semakin rendahnya prestasi belajar yang diperoleh pebelajar dalam pembelajaran. Dengan demikian, kompetensi guru dan lingkungan sekolah akan mempengaruhi prestasi belajar siswa. Mengacu penjelasan di atas, dapat disimpulkan bahwa adanya kompetensi guru dan lingkungan sekolah yang tinggi akan menumbuhkan prestasi belajar siswa yang baik maupun tinggi.

Simpulan Dan Saran

Simpulan
Berdasarkan hasil analisis data dan pengujian hipotesis dalam penelitian ini, dapat disimpulkan sebagai berikut:
Terdapat hubungan yang signifikan antara kompetensi guru dan prestasi belajar siswa SMK N 2 Manado. Kontribusi variabel kompetensi guru dan prestasi belajar sebesar 38.20%.

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Terdapat hubungan yang signifikan antara lingkungan sekolah dan prestasi belajar siswa SMK N 2 Manado. Kontribusi variabel lingkungan sekolah dan prestasi belajar sebesar 32.95%.

Terdapat hubungan yang signifikan antara kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar siswa SMK N 2 Manado. Kontribusi variabel kompetensi guru, dan lingkungan sekolah secara simultan dengan prestasi belajar siswa SMK N 2 Manado sebesar 47.10%.

Saran

Berdasarkan kesimpulan penelitian, dikemukakan beberapa saran sebagai berikut:

Kemampuan kompetensi guru perlu dipertahankan serta ditingkatkan dalam pelaksanaan pembelajaran untuk meningkatkan prestasi belajar siswa, dan harus sesuai dengan ketentuan yang berlaku serta mempertimbangkan standar mutu pendidikan dalam menghadapi era globalisasi.

Perlu dipertahankan serta ditingkatkan lingkungan sekolah dalam pembelajaran para siswa untuk meningkatkan prestasi belajar siswa SMK N 2 Manado.

Lembaga maupun manajemen sekolah perlu memperhatikan langkah-langkah kebijakan yang berkaitan dengan kompetensi guru maupun lingkungan sekolah yang secara nyata mempunyai peranan yang cukup besar terhadap peningkatan prestasi belajar siswa.

Perlu dilakukan penelitian lanjutan dengan menggunakan variabel-variabel lain agar dapat terinventaris berbagai variabel yang dapat mempengaruhi atau mempunyai hubungan dengan prestsi belajar siswa.

Daftar Pustaka

Dalyono. 2010. Psikologi Pendidikan. Jakarta: Rineka Cipta

Departemen Pendidikan Nasional. 2008. Kamus Besar Bahasa Indonesia. Balai Pustaka: Jakarta.

Djamarah, S. B. 2011. Psikologi Belajar. Jakarta : PT. Rineka Cipta

Hapsari, Diasty Widar., Arif Partono Prasetio, M.M, CPHR. 2017. Pengaruh Kompetensi Guru Terhadap Prestasi Belajar Siswa Smk Negeri 2 Bawang. e-Proceeding of Management. (4), (1), 269-274

Hadis, A. 2008. Psikologi dalam Pendidikan. Bandung : Alfabeta

Miarso Yusufhadi, 1994, Posisi dan Fungsi Profesi Teknologi Pendidikan

Mulyasa, E. 2009. Kurikulum Berbasis Kompetensi Konsep, Karakteristik, dan Implementasi. Bandung: PT Remaja Rosdakarya.

Peraturan Menteri Pendidikan Nasional Republik Indonesia No.16 Tahun 2007 Tentang Standar Kualifikasi Akademik dan Kompetensi Guru

Riduwan. 2011. Dasar-dasar Statistika. Bandung: Alfabeta

Slameto. 2010. Belajar dan Faktor-Faktor yang Mempengaruhinya. Rineka Cipta: Jakarta.

Sutardi, Sugiharsono. 2106. Pengaruh Kompetensi Guru, Motivasi Belajar, Dan Lingkungan Keluarga Terhadap Hasil Belajar Mata Pelajaran Ekonomi. Harmoni Sosial: Jurnal Pendidikan IPS. (3), (2), 188-198.

Sugiyono. 2010. Metode Penelitian Pendidikan. Bandung : CV. Alfabeta

Sukmadinata, Nana Syaodih. 2009. Landasan Psikologi Proses Pendidikan. Bandung: PT Remaja Rosdakarya Offset.

Suwarno, W. 2008. Dasar-Dasar Ilmu Pendidikan. Yogyakarta : Ar-Ruzz Media

Syah, Muhibbin. 2010. Psikologi Pendidikan. Bandung : PT Remaja Rosdakarya Offset

Syah, Muhibbin. 2007. Psikologi belajar. Jakarta: rajawali pers, Hal: 185

Tu'u, Tulus. 2004. Peran Disiplin Pada Perilaku dan Prestasi Siswa. Jakarta: Gramedia Widiasarana Indonesia.

Undang-Undang Nomor 14 Tahun 2015 tentang Guru dan Guru, Pasal 7 dan   Pasal 8.

Wahyuningsih, Sri & M. Djazari 2012. Pengaruh Lingkungan Sekolah Dan Kebiasaan Belajar Terhadap Prestasi Belajar Akuntansi Siswa Kelas XI IPS SMA Negeri 1 Srandakan. Kajian Pendidikan Akuntansi Indonesia. Hal. 37- 160.

Yusuf, S. 2008. Psikologi Perkembangan Anak dan Remaja. Bandung: PT Remaja Rosdakarya

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Improving Students' Cognitive Ability In Civil Building Drawing Courses Using Jobsheet Media

Agus Wiyono

Drawing building construction still poses difficulties for vocational students of the Building Engineering Department. Therefore we need innovative and creative learning media that can be easily understood by students. In other words, the media must be able to increase the construction literacy of student, so that students can easily understand the information and instructions delivered by the learning media. This study aims to illustrate the use of jobsheet learning media in Building Construction Drawing subjects in improving the literacy construction of vocational students of the Building Engineering Department. Through a qualitatively literature review approach, this study concludes that the use of jobsheet media can improve the construction literacy ability of students of Department of Building Engineering. This construction literacy ability will subsequently have an impact on students' ability to complete the tasks delivered in the Building Construction Drawing subject. Jobsheets that can improve competence koqnitive are jobsheets that meet the validity aspects of the jobsheet, namely material, language, appearance, use, consistency, format, graphics, benefits, feasibility. In addition, the jobsheet must also be practical, which is indicated by the fulfillment of aspects including clarity of content, clarity of material coverage, clarity of information, effective and efficient use of language (clear and concise), meaningfulness, appearance, presence of reader appeal, use of fonts writing, lay out jobsheet, clarity of the layout of the structure characteristics of the jobsheet.

Keywords : competence koqnitive, drawing civil building, jobsheet, learning media.

INTRODUKTION

The literacy movement is a movement in the field of reading and writing. Cognitive ability can be interpreted as literacy that intersects with the construction field. Meanwhile, the construction literacy movement is "efforts to increase construction knowledge through both technical and non-technical reading and writing activities" (Andong, 2020). Thus, cognitive abilities can be interpreted as the ability to understand construction knowledge possessed by individuals through reading and writing activities. In everyday life construction literacy is still very rarely discussed. Even a Google search is very rare. In fact, cognitive ability is a factor that can be considered crucial, because the construction field has a scope of language and terms with certain specificities. As conveyed by Gunawan (2005) who presents science about buildings in four aspects, namely the administrative aspect of the building, the architectural aspect of the building, the construction aspect of the building, and the technical aspect of the building. The field of construction which is often presented in the form of drawings has terms and principles that must be understood by academics and practitioners in the construction field. Therefore, understanding of each term in construction must be thoroughly understood, so that the translation of concepts into drawings and translation of drawings into technical forms of buildings can be carried out accurately. Understanding of the terms in this construction needs to be instilled starting from the scope of education. Students who major in building engineering must be able to describe concepts in the form of pictures and explain pictures accurately. The problem that is often found in the field is the difficulty in drawing activities for students at the Building Drawing Engineering Vocational School (Kamiruriansah & Winanti, 2017). This difficulty is mainly due to the use of learning media that still does not support the development of students' drawing skills, which are less innovative and creative (Putri & Rifwan, 2019; Kamiruriansah & Winanti, 2017; Efendi, 2018). Some of the learning media that can be used by teachers in delivering lessons include job sheets, photos, graphics, and learning using computers (Andreas & Gusmareta, 2018; Putri & Rifwan, 2019). The

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learning media observed in this study is thelearning media jobsheet, because the use of thelearning media jobsheet has been widely used by teachers in the Engineering Department Vocational School. Where several studies have shown that the use of innovative and creative jobsheet media can increase the achievement of vocational students' drawing competence (Nuryanto, Rahayu, & Setiadi, 2020), both for building construction subjects (Efendi, 2018; Kamiruriansah & Winanti, 2017) and building engineering drawings (Putri & Rifwan, 2019). Jobsheet is a learning media in printed form that contains a series of guides and pictures on how to do the work that must be done by students (Slamet, 2005; Trianto, 2009), so that students can use them to carry out investigations or problem solving activities (Trianto, 2009). . Thus, when the jobsheet is used as a learning medium in construction drawing engineering subjects, the jobsheet will describe the types of drawings, the shape of the images, the steps that must be taken in compiling the drawings. Where in the guide there will be many terms that must be understood by students to support the development of drawing technique skills and students' cognitive abilities at the same time. Furthermore, the focus of this research is on the jobsheet learning media, aspects that must be considered in the preparation of the jobsheet, the impact of using the jobsheet on construction literacy skills and students' building construction drawing skills.

RESEARCH METHOD

This research framework uses the following analytical model adapted from Fink (2010):
Determining Research Questions
Collecting Literature (Library) from Various Sources
Conducting Review in Resources Has Collected Quality Monitoring:
a. Ensuring Sufficiency, Reliability and Accuracy of References
Synthesize Results:
Report existing information; to justify the need for research;
explain research findings;
explain the quality of research
Results: Descriptive review in the form of synthesis

HASIL

Figure 1. Research Framework (adapted from Fink, 2010).
This study uses a literature review approach, which is a systematic, explicit, and reproducible research approach with the aim of identifying, evaluating, and synthesizing studies that have been conducted and recorded by existing researchers, academics, and practitioners (Fink, 2010). Thus, the data collected is derived from secondary data, namely from the empirical and theoretical literature. Meanwhile, this research design is qualitatively oriented which is intended to convey the context and needs of the research submitted (Pan, 2017). Where the purpose of this research is to convey the importance of jobsheets as learning media in building construction drawing subjects in relation to improving cognitive abilities and building construction drawing skills in vocational students. Data analysis was carried out in a narrative manner which was presented in the form of text and graphics.

DISCUSSION

Cognitive Ability

Cognitive Ability Literacy is generally understood as the ability to read and write. Baran (Ahmadi & Ibda, 2018) states that literacy is the ability to understand written symbols efficiently and effectively, as well as comprehensively. The Education Development Center (Nur, 2019) states that literacy is more than just the ability to read and write, but literacy is the ability of individuals to use all their potential and expertise in life, with the understanding that literacy is the ability to read words and read the world. Barton (Ahmadi & Ibda, 2018) explains that literacy practice is a social event that includes reading and writing activities, where in building literacy as an event, it can be seen from how individuals live their daily lives. Unesco (Nur, 2019) explains that literacy skills can empower and improve the quality of individuals, families, communities. Literacy is formed in a different way from the life of each individual and every community group (Ahmadi & Ibda, 2018). Literacy abilities can be formed through habituation, because literacy skills do not appear instantly and are not formed just like that, so it requires a process that is conditioned to be experienced and carried out by students to start habits (Padmadewi & Artini, 2018). More specifically, cognitive ability is the ability to read and write construction knowledge (Andong, 2020). Thus, cognitive abilities can be interpreted as the ability to understand construction knowledge possessed by individuals through reading and writing activities. Referring to an empirical study conducted previously which stated that the use of activity sheet learning media or worksheets in learning methods, in fact, can improve students' literacy skills (Izzatunnisa, Andayani, & Hakim, 2019). In addition, other studies also mention that one of the factors that support the learning process that can provide meaning and students' literacy skills is to provide quality teaching materials (Nurhidayah, Irwandi, & Saridewi, 2015) which are delivered through effective, creative, and effective learning media. and innovative (Putri & Rifwan, 2019; Kamiruriansah & Winanti, 2017;Efendi, 2018).
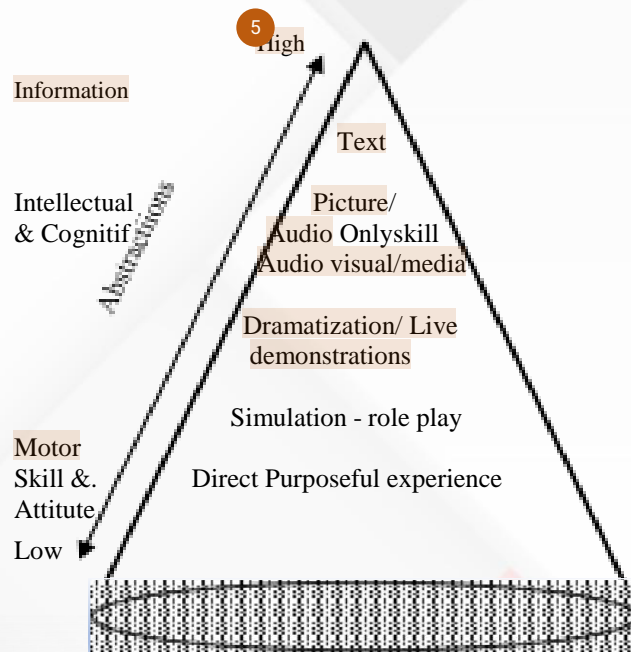
Learning Media Learning

Media is a communication tool during teaching and learning activities used by teachers and students (Sumiharsono & Hasanah, 2017), whose function is not only as a teacher's tool, but as a carrier of information or learning messages that are in accordance with student needs (Development Team Education Science FIP-UPI, 2007). Conceptually, learning media can be defined as a container of messages, where the

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material to be conveyed is a learning message with the aim of supporting the learning process. In this case, the use of creative learning media will increase the possibility for students to learn more, remember what is learned better, and improve performance in performing skills in accordance with the learning objectives (Riyana, 2012). Kemp & Dayton (Sumiharsono & Hasanah, 2017) state that learning media has at least three main functions, namely motivating interest or action, presenting information, and giving instructions. As a presenter of information, learning media provide information about learning materials to students, so that students are motivated to read and interested in learning the material. As an instruction, learning media involve students both mentally and mentally, as well as in the form of real activities, so that learning can occur. Therefore, the material must be designed systematically and psychologically by taking into account the principles of learning in order to provide effective instruction. This learning media must also be able to provide a pleasant experience and meet the individual needs of students.

Figure 1. Dales's Cone Experience (Riyana, 2012)
Learning media provides experience for students can encourage learning motivation, clarify and simplify the concept abstract, and enhance absorption or retention learning (Riyana, 2012). On progress Edgar Dale (Riyana, 2012) classifies media learning from the most concrete to the most abstract. Figure 2 explains that the media the learning used has a classification the most abstract is the learning media in text form, which has informative properties.

Furthermore, what is more concrete than the text and is informative is with the use of audio or picture only. Then continue with the media increasingly concrete, namely audio-visual, demonstration, simulation, and hands-on experience.
Use of Jobsheets as Media Drawing Subject Learning Building construction
Jobsheet learning media is a form of student worksheets in which you can contains text only, and can also be a combination between text and images. Thus, if referring to Dale's Cone Experience in Figure 2 in advance, then in the jobsheet , the main function are information and instructions. Jobsheet is a guide for complete practical activities that must be carried out by students according to the topic that have been determined (Prastowo, 2011).

The jobsheet has a function as a guide for training in the development of cognitive aspects as well as all aspects of learning in the form of an experimental or demonstration guide (Kamiruriansah & Winanti, 2017), because it contains theories and steps to complete the work.

That is, the jobsheet already contains work instructions and is supported by devices that support learning activities in order to achieve learning objectives. In the preparation of the jobsheet for students of the Building Engineering Vocational School, several things that need to be considered in the preparation of the jobsheet are linguistic material, appearance, use, consistency, format, graphics, and benefits (Putri & Rifwan, 2019). In an empirical study conducted by Cahyani (2019), it shows that a jobsheet is said to be valid when it meets the aspects of jobsheet eligibility, jobsheet language, jobsheet presentation, and jobsheet graphics. In addition, the jobsheet must also be practical, which is indicated by the fulfillment of aspects, including clarity of content, clarity of material coverage, clarity of information, effective and efficient use of language (clear and concise), meaningfulness, appearance, attractiveness of readers, use of fonts. writing, lay out the jobsheet, the clarity of the layout of the characteristic structure of the worksheet.

Use of Jobsheets in Improving Students' cognitive abilities.
As mentioned earlier, the function of using instructional media is to provide information, motivation, and instruction. In the jobsheet, the theories and stages or steps that must be taken by students are presented, along with the materials and tools used in carrying out the learning process.

Previous research stated that the use of job sheets in the subject of Building Construction Drawings for SMK students was able to increase the achievement of student learning outcomes (Efendi, 2018; Kamiruriansah & Winanti, 2017). This empirica

A jobsheet that is able to improve literacy constructionis a jobsheet that meets the aspects of the validity of the jobsheet , namely material, language, appearance, use, consistency, format, graphics, benefits, feasibility. In addition, the jobsheet must also be practical, which is indicated by the fulfillment of aspects, including clarity of content, clarity of material coverage, clarity of information, effective anduse of language efficient(clear and concise), meaningfulness, appearance, attractiveness of readers, use of fonts. writing, lay out the jobsheet , the clarity of the layout of the characteristic structure of the jobsheet.

Suggestions

Based on the conclusions that have been put forward, the suggestions for this research are:

In using the jobsheet , the teacher should pay attention to the elements of the feasibility (validity) of the jobsheet and also pay attention to theaspect of the practicality jobsheet . Thus, students will easily understand the instructions and information conveyed in the worksheet , which in turn will make it easier for students to carry out the instructions in the worksheet .

For the next researcher, they can conduct experiments related todesign jobsheet by

paying attention to the aspects of the validity and practicality of the jobsheet , then testing its impact on students' literacy skills and student learning outcomes.

REFERENCES

Ahmadi, F., & Ibda, H. 2018. Media Literasi Sekolah: Teori dan Praktik. Semarang: Pilar Nusantara.
Andong, Z. 2020. Kemampuan koqnitif .
Retrieved Mei 08, 2020, from Dunia Jasa Konstruksi Indonesia: https://duniajasakonstruksi.com/literasi-konstruksi/
Andreas, L. O., & Gusmareta, Y. 2018. Pengembangan Media Pembelajaran Mata Kuliah Mekanika Tanah dan Teknik Pondasi Berbasis Video Tutorial. Journal of Civil Engineering and Vocational Education, 5 (4), 1-6.
Cahyani, P. A. 2019. Pengembangan Jobsheet pada Mata Kuliah Kerja Pelat di Program Studi Pendidikan Teknik Mesin Universitas Sriwijaya. Jurnal Pendidikan Teknik Mesin, 6 (2), 143-150.
Efendi, R. 2018. Penerapan Model Pembelajaran Problem Based Instruction (PBI) Dengan Jobsheet Pada Mata Pelajaran Gambar Konstruksi Bangunan Kelas XI SMK Negeri 7 Surabaya. Jurnal Kajian Pendidikan Teknik Bangunan, 4 (1), 1-7.
Fink, A. 2010. Conducting Research Literature Reviews: From the Internet to Paper. Thousand Oaks, California: Sage Publications, Inc.
Gunawan, R. 2005. Pengantar Ilmu Bangunan. Yogyakarta: Kanisius. Izzatunnisa, I., Andayani, Y., & Hakim, A. 2019.
Pengembangan LKPD Berbasis Pembelajaran Penemuan untuk Meningkatkan Kemampuan Literasi Sains Peserta Didik pada Materi Kimia SMA. J. Pijar MIPA, 14 (2), 49-54. Kamiruriansah, & Winanti, E. T. 2017. Penerapan Media Pembelajaran Jobsheet pada Mata Pelajaran Gambar Konstruksi Bangunan pada Siswa Kelas XI TGB di SMKN 2 Surabaya. Jurnal Kajian Pendidikan Teknik Bangunan, 2 (2), 241-248.
Tim Pengembang Ilmu Pendidikan FIP-UPI. 2007. Ilmu dan Aplikasi Pendidikan: Bagian 2 (Ilmu Pendidikan Praktis). Jakarta: Imperial Bhakti Utama (IMTIMA).
Trianto. 2009. Mendesain Model Pembelajaran Inovatif Progresif. Jakarta: Kencana.
LNur, R. A. 2019. Apa Sih Literasi Itu?? In N.
H. Salahudin, M. Khairani, & Fatmawati, Teras Literasi (pp. 62-64). Aceh: Syiah Kuala University Press.
Nurhidayah, R., Irwandi, D., & Saridewi, N. 2015. Pengembangan Modul Berbasis Inkuiri Terbimbing pada Materi Larutan Elektrolit dan Non-elektrolit. Edusains, 7 (1), 36-47.

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Nuryanto, A., Rahayu, N. S., & Setiadi, B. R. 2020. The Development of Mechanical Drawing job-sheet for Vocational High School Instructional. Journal of Physics: Conference Series (1446), 1-5. Padmadewi, N., & Artini, L. P. 2018.

Literasi di Sekolah, dari Teori ke Praktik. Badung, Bali: Nilacakra.

Pan, M. L. 2017.Preparing Literature Reviews: Qualitative and Quantitativ Approaches. Routledge: New York.

Prastowo, A. 2011. Panduan Kreatif Membuat Bahan Ajar Inovatif. Yogyakarta: Diva Press.

Putri, I. A., & Rifwan, F. 2019. Rancangan Jobsheet Sebagai Media Pembelajaran Mata Pelajaran Gambar Teknik Siswa Kelas X DPIB di SMKN 1 Koto XI Tarusan. CIVED, Jurusan Teknik Sipil, 6 (3), 1-6.

Riyana, C. 2012. Media Pembelajaran.

Jakarta: Direktorat Jenderal Pendidikan Islam, Kementerian Agama RI.

Slamet, T. 2005. Teknik Pembuatan Jobsheet. Seminar dan Lokakarya Program Hibah Kompetensi A-1.

Makasar: 28-30 Juli 2005: Universitas Negeri Makasar.

Sumiharsono, M. R., & Hasanah, H. 2017. Media Pembelajaran: Buku Bacaan Wajib Dosen, Guru dan Calon Pendidik.   Jember: Pustaka Abadi.

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THE INFLUENCE OF KNOWLEDGE LEVEL ON INTEREST IN JOINING THE PROFESSIONAL ENGINEER PROGRAM OF STUDENTS OF THE BUILDING ENGINEERING EDUCATION STUDY PROGRAM UNIVERSITAS NEGERI SEMARANG

Eko Nugroho Julianto, Bambang Endroyo, Vurrinda Ayu Kartika

Abstract Indonesia has entered the ASEAN Economic Community in 2015 and now the global competence based on science and technology is very strict. One form of the Indonesian government's strategy to deal with it is to improve the quality of human resources and science and technology. It is therefore important to increase the number of engineers in Indonesia. In this regard, it is also important to increase student interest in engineering. Profiles of graduates of Building Engineering Education can become educators or technical personnel. Therefore, students of Building Engineering Education have the opportunity to continue their education in the Professional Engineer Program. This study aims to determine the effect of the level of knowledge about the engineer profession program on the interest in joining the engineer profession program in the 2017 students of the Building Engineering Education study program, State University of Semarang. This research is a quantitative research with the analysis used is regression. Data collection techniques using documentation, questionnaires and knowledge tests. Respondents in this study were 44 students of Building Engineering Education study program class 2017. The results of the research analysis show that there is a significant influence between the level of knowledge about the engineer's professional program on the interest in joining the Professional Engineer Program.

Keywords: student, interest, level of knowledge, Professional Engineer Program

INTRODUCTION

In facing the ASEAN Economic Community, the Building Engineering Education Study Program prepares human resources or graduates who have good capacity and competence so that they are not only able to compete with domestic graduates but are able to compete with graduates from ASEAN countries. In addition to educators, the profile of Building Engineering Education graduates can also become technical personnel, therefore, Building Engineering Education students have tasks that are not only related to abilities in the field of building engineering education skills, but also need to have civil engineering skills . In this regard, graduates of Building Engineering Education will have the opportunity to continue in professional education, namely PPG (Professional Teacher Education) and Professional Engineer Program (PPI) or continue at the Masters level.

The Engineer Profession Program (PPI) is a higher education program that aims to build engineering competencies. The Professional Engineer Program covers a wide range of fields, some of which are technical/technology education

and training; research, development, assessment, and commercialization; consultancy, design and construction; then the scope of other fields can be seen in the Law of the Republic of Indonesia Number 11 of 2014 concerning Engineering [1]. From the explanation above, it is known that the Professional Engineer Program (PPI) is not limited to practitioners in the field but also applies to the field of technology education/training. A person may be interested in participating in an activity if he already knows about the object. Interest itself is the result of learning and supports further learning. Student learning outcomes are known as academic achievement or known as the cumulative achievement index (GPA). So that academic achievement may be able to affect a person's interest. A person may be interested in joining the professional engineering program if the person has experience in the field of civil engineering, knowledge of the professional engineering program itself and good academic achievement.

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As an effort to provide direct experience in the field, the Building Engineering Education requires students to carry out industrial practices. After carrying out industrial practice, students are expected to gain experience in the field of civil engineering expertise, including as planners, implementers and supervisors.

Then the reason the researcher is researching this is because so far in the Building Engineering Education study program there has been no research related to the Professional Engineer Program. Thesis or journals that examine interest in joining the professional engineer program (PPI) have also not been found by researchers.

In connection with the need to increase the number of engineers in Indonesia, it is also important to increase student interest in engineering. Therefore, researchers are interested in examining student interest in joining the Engineer Professional Program (PPI). The Engineer Professional Program (PPI) is a higher education program that aims to build engineering competencies. Many things affect interest. According to Chaplin [2], interest is a feeling that states that an activity, job or object is valuable or meaningful to the individual. A person who performs an activity clearly gains experience. Chaplin [2] also states that experience is "knowledge or skills obtained from events that have been experienced as a result of practice or from learning efforts.

Experience is related to skills, skills can be honed and developed through practice. Industrial practice may influence students' interest in participating in the PPI because it provides hands-on experience related to the field of civil engineering. Then a person may not be interested in joining the PPI if he does not have knowledge of the Engineer Professional Program. Interest itself is the result of learning and supports further learning. Learning outcomes or academic achievement or known as the cumulative achievement index (GPA). So that academic achievement may also affect student interest in joining the Engineer Professional Program.

The identification of the problems in this study are as follows: (1) Not yet known experience of industrial practice of building engineering education students (2) There is still a lack of knowledge of students about professional engineering programs (3) Academic achievement of each student is different (4) It is not known whether the experience, knowledge and academic achievement can affect students' interest in joining the engineering profession program.

Based on the background of the problem described above, it can be formulated the problem of this research, is there any influence of the level of knowledge about the professional engineer program on the interest in joining the engineering profession program in the 2017 students of the Building Engineering Education study program, Universitas Negeri Semarang?

The expected purpose of this research is to determine the effect of the level of knowledge about the professional engineer program on the interest in joining the professional engineer program in the 2017 class of students of the Building Engineering Education study program, Universitas Negeri Semarang,

Research methodology

Location, Time and Object of Research
The location of this research is the Department of Civil Engineering, Universitas Negeri Semarang and the time of the research is June 1 to August 31, 2021. While the object of research is the active students of the 2017 Class Building Engineering Education.

Population and Research Sample

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The population in this study were all active students of the 2017 Class of Building Engineering Education, Semarang State University. The population of this study amounted to 53 students consisting of two groups, namely class one and class two. The details of the population of this study are as follows:

Table 1.
Number of Active Students

No	PTB Class of 2017	Number of Students
1	study group 1	27 students
2	study group 2	26 students
Total		53 students

The data collection technique of this research is purposive sampling. Purposive sampling is a sampling technique with certain considerations [3]. The reason for using purposive sampling technique is because researchers only need samples that meet the criteria, namely students of the 2017 Building Engineering Education study program who have completed industrial practice. The number of samples will be known after the research questionnaires are distributed and the results are accepted by the researchers.

Data collection technique
The documentation method used is documentation, questionnaires and tests. Documentation was used to obtain initial data in the form of the number of students of Building Engineering Education Class of 2017 Semarang State University. The questionnaire was used to obtain data on students' industrial practice experience, academic achievement and interest in joining the Engineer Professional Program for 2017 UNNES Building Engineering Education students. The test is used to determine the level of knowledge about the Engineer Professional Program in the research sample.

Variables and Measurements
The dependent variable of this research is the interest in joining the professional engineer program (Y). The independent variable in this study is the level of knowledge about the professional engineer program (X). In this study, the variables were measured using questionnaires and tests. The test is used to measure the level of knowledge about the Engineer Professional Program (X) in multiple choice form. How to find the final score in a multiple choice test using the no-fine method (counting only the correct ones). The assessment is for questions that are not done and incorrectly scored 0 (zero) while for correct answers are scored 1 (one). Meanwhile, to measure the interest in joining the professional engineer program (Y) using the Linkert Scale.

Results and Discussion
Walgito [4] states that "Interest is a condition where a person has attention and learns and further proves the object". Crow and Crow [5] say that interest is related to the style of movement that encourages a person to face or deal with people, objects, activities, experiences stimulated by the activity itself.Slameto [6] states that "interest is a sense of preference and a sense of attachment to a thing or activity, without anyone telling". Based on some of the opinions above, it can be concluded that interest is a sense of preference and attention so that someone has an attachment or relationship with certain objects or certain activities without anyone telling. Then interest can develop and be acquired through individual experience. Interest will arise when someone has knowledge of a particular object or activity.

Interests have an important role in life and have a major impact on a person's behavior and attitudes. Learning experiences also affect a person's interest. For example, interest in education, for students, interest in continuing higher education depends on the job or profession they want.

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The amount of youth's interest in education is strongly influenced by their interest in work. If teenagers expect jobs that require higher education, education will be considered a stepping stone [7].

Furthermore, the professional program is a special skill education intended for graduates of a bachelor's or equivalent program to develop talents and abilities to acquire the necessary skills [8]. The professional program aims to prepare professionals in their fields. In the Law of the Republic of Indonesia Number 11 of 2014 concerning Engineering [1] it is stated that "The professional engineer program is a higher education program after the undergraduate program to form engineering competence". Based on all the descriptions above, the researcher concludes that interest in joining the Professional Engineer Program (PPI) is a sense of preference and attention so that someone is interested in learning what the Professional Engineer Program (PPI) is without anyone asking, through various efforts based on the knowledge and experience that has been obtained. In this way, a relationship is created between a person and anything related to the professional engineer program (PPI). The stronger or closer the relationship, the greater the interest [5].

According to Bloom [9], "knowledge is the result of human sensing, or the result of someone knowing about objects through the senses they have (eyes, nose, ears, and so on)". Wotloly [10] divides knowledge into two regulators in terms of static and dynamic. Static knowledge of knowledge is the result of tofu work, the results can be in the form of theories or scientific documents. The characteristic of static knowledge according to the conventional view is dogmatic knowledge where knowledge is seen as inheritance/gift and how to obtain it through teachers (teachers, lecturers, and scientists). In the Law of the Republic of Indonesia Number 11 of 2014 concerning Engineering [1] it is explained that "The professional engineer program is a higher education program after the undergraduate program to form Engineering competence". While the level is high and low dignity, rank, degree, level, class [11]. So the understanding of the level of knowledge about the engineer's professional program is the high and low result of knowing someone through their senses of anything related to the engineer's professional program.

Variable data on the level of knowledge about the professional engineer program was obtained through a multiple choice test consisting of 20 items. Then based on the data obtained, it can be seen the frequency and trend of the variable data on the level of knowledge about the professional engineer program which is described in the form of a diagram as follows:
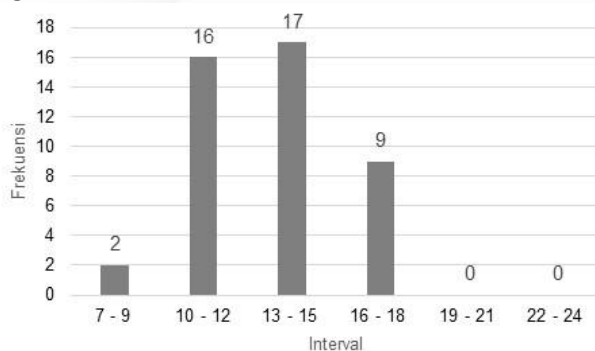
Fig. 1. Frequency Distribution of Knowledge Levels About Professional Engineer Program

Fig. 2. Knowledge Level of Professional Engineer Program

Based on descriptive research data, the variable level of knowledge about the engineer profession program has a percentage of 70% which is included in the high category. From the results of the tendency for a high level of knowledge about the professional engineer program, it can be seen that
students have understood the engineer professional program because they can relate information about the engineer professional program that they obtained during this research and those obtained before this research. In addition, it can be seen that there are no students who have a low level of knowledge about the professional engineer program because in the descriptive results of the low category data there are 0 students.

Hopkins [12] states that measuring a person's interest is useful for predicting a person's level of interest, for example student interest in a field of study or study program or higher education. Hurlock [13] states that there are seven techniques that can be used to identify children's interests, namely (1) through observing their activities, (2) through the types or types of questions that are always raised or asked, (3) through daily conversation topics, (4) through the reading that he chooses if he is given the freedom to choose, (5) through the spontaneous images that are made, (6) through his hopes or desires, (7) through direct statements about his interests.

Variable data on the interest of the engineer profession program was obtained through a questionnaire consisting of 20 question items. Then based on the data obtained, it can be seen the frequency and trend of the interest variable data to join the professional engineer program which is described in the form of a diagram as follows:
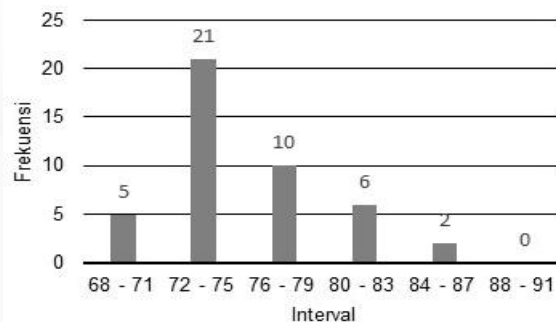
Fig. 3. Frequency Distribution of Interest in Joining the Professional Engineer Program

The amount of someone's interest can be known which is classified into several categories. In his book Syahputra [14] explains that a person's interest criteria are classified into three categories, namely low, medium and high. As in this study, the magnitude of interest is also classified according to these criteria as shown in the image below.

Fig. 4. Interest in Joining the Professional Engineer Program

This condition shows the tendency of students' interest in joining the engineering professional program to be included in the high category with a percentage of 61% or as many as 27 students. Then as many as 17 students tend to be interested in joining the professional engineer program including in the medium category or 39%.

Multiple linear regression analysis was carried out to predict the ups and downs of interest in joining the engineering professional program if the experience of industrial practice, the level of knowledge about the engineering professional program and academic achievement increased and decreased (manipulated). Based on the results of the analysis, it can be seen that the multiple linear regression equation for this study is as follows:

$Y = 73.229 + 0.152 X$

From the equation above, it shows that the interest in joining the engineer profession program will be high, if the knowledge about the engineer profession program is also high.

Then from the results of the research analysis obtained a significance value of 0.528, t count of 0.637 and a regression coefficient of 0.152. Based on the conclusion of the t-test results, it is known that the level of knowledge about the professional engineer program has a significant effect on the interest in joining the engineer profession program in students of the 2017 UNNES Building Engineering Education study program. These results are in line with the theory of interest. In the study of theory, interest may arise if someone has knowledge of a particular object or activity, in this case, is an interest in joining the Engineer Professional Program (PPI). If there are students who do not have an interest in something,

Based on descriptive research data, the level of knowledge about the engineer's professional program is divided into 3 categories, namely low, medium and high. The high category is in the total score range of 12-17 with a frequency of 31 students or 70%, the medium category is in the total score range of 6-11 with a frequency of 13 students or 30%, the low category is in the total score range 0-5 with a frequency of 0 students or 0 % (can be seen in Figure 1). The tendency of the variable level of knowledge about the engineer's professional program is included in the high category with a percentage of 70%, which is obtained from the frequency of students who get a total score above 11, namely 31 students divided by the total respondents in this study, namely 44 students.

From the results of the tendency for a high level of knowledge about the professional engineer program, it can be seen that students have understood the engineer professional program because they can relate the information about the Engineer Professional Program that they obtained at the time of this research and those obtained before this research. In addition, it can be seen that there are no students who have a low level of knowledge about the professional engineer program because in the descriptive results of the low category data there are 0 students.

In this study, it shows that a high level of knowledge has little effect, so the provision of knowledge or information about the professional engineer program (PPI) indirectly affects students' perceptions of the engineering profession program for students of the 2017 UNNES Building Engineering Education study program.

This might happen because students already know and understand the requirements to join the professional engineer program which in quotes may be a little burdensome so that it might diminish student interest. The conditions that were taken into consideration by the respondents when they were given material about the PPI were the requirements for the past learning recognition program (RPL) which required work experience. Maybe that's what makes the respondents' interest in joining the engineer profession program low. Although lately there are policies that may make it easier so that the rules are not directly in accordance with the law. However, this research refers to the conditions or things that are already standard based on published references.

Conclusions and suggestions

Based on the data obtained as well as the results of research and discussion, the conclusion of this study is that there is a significant influence between the level of knowledge about the the professional engineer program on the interest in joining the professional engineer program (PPI) in the 2017 students of the Building Engineering Education study program, Universitas Negeri Semarang. This means that the level of knowledge about the professional engineer program supports interest in joining the professional engineer program, because the higher the level of knowledge about the professional engineer program, the more it will increase the influence on interest in participating in the professional engineering program for students of 2017 Building Engineering Education Universitas Negeri Semarang.

Based on the results of existing research, the suggestions that can be bonded by researchers are as follows:

For Building Engineering Education Study Program Provide information about professional engineering programs, for example through student associations, wall magazines or other media so that information about PPI is more widespread. Considering whether or not a professional engineer study program at FT UNNES is necessary.For Students Continue to improve the quality of its industrial practice experience. Seek more information about PPI through various sources. Study well to get good academic achievement so that they can compete with other engineering graduates. For Further Researchers Considering other variables that were not examined in this study.
Consider the variation of the sample used.

References
Laws of the republic Indonesia. 2014. Law of the Republic of Indonesia Number 11 of 2014, concerning Engineering.
Chaplin, J. P. 2008. Kamus Lengkap Psikologi. Jakarta: Raja Grafindo Persada. Penerjemah: Dr. Kartini Kartono.
Sugiyono. 2016. Statistika Untuk Penelitian. Bandung: Alfabeta.
Walgito, B. 1994. Pengantar Psikologi Umum. Yogyakarta: Andi Offset.
Djaali. 2007. Psikologi Pendidikan. Jakarta: Bumi Aksara
Slameto. 1991. Belajar dan Faktor-faktor Yang Mempengaruhi. Jakarta: Rineka Cipta.
Hurlock, E. B. 1999. Psikologi Perkembangan: Suatu Pendekatan Sepanjang Rentang Kehidupan. Jakarta: Erlangga.
Laws of the republic Indonesia. 2012. Law of the Republic of Indonesia Number 12, Year 2012, concerning Higher Education.

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Notoatmodjo, S. 2005. Promosi Kesehatan Teori Dan Aplikasinya. Jakarta: Rineka Cipta.

Jurdi, F. 2019. Hukum Tata Negara Indonesia. Jakarta: Kencana.

Kamus Besar Bahasa Indonesia Daring. Retrieved from https://kbbi.kemdikbud.go.id.

Hopkins, K. D and Stanley, J. C. 1981. Educational and Psychological Measurement and Evaluation, Englewood Cliffs. New Jersey: Prentice-Hill Inc.

Suseno, M. 2020. Mengukur Minat Profesi Guru: Instrumen dan Teknik Validasi. Jakarta Timur: UNJ PRESS.

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and Vocational Competence
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Effect Proteus as Learning Media to Students' Learning Outcome in Digital Electronic Subject

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Abstract

Learning is a consciously planned change through a program designed to produce behavioral change. Likewise, to learn to understand Digital Electronics, good planning is needed so that students' ability to solve problems in the form of projects can be improved through the help of Proteus learning media. When learning online, simulation learning media is needed to assist in the learning process. Proteus media is one of the simulation media that can be used to help simulate digital electronics theories in their implementation in the real world. This study aims to find out about (1) how students' learning outcomes on the use of Proteus media in project-based Digital Electronics learning, and (2) how students respond to learning with Proteus media in project-based Digital Electronics learning?. The research model is experimental research. The respondents of this research are students who program the Digital Electronics course. Data was collected through learning outcomes tests and questionnaires. Learning outcomes tests to measure learning outcomes of Digital Electronics and questionnaires to measure student responses to learning with Proteus media in learning. The results showed that the average student learning outcomes were 83, 5 with a very good category. Student responses to learning with Proteus media include two aspects, namely aspects of product results and aspects of effectiveness for students. The resulting aspect of the product shows that the average value is 86,06% while the effectiveness aspect for students is 87,84%. Based on these data, student responses to Proteus media can be classified as highly meeting the criteria as an very effective learning medium for learning Digital Electronics.

Keywords: Learning Media, proteus, project-based learning, online, digital electronics

INTRODUCTION

Learning today is required to have 21st-century skills known as 4C, namely; Communication, Collaboration, Critical thinking, and Creativity that students need to have. The five main domains of 21st-century skills are (1) digital literacy; (2) intensive thinking, (3) effective communication, (4) high productivity; and (5) spiritual and moral values (Osman (2013). Rotherdam & Willingham (2009, p.21) note that a student's success depends on skills in the 21st century, so they must try and learn to have them.

Education is one of the important aspects to prepare human resources who have quality, are intelligent, democratic, critical, and can develop themselves to improve human dignity. Education also plays a role in shaping the character of students to become human beings who have good qualities and have good qualities. Mulyasa (2007) revealed that learning is essentially a process of interaction between students and their environment, resulting in a change in behavior for the better. According to Uno (2008), planned learning requires a variety of theories so that structured learning can meet expectations and

achieve learning objectives. Thus educators need to organize students, learning resources, facilities, procedures, and equipment in a learning environment to achieve learning objectives. How learning can create a constructive learning environment, and students build their knowledge, while lecturers become facilitators. One of them is by choosing a student-centered learning model, such as a project process-based learning model.

The project-based learning model is one of the constructivist learning models, which gives students the freedom to plan their learning activities independently. Students can produce work products that can be presented, carried out collaboratively, and evaluated continuously about the quality of the products

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produced. The project-based learning model is one model that can bridge the achievement of 21st-century skills. Project-based learning focuses on student activities to carry out a project and produce products that will later be presented in learning. In this learning model, the lecturer designs a project that aims to develop various student skills, including (1) completion time management; (2) collaboration and communication between students; and (3) contextual problem-solving in a project.

Learning must be developed and adapted to the skills needed in the global era. One of the learning models that support 21st-century learning is Project-Based Learning (PJBL). With the implementation of a project-based learning model in the Digital Electronics course, it is expected to improve several student skills needed according to the demands of the 21st century, which include (1) critical thinking skills; (2) creative thinking skills; (3) collaboration skills and (4) communication skills.

The implementation of project-based learning (PjBL) with today's technological developments has become easier because it is supported by various software media. Learning media is a tool used in delivering material to students so that it is easy to understand during the learning process in class. Rifai et.al. (2020) explained that the use of computer applications based on experimental activities was previously difficult to obtain in terms of tools and materials, but now it is easy to obtain so that experiments can be carried out easily. Further, Rifai et.al. (2020) explains that interactive computer applications can increase students' creativity to develop thinking and problem-solving skills.

Proteus is a simulation software that can simulate the interaction between software running on a microcontroller and digital and analog devices associated with it (Asparuhova et.al. 2018). Zheng (2016) argues that Proteus simulation software should be applied in experimental-based learning where Proteus can complement simulation and programming and have more capabilities in terms of experimental design. Proteus media is one of the simulation media that can be used to help simulate digital electronics theories in their implementation in the real world. Therefore this study aims to find out about (1) how students' learning outcomes on the use of Proteus media in project-based Digital Electronics learning, and (2) how students respond to learning with Proteus media in project-based Digital Electronics learning?

Literature review

In Bell's research (2010) it was concluded that Project Based Learning (PjBL) is a learning innovation for students to achieve success in the 21st century by (1) encouraging inquiry learning; (2) working together to research and create projects; (3) gather new information to become proficient communicators; and (4) advanced troubleshooting.

Tseng et al. (2011) explained that the combination between PjBL and STEM can effectively produce meaningful learning, and influence student behavior in future careers, and students show a positive response to PjBL and STEM-based learning. Furthermore, Gil (2017) stated that students who took part in short projects showed a significant improvement compared to students who participated in long-term projects.

Meanwhile, the project-based learning model according to Kovalyova (2016) is an ideal learning method used to significantly improve communication skills (oral and written). According to Chiang & Lee (2016), that (1) PjBL has a positive effect on students' learning motivation. The level of student involvement is more, and this can encourage motivation to demonstrate and explain their projects; and (2) PBL can facilitate students' problem-solving skills. If teachers can make more PBL activities and apply them in the classroom, then students can improve problem-solving skills to practical situations that will be faced in the future.

Cadle (2017) concludes that: (1) project-based learning (PjBL) is a proven strategy for transferring the competence of creative thinking skills, critical thinking, collaboration, and communication; (2) PBL has many advantages, namely: (a) it results in more student engagement than teacher-directed methods; (b) requires students to train and acquire metacognitive skills; (c) students retain concepts during memorization; (d) practice collaboration between individuals for group creativity; and (e) PBL allows for diagnostic, formative and substantive assessments to be included in the project.

Furthermore, Guo (2012) stated that another advantage of the project-based learning model is that it can develop the professional competence of teachers and improve student learning outcomes. While the weakness of the project-based learning model can be overcome by providing facilities to students in dealing with problems. By (1) limiting students' time in completing project assignments to train discipline and motivation to complete projects on time; (2) provide simple tools that are around, by choosing research that is easily accessible so that it does not require a lot of time and money; (3) create a comfortable and pleasant learning atmosphere between teachers and students. Project-based learning according to the Educational Technology Division-Ministry of Education Malaysia (2006) has six steps, namely: (1) preparing important questions related to a topic to be studied; (2) making a project plan; (3) making a schedule; (4) monitoring project implementation; (5) conduct an assessment; and (6) learning evaluation.

Learning media is one of the most important elements in the delivery of material so that students can easily absorb the material in full well and faster. E-Learning according to (Clark & Mayer, 2008:10) is a form of learning model that is facilitated and supported by the use of information and communication technology. E-Learning has the following characteristics: 1) has content that is relevant to the learning objectives; 2) using instructional methods, for example presenting examples and exercises to improve learning; 3) using media elements such as words and pictures to convey learning materials; 4) allows direct learning centered on the teacher (synchronous E-Learning) or designed for independent learning (asynchronous E-Learning); 5) build understanding and skills related to learning objectives either individually or improve group learning performance.

Hanif et al. (2021) in their research revealed that the use of Proteus software has a better effect in increasing student achievement so that Proteus can be categorized as one of the alternative simulation media that can be used for vocational education. Based on research data from Waluyo et.al. (2021) it is concluded that the use of virtual laboratories through Proteus software is an alternative to overcome the problem of limited tools and materials in practical learning

METHOD

The research subjects were undergraduate students who programmed the Digital Electronics course with a total of 23 students. This type of research is experimental research with a research design that uses a one-shot case study. The following is the design of this research design in the image below:

Table 1. Research Design

Subject	Treatment	Posttest
Experiment	X	Y

Note:
 Y: Posttest (Learning outcomes)
 X: Treatment (Proteus simulation media)

Data collection techniques with digital electronics learning outcomes tests and questionnaire responses to the use of Proteus media in learning. The data analysis technique used in this research is the descriptive analysis technique.

RESULTS

 a. Digital Electronics learning outcomes

Four Digital Electronics questions covering the material of Number Conversion, Logic Gate, Combination Gate were tested on 23 students. Table 2 shows student learning outcomes. The study results show that the highest score is 90 and the lowest is 75, while the average value is 83.5.

Table 2. Digital Electronics learning outcomes

Student ID	Problems				Total Value
	1	2	3	4	
1	1	1	0	1	85
2	1	1	1	1	90
3	1	0	1	1	80
4	1	1	1	1	90
5	0	1	1	1	80
6	1	1	0	1	75
7	1	1	1	1	90
8	1	1	1	1	90
9	1	1	0	1	85
10	1	1	0	1	75
11	1	1	1	0	80
12	1	0	1	1	85
13	1	1	1	0	75
14	1	1	1	1	90
15	1	0	1	1	85
16	1	0	1	1	80
17	1	1	1	1	90
18	1	1	1	1	90
19	1	0	1	1	85
20	1	0	1	1	80
21	1	0	1	1	80
22	0	1	1	1	80
23	1	0	1	1	80

b. Student response to Proteus media in learning

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The questionnaire compiled for student responses consists of 10 question items. The ten student responses questions are divided into 2 aspects, namely: product aspects and effectiveness aspects. The product aspect consists of 5 questions and the effectiveness aspect also consists of 5 questions.
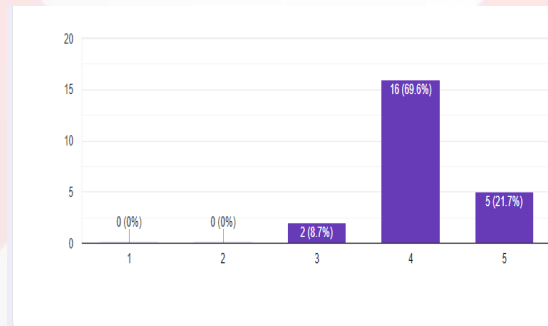
Figure 1(a) The student response result of the Proteus application is simple and easy to use
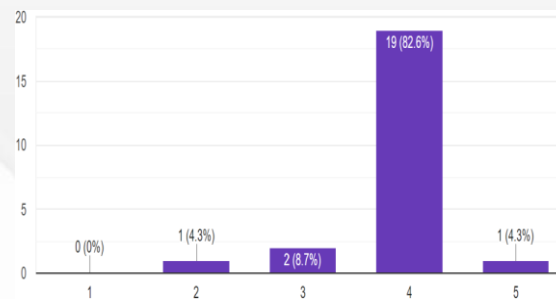
Figure 1(b) The student response result of languages or commands in the Proteus application
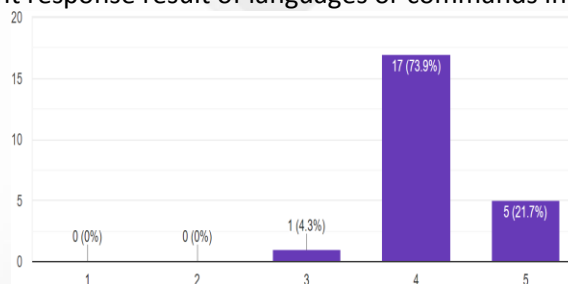
Figure 1(c) The student response result of utilizing the Proteus application through Project Learning
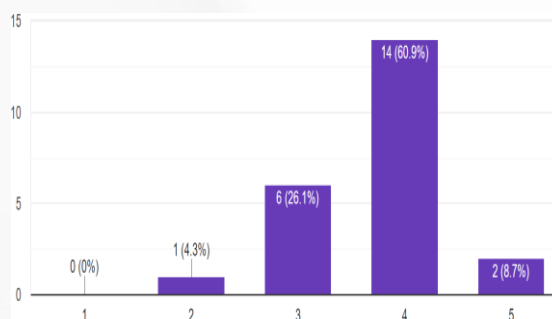
Figure 1(d) The student response result of digital Electronics Materials can be understood
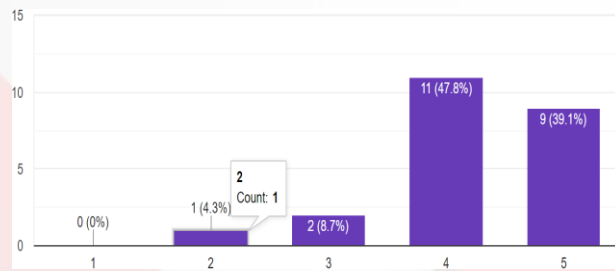
Figure 1(e) The student response result of the Proteus application can be used anytime and anywhere

Figures from 1(a) to 1(e) show the product aspects of student responses. Figure 1(a) shows a simple and easy-to-use Proteus application that was approved by students, almost all of the students stated strongly agree. Figure 1(b) shows 82.6% agree that the language or commands in the Proteus application are simple and easy to understand, while 4.3% disagree with the language or commands in the Proteus application, simple and easy to understand. Figure 1(c) shows 73.9% agree that the Proteus application through Project Learning in making challenging and interesting material is useful, only 4.3% disagree with the benefits of the Proteus application. Figure 1(d) shows that Digital Electronics Materials can be easily understood through Proteus media and project-based learning. Only one person disagrees or finds it difficult to understand Digital Electronics material with Proteus media, while the others agree and strongly agree that learning becomes easier to understand with the help of the Proteus application, one of the simulation media. Figure 1(e) shows that almost all students agreed and even strongly agreed that the Proteus simulation media could be used anytime and anywhere, only one person disagreed.
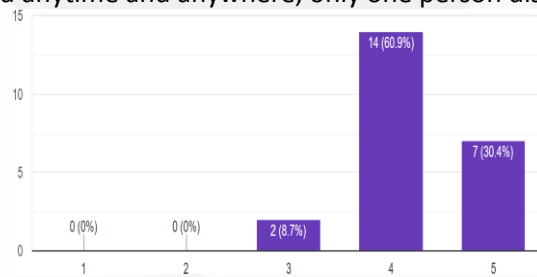
1(f) The student response result of enjoying the learning process using the Proteus Application
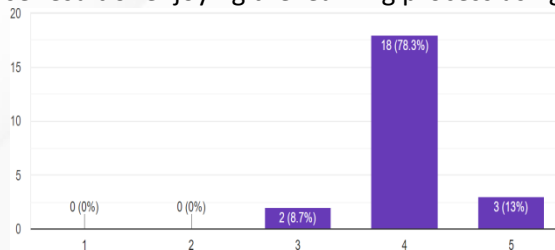
1(g) The student response result of the use of the Proteus Application learning media is practical and easy
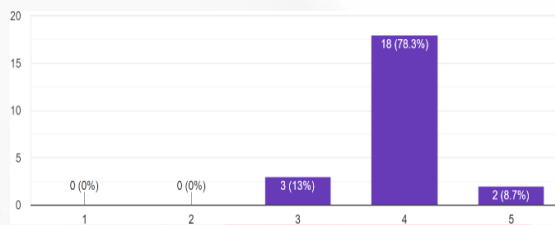
1(h) The student response result of motivation to learn with the Proteus app
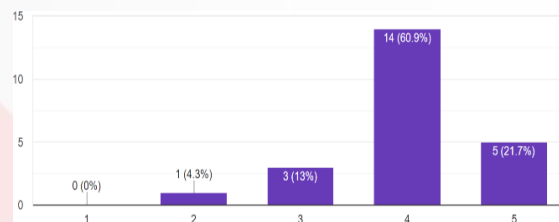
1(i) The student response result of Proteus media encourages active discussion
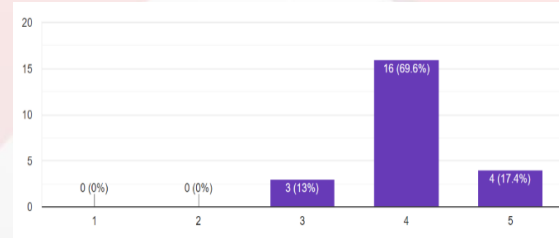
1(j) The student response result of Proteus application as a learning medium and motivates learning

Figures from 1(f) to 1(j) show the effectiveness aspects of student responses. Figure 1(f) All students agree and strongly agree that students enjoy learning Digital Electronics assisted by Proteus simulation media. Figure 1(g) Proteus is practical and easy to use for learning Digital Electronics, it is shown by all students agreeing, and even 13% agreeing strongly. Figure 1(h) Students are more motivated to learn Digital Electronics with the Proteus application and almost all agree. Figure 1(i) 14 people or 61% and 22% strongly agree that the Proteus simulation media encourages students to be active in discussions, both asking questions and finding solutions to the problems given. Figure 1(j) All students agree and strongly agree that Proteus media is a learning medium that can motivate students to learn

DISCUSSION

The learning outcomes obtained with an average of 83, 5 are very good, where students learn with the help of Proteus simulation media. In addition, Digital Electronics learning uses a project-based learning model, according to the phases. The skills that are demanded in the 21st century are critical thinking, creative thinking, collaboration, and communication. To achieve these 21st-century skills, one of them is choosing the learning model that is applied.

The project-based learning model is one model that can bridge the achievement of 21st-century skills in the learning process. Project-Based Learning Model with the hope of being a means of implementing effective and innovative learning. Based on the Regulation of the Minister of Education and Culture Number 103 of 2014 concerning Guidelines for Implementation of Learning, it is stated that the Project-Based Learning Model is one of the recommended learning models in the 2013 Curriculum. Thus, this project-based learning model gives students the freedom to plan learning activities well independently, be able to produce work products that can be presented, carry out project tasks collaboratively and evaluate continuously the quality of the products produced.

This project-based learning focuses on student activities to carry out a project and produce products that will later be presented in learning. In this learning model, the teacher designs a project that aims to develop various student skills, including (1) completion time management; (2) collaboration and communication between students; and (3) contextual problem-solving in a project.

The student activities during the learning process observed were (1) students trying to solve problems or assignments for making projects; (2) students can design processes and complete projects; (3) students are encouraged to collaborate independently in managing projects and try various forms of communication in solving project implementation problems; (4) students can present and account for project results both individually and in groups.

Student responses to learning with Proteus media include two aspects or indicators, namely aspects of product results and aspects of effectiveness for students. Judging from the aspect of product results, student responses showed an average of 86,06%, while the effectiveness aspect for students was 87,84%. Based on these data, student responses to Proteus media can be classified as highly meeting the criteria as an very effective learning medium for learning Digital Electronics. Proteus media is simple, practical, and easy, it can encourage students to be actively involved in discussions. In addition, Digital Electronics learning uses a project-based learning model, which makes the material more challenging and interesting.

CONCLUSIONS

The results showed that learning with Digital Electronics material assisted by Proteus media as a simulation medium could produce learning outcomes with a good average score of 83.5. This shows that the Proteus media combined with the PjBL model can be used in learning. In addition, student responses consisting of 10 indicators showed a very positive response from students who studied with Proteus media. Students believe that Proteus media is simple, practical, and easy to use. Proteus is a simulation media whose goal is to make it easier for students to understand the material, media that is close to the real situation, to be able to prove theories in Digital Electronics material. Proteus media can encourage students to be actively involved in conducting experiments. In addition, Digital Electronics learning uses a project-based learning model, which makes the material more challenging and interesting.

SUGGESTION

In project-based learning, students need more time for preparation, especially in terms of mastering the material that will be used as the basis for making projects. In addition, it also takes time to experiment with Proteus media in order to get the best solution. With sufficient preparation, and high motivation and learning independence in the implementation of project learning, students do not encounter many obstacles in terms of project planning and implementation.

REFERENCES

Asparuhova, Katya et.al. (2018). Using Proteus to Support Engineering Student Learning: Microcontroller-Driven Sensors Case Study. Proc. XXVII International Scientific Conference Electronics: Sozopol.

Bell, Stephanie. (2010). Project-Based Learning for the 21st Century: Skills for the Future. Taylor & Francis Group, LLC. The Clearing House, 83: 39–43, 2010.

Cadle, C. (2017). Skills for Today: Project-Based Learning: a Solution to Teaching the 4Cs. P21

Ciang, C. L., dan Lee, H. (2016). The Effect of Project-Based Learning on Learning Motivation and Problem Solving Ability of Vocational High School Students. International Journal of Information and Education Technology, Vol. 6, No. 9, September 2016. Online publication. DOI: 10.7763/IJIET.2016.V6.779

Gil, Pablo. (2017). Short Project-Based Learning with MATLAB Applications to Support the Learning of Video-Image Processing. Springer: New York.

Guo, S. (2012). Project-Based Learning an Effective Approach to Link Teacher Professional Development and Students Learning. Journal of Educational Technology Development and Exchange, 5(2), 41–56.

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Hanif, Sofi et.al. (2021). Using Proteus Software-Based Instructional Media to Promote Students Achievement in Learning Microcontroller. Jurnal Revolusi Indonesia: Indonesia.

Hosnan, M. (2014). Pendekatan Saintifik dan Kontekstual Dalam Pembelajaran Abad 21. Bogor: Ghalia Indonesia.

Kovalyova, Yu. (2016). Project-Based Learning in Teaching Communication Skills in English as a Foreign Language to Engineering Students. iJET – Volume 11, Issue 4. Russia: National Research Tomsk Polytechnic University.

Mulyasa, E. (2007). Kurikulum Tingkat Satuan Pendidikan. Bandung: PT Remaja Rosdakarya

Osman, K., Hiong, L. C., & Vebrianto, R. (2013). 21st-century biology: an interdisciplinary approach of biology, technology, engineering, and mathematics education. Procedia-Social and Behavioral Sciences, 102, 188-194.

Rifai, Moch et.al. (2020). Electronic Design Automation (EDA) Software-Assisted Learning Media: A Tutorial of Proteus Software. Journal of Critical Reviews: Malaysia.

Rotherham, A. J., & Willingham, D. (2009). 21st Century Skills: the challenges ahead. Educational Leadership Volume 67 Number 1, 16 - 21.

Trilling, Bernie, Fadel C. (2009). 21st Century skills: learning for life in our times. San Fransisco: Jossey-Bass.

Tseng, Kuo-Hung et.al. (2011). Attitudes Towards Science, Technology, Engineering, and Mathematics (STEM) in A Project-Based Learning (Pjbl) Environment. Springer Science Business Media: Taiwan.

Uno, B. H. (2008). Teori Motivasi dan Pengukurannya. Jakarta: Bumi Aksara.

Waluyo, Bakti Dwi et.al. (2021). The Effect of Using Proteus Software as a Virtuyal Laboratory on Student Learning Outcomes. Jurnal Kajian, Penelitian, dan Pengembangan Kependidikan: Medan.

Zheng, Zi-han. (2016). Application of Proteus and Keil Software in the Teaching of MCU Course. International Conference on Artificial Intelligence and Computer Science: China.

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Pengaruh Lingkungan Keluarga, Minat Berwirausaha, Motivasi Kerja Dan Intensitas Belajar Terhadap Kompetensi Lulusan Mahasiswa Jurusan Pendidikan Teknik Mesin Fakultas Teknik Unima

Davidsen O. Mapaliey1,

Competence of student graduates is a major problem in this study. The purpose of this study is to uncover and analyze the influence of the family environment, entrepreneurial interest, work motivation, and intensity of study on the competencies of UNIMA Fatek Mechanical Engineering student graduates. This type of research uses survey research methods with quantitative research approaches and analyzed using descriptive data analysis and path analysis. The study population numbered 78 respondents and the sample used a probability sample with a simple random sampling technique totaling 64 respondents. Data collection techniques used were questionnaires and documentation from the Cumulative Achievement Index as the basis of the competence of student graduates. To test hypotheses using Path Analysis as a quantitative analysis. The results of the analysis found that a significant and positive influence between (1) the variables of entrepreneurial interest, work motivation and learning intensity on the competence of student graduates, (2) Family environment variables and work motivation on learning intensity. And also found two insignificant influences namely the family environment on student graduate competencies and interest in entrepreneurship on the intensity of learning.

Keywords : family environment, interest in entrepreneurship, work motivation, learning intensity, competence of student graduates

PENDAHULUAN

Di era globalisasi ini ditandai persaingan kualitas sumber daya manusia.Maka menuntut semua pihak dalam berbagai bidang untuk meningkatkankompetensinya termasuk bidang pendidikan. Suatu organisasi dalam menjalankan aktivitasnya akan selalu berhadapan dengan manusia sebagai sumberdaya yang dinamis dan memiliki kemampuan untuk terus berkembang, dimana dengan berkembangnya manusia sebagai tenaga kerja tersebut akan mempengaruhi stabilitas dan kontinuitas organisasi tersebut.

Setiap lulusan mendambakan pekerjaan yang sesuai dengan kompetensi yang dimiliki, tidak terkecuali mahasiswa Pendidikan Teknik Mesin. Kompetensi lulusan mahasiswamerupakan modal utama bagi mahasiswa dalam memperoleh pekerjaan sesuai denganprogram studi yang ditempuh pada masa studi program sarjana. Kompetensi lulusanmenjadi pertimbangan di kalangan perusahaan dalam merekrut tenaga kerja melalui seleksi, sehingga dalam perumusan standar kompetensi lulusan setiap program studi harus mencakup pengembangan kecerdasan intelektual, akhlak mulia, dan keterampilan. Seorang akan dikatakan memiliki komptensi lulusan sesuai yang diharapkan seperti kemampuan minimal sesuai dengan standar nasional, mampu bersaing dengan lulusan dari luar, dan diakui proses pelaksanaan pendidikan secara internasional yang memenuhi aspek kognitif (pengetahuan termasuk kecerdasan bahasa dan kecerdasan logika), afektif (sikap atau pengetahuan), dan psikomotor (keterampilan).

Berdasarkan data Pusat Komputer serta didukung data operator Pendidikan Teknik Mesin dari tahun dengan jumlah mahasiswa yang aktif sampai tahun 2018 atau dalam rentang tahun 2012 – 2018 adalah 334 mahasiswa, mahasiswa yang tidak aktif kuliah dan pindah berjumlah 244 mahasiswa dan jumlah mahasiswa yang lulus 58 mahasiswa dari 637 mahasiswa (http://si.unima.ac.id/gtakademik/).

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Tabel 1 Jumlah Status Mahasiswa dari Tahun 2012 – 2018

TAHUN	JUMLAH MAHASISWA					KET.
	BARU	AKTIF	LULUS	NON AKTIF	PINDAH	
2012	124	14	42	67	1	
2013	142	42	20	80		
2014	117	68	3	46		
2015	108	78	1	29		
2016	62	50		12		
2017	39	34		5		
2018	45	44		1		
JUMLAH	637	334	58	244	1	

Sumber : Operator PTM dan Pusat Komputer UNIMA Th. 2018 serta http://si.unima.ac.id/gtakademik/
Berdasarkana tabel 1 disimpulkan bahwa terjadi ketidakseimbangan data dan fakta antara mahasiswa yang masuk dengan yang selesai, baik selesai tepat waktu atau tidak. Artinya mahasiswa yang selesai/diwisuda jauh lebih sedikit dengan yang masuk/aktif tiap angkatan.

Tabel 2 Rata-rata hasil belajar tahun 2017/2018 semester genap beserta IPK dan sks yang diperoleh mahasiswa yang Aktif dari tahun 2012-2018

TAHUN	JL.	IP RATA-RATA Th. 2017 Genap		JL. SKS Th. 2017 Genap	IPK RATA-RATA	JL. SKS YANG DICAPAI	KET.
2012	149	0,00		4,00	3,22	145,00	
2013	149	0,15		6,95	3,12	145,76	
2014	149	1,27		10,84	3,12	139,86	
2015*	149	1,97		18,14	3,07	106,11	
2016	149	2,09		18,54	3,03	82,29	
2017	149	2,21		18,44	2,68	36,97	
2018	149						
RATA-RATA		1,10		10,99			

* data sampel penelitian
Sumber : Operator PTM dan Pusat Komputer UNIMA Th. 2018 serta http://si.unima.ac.id/gtakademik/

Berdasarkan data yang diperoleh tahun 2017 semester genap dengan jumlah rata-rata SKS yang di ambil adalah 10,99 dan capaian IP semester tersebut 1,10. Untuk angkatan tahun 2012 sampai 2015 maka diperoleh SKS rata-rata 9,98 dan IP semester 0,85 artinyamahasiswa rentang angkatan tersebut pada semester yang berjalan masih dibawah standar kelulusan nilai mahasiswa adalah nilai C dengan IPK 2.0 berdasarkan pedoman akademik Universitas Negeri Manado tahun 2016.

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Menurut Hasan dan Bataviase, 2010 dalam jurnal Agustin, Vony.,2012 mengatakan "lulusan universitas tidak sesuai dengan kebutuhan masyarakat dan dunia usaha yang ada serta tingginya angka pengangguran di kalangan sarjana ini adalah karena rendahnya keterampilan diluar kompetensi utama sebagai sarjana.Hal ini tentunya membuktikan bahwa gelar sebagai seorang sarjana tidak menjamin untuk memperoleh pekerjaan. Tidak mengherankan jika lulusan sarjana masih kesulitanmemperoleh pekerjaan yang sesuai dengan kemampuan dirinya saat ini. Dikarenakan dalam proses pembelajaran di universitas belum maksimal dalam penyerapan materi. Begitu juga praktek yang dilakukan hanya memenuhi kebutuhan mata kuliah saja. Keadaan seperti itu karena pada dasarnya mereka belum menetapkan tujuan kehidupan mereka kedepannya akan seperti apa dan hanya mengikuti apa kata dosen saja yang penting lulus yang menyebabkan lingkungan keluarga, minat berusaha, motivasi kerja dan intensitas belajar menjadi faktor-faktor penentu keberhasilan mahasiswa terutama dalam pemahaman kompetensi lulusan.Adanya pengembangan berbagai kompetensi yang diberikan kepada para mahasiswa merupakan salah satu langkah yang harusdilakukan tidak hanya ketika mengenyam pendidikan di bangku kuliah saja, sehingga ketika luluspun pihak universitas masih punya beban moral, sosial dan kredibilitas pada para alumninya.

Kemampuan mahasiswa untuk memahami suatu materi pembelajaran sangat berbeda. Ada mahasiswa yang memiliki kemampuan untuk menanggapi dan yang memahami materi dengan cepat dan baik, namun dalam kenyataan pula, ada juga mereka yang berpikir lambat, yang sulit dimengerti dan dipahami, dan itu adalah hal yang wajar. Makna tersebut dapat diartikan bahwa seorang yang sering berlatih dan berulang kali melakukan rutinitas belajar akan membuat otak terbiasa berpikir dan mampu menyimpan ingatan dengan baik. Hal ini sama dengan pemahaman materi melalui pembelajaran rutin di sekolah, di rumah, les dan di tempat lain sebagai tempat untuk belajar diperlukan sebagai rutinitas dalam belajar atau dengan kata lain, intensitas belajar.

Hal yang paling berpengaruh dalam prosespembelajaran dalam lingkungan keluarga yaitu cara orang tua mendidik, relasi antara anggota keluarga, suasana rumah, keadaan ekonomi, dan latar belakang budaya (Slameto, 2010: 60). Sehingga lingkungan keluarga menjadi perhatian penting dikarenakan pengawasan terhadap pengaruh-pengaruh negatif dari lingkungan sekitar yang dampaknya menyebabkan kurangnya perhatianbelajar mahasiswa, tergantungnya kegiatan proses belajar mengajar dan cenderung kearah kenakalan. Kenakalan anak didik seperti keluyuran pada saat kuliah, seks bebas, narkoba, dan lain-lain, sehingga dapat mempengaruhi hasil belajar yang menyebabkan kelulusan hanya berupa angan-angan semata.Mahasiswa yang kurang nyaman dilingkungan keluarga cenderung mencari perhatian dan kasih sayang dari lingkungan luar yang memiliki pengaruh positif dan negatif bagi mahasiswa. Dalam hal ini pentingnya peran dari seorang guru/dosen, orang tua serta mahasiswa itu sendiri.

Faktor minat berwirausaha ini merupakan sebuah rasa yang keluar dari dalam diri setiap orang yang berkemauan keras dalam melakukan tindakan, bermanfaat dan patut menjadi teladan hidup. Rasa ingin mengapai atau memahami sesuatu yang ada di dalam dirinya (Sardiman, 2014:39).Peran wirausahaa (entrepreneur) dalam menentukan kemajuan suatu bangsa/ negara telah dibuktikan oleh beberapa negara maju seperti Amerika Serikat, Jepang, plus tetangga terdekat Indonesia yaitu Singapura dan Malaysia (Dewi, 2017: 29). Di Amerika sampai saat ini sudah lebih dari 12 persen penduduknya menjadi entrepreneur, dalam setiap 11 detik lahir entrepreneur baru dan data menunjukkan 1 dari 12 orang Amerika terlibat langsung dalam kegiatan entrepreneur.

Di Jepang, lebih dari 10 persen penduduknya sebagai wirausaha dan lebih dari 240 perusahaan Jepang berskala kecil, menengah, dan besar bercokol di bumi Indonesia. Selanjutnya negara tetangga Singapura dan Malaysia, lebih dari 7,2 persen pengusaha Singapura dan 3 persen pengusaha Malaysia menjadikan pertumbuhan ekonomi negaranya jauh meninggalkan Indonesia.

Berdasarkan pada data tersebut, perguruan tinggi perlu melakukan pembenahan supaya pembelajaran selama perkuliahan mampu mengubah orientasi mahasiswa dari pencari kerja menjadi penyedia lapangan kerja. Indarti & Rostiani (2008) menguraikan bahwa mahasiswa yang telah menyelesaikan studinya akan dihadapkan pada 3 pilihan, yaitu pilihan untuk menjadi pegawai baik pegawai perusahaan swasta, Badan Usaha Milik Negara (BUMN) atau Pegawai Negeri Sipil (PNS). Pilihan kedua menjadi pengangguran intelektual karena sulitnya mendapatkan pekerjaan yang sesuai dengan kriteria. Pilihan ketiga adalah membuka usaha sendiri atau berwirausaha. Mengingat tentang perekonomian Indonesia saat ini, lulusan perguruan tinggi seharusnya mampu memberikan kontribusi pada negara dengan cara berwirausaha

Kesiapan kerja mahasiswa lulusan di perguruan tinggi salah satunya dapat dipengaruhi oleh kematangan mental. Kematangan mental ini dapat dilihat dari tinggi rendahnya motivasi kerja yang ada pada diri mahasiswa. Bagi mahasiswa jurusan Pendidikan Teknik Mesin, peran motivasi kerja pada diri mereka menjadi sangat penting karena akan memberikan dorongan dansemangat untuk bekerja. Adanya motivasi kerja yang tinggi akan mendorong siswa untuk sebanyak mungkin membekali diri dengan berbagai kompetensi yang diperlukan dalam bekerja sehingga kesiapan kerja yang miliki menjadi memadai.

METODE PENELITIAN

Jenis penelitian ini menggunakan metode penelitian survei dengan pendekatan penelitian kuantitatif. sekaligus menjelaskan pengujian hipotesis. Penelitian ini menggunakan deskriptif analisis data. Analisis yang digunakan analisis jalur. Analisis ini akan digunakan dalam menguji besarnya pengaruh dari 3 variabel bebas (independent variable),1 variabel intervening dan 1 variabel terikat (dependent variable) yaitulingkungankeluarga (X1),minatberwirausaha(X2), motivasikerja (X3)adalah variabel bebas, intensitas belajar (X4) adalah variabel intervening, dan variable terikat adalah kompetensi lulusan mahasiswa(X5). Hubungan antar variabel penelitian tersebut dapat digambarkan dalam konstelasi masalah pada gambar 1
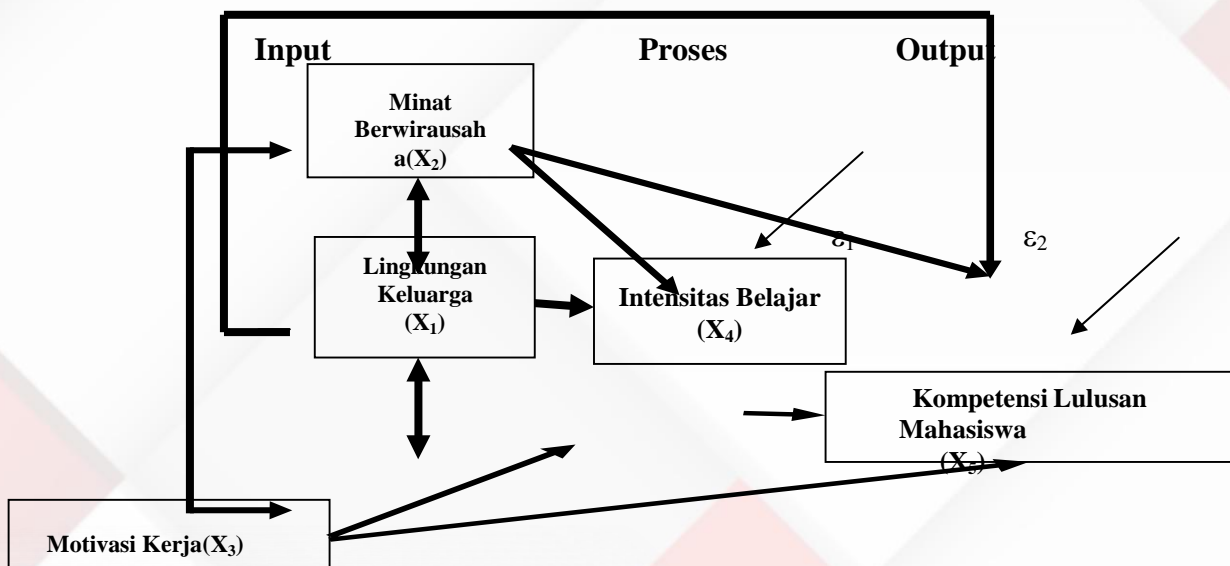
Gambar 1. Desain Konstelasi Hubungan Variabel Penelitian

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Populasi dalam penelitian ini adalah mahasiswa Jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado angkatan 2015tahun ajaran 2018/2019 sejumlah 78 orangyang didasarkan oleh kriteria tertentu sesuai dengan tujuan penelitian. Dengan jumlah sampel adalah 64 mahasiswa. Kompetensi lulusan diukur berdasarkan kognitif, afektif, dan psikomotor sesuai dengan kurikulum termasuk didalamnnya matakuliah bidang keahlian Pendidikan Teknik Mesin yang diperoleh melalui operator PTM dan Pusat

Komputer UNIMA untuk mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado tahun angkatan 2015 sebagai responden.

Teknik analisis yang dipergunakan dalam penelitian ini adalah analisis regresi. Sebelum dilakukan analisis data, akan dideskripsikan data penelitian dari 3 variabel bebas dan 1 variabel terikat dalam bentuk tabel data, distribusi, frekwensi dan histogram. Sebelum dilakukan uji hipotesis, terlebih dahulu dilakukan (1) statistic deskriptif, (2) pengujian persyaratan analisis yaitu uji normalitas galat taksiran (residu)dan uji signifikansi dan linearitas regresi(3) pengujian hipotesis dengan analisis inferensial dengan menggunakan analisis jalur (path analysis).

HASIL DAN PEMBAHASAN

Deskripsi Data Hasil Penelitian

Deskripsi data yang disajikan dalam bagian ini meliputi data variabel Lingkungan Keluarga (X1), Minat Berwirausaha(X2),Motivasi Kerja (X3),Intensitas Belajar (X4) sebagai variabel intervening, Kompetensi Kelulusan Mahasiswa (X5) sebagai variabel terikat. Data penelitian ini ditampilkan dalam bentuk statistik deskriptif seperti jumlah responden, nilai rata-rata (mean), simpangan baku (Standar Deviasi), median (me), modus (mo) dan distribusi frekuensi dituangkan ke dalam kelas interval dengan skor maksimum, skor minimum dan rentang skor menggunakan IBM SPSS 25 for windows, panjang kelas dan interval kelas dalam lampiran. Secara berturut-turut hasil analisis distribusi frekuensi masing-masing variabel seperti yang dijelaskan berikut ini:
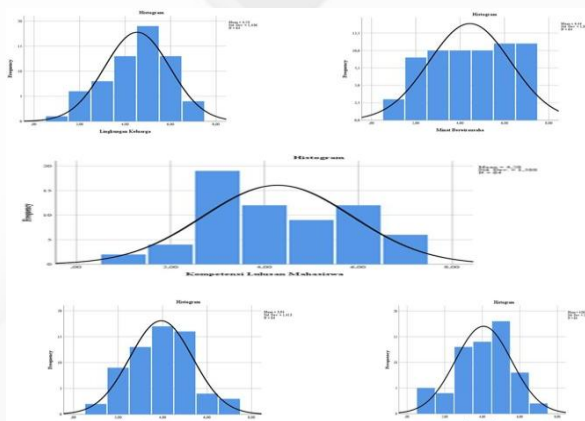
Penyebaran skor lingkungan keluarga, minat berwirausaha, motivasi kerja, intensitas belajar dan kompetensi lulusan mahasiswa terlihat pada gambar 2.

Gambar 2 Penyebaran Skor Variabel Penelitian

Pengujian Persyaratan Analisis

Dalam penelitian ini, sebelum melakukan analisis jalur, terlebih dahulu diadakan pemeriksaan terhadap catatan yang harus dipenuhi yaitu: (1) Uji Normalitas, (2) Uji signifikansi dan linearitas koefisien regresi. Pada bagian ini memaparkan kedua uji statistik tersebut yang dipersyaratkan:

Uji Normalitas Galat Taksiran (Residu)

Dasar pengambilan keputusan uji normalitas adalah jika nilai sig (signifikansi) > 0,05 maka terima Ho, data berdistribusi normal, sebaliknya jika nilai sig (signifikansi) < 0,05 maka tolak Ho, data berdistribusi tidak normal.

Tabel 3 Rangkuman Hasil Uji Normalitas Data Galat Taksiran

No.	Variabel	n	phitung	Hasil	Kesimpulan
1	Kompetensi Lulusan Mahasiswa (X5) atas Lingkungan Keluarga (X1)	64	0,200	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
2	Kompetensi Lulusan Mahasiswa (X5) atas Minat Berwirausaha (X2)	64	0,200	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
3	Kompetensi Lulusan Mahasiswa (X5) atas Motivasi Kerja(X3)	64	0,200	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
4	Kompetensi Lulusan Mahasiswa (X5) atas Intensitas Belajar (X4)	64	,092	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
5	Intensitas Belajar (X4) atas Lingkungan Keluarga (X1)	64	0,200	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
6	Intensitas Belajar (X4) atas Minat Berwirausaha (X2)	64	0,067	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.
7	Intensitas Belajar (X4) atas Motivasi Kerja(X3)	64	0,169	phitung> 0,05	Galat taksiran berasal dari populasi yang berdistribusi normal.

Uji Signifikansi dan Linearitas Regresi

Persyaratan kedua yang harus dipenuhi dalam melakukan analisis adalah signifikansidan linaritas regresi variabel endogen terhadap variable eksogen.Hasil perhitungan uji signifikansi dan linearitas sebagai berikut:
Tabel 4 Rangkuman Hasil Uji Signifikansi dan Linearitas Regresi

No	Hubungan Variabel	Hasil Perhitungan dan Analisis					Ket.
		Persamaan Regresi	Uji Keberartian Regresi		Uji Linearitas		
			Fhitung	F tabel (α = 0,05; 0,01)	Fhitung	F tabel (α = 0,05; 0,01)	
1	Kompetensi Lulusan Mahasiswa (X5) Atas Lingkungan Keluarga (X1)	Ŷ = -1,765+ ,049X1	760,846	3,999;7,058 (dk=1;dn=(n-2)=62)	1,486	1,837;2,365 (dk=21; dn=41)	
			Fhitung> F tabel koefisien arah regresi berarti		Fhitung< F tabel regresi linier		

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No	Variable	Fhitung	F tabel	Nilai	F tabel
2	Kompetensi Lulusan Mahasiswa (X5) Atas Minat Berwirausaha (X2) $\hat{Y} = -0,546 + 0,038X2$	Fhitung =666,651	3,999;7,058 (dk=1;dn=(n-2)=62)	1,431	1,819; 2,348 (dk= 25; dn =37)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	
3	Kompetensi Lulusan Mahasiswa (X5) Atas Motivasi Kerja (X3) $\hat{Y} = -1,460 + 0,052X3$	750,773	3,999;7,058 (dk=1;dn=(n-2)=62)	1,119	1,840;2,370 (dk= 20; dn=42)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	
4	Kompetensi Lulusan Mahasiswa (X5) Atas Intensitas Belajar (X4) $\hat{Y} = -0,806 + 0,039X4$	961,559	3,999;7,058 dk= 1;dn=(n-2)=62,	1,587	1,819;2,348 (dk=25; dn=37)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	
5	Intensitas Belajar(X4) Atas Lingkungan Keluarga (X1) $\hat{Y} = -23,138 + 1,251X1$	1506,579	3,999;7,058 (dk=1;dn=(n-2)=62)	0,922	1,823;2,358 (dk=21;dn=41)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	
6	Intensitas Belajar(X4) Atas Minat Berwirausaha(X2) $\hat{Y} = 12,886 + 0,918X2$	367,069	3,999;7,058 (dk=1;dn=(n-2)=62)	1,093	1,819;2,348 (dk=25;dn=37)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	
7	Intensitas Belajar(X4) Atas Motivasi Kerja (X3) $\hat{Y} = -13,501 + 1,301X3$	952,900	3,999;7,058 (dk=1;dn=(n-2)=62)	1,015	1,824;2,360 (dk=20;dn=42)
		Fhitung> F tabel		Fhitung< F tabel	
		koefisien arah regresi berarti		regresi linier	

Pengujian Hipotesis

Pengujian hipotesis dilakukan setelah semua persyaratan terpenuhi dalam analisis jalur tentang data yang diperoleh yang diujicobakan di lapangan, maka tahapan selanjutnya adalah pengujian hipotesis. Adapun hipotesis yang akan diuji
yaitu pengaruh variabel endogen terhadap variabel eksogen, variabel terikat yang di analisis berdasarkan konsep teoretik.
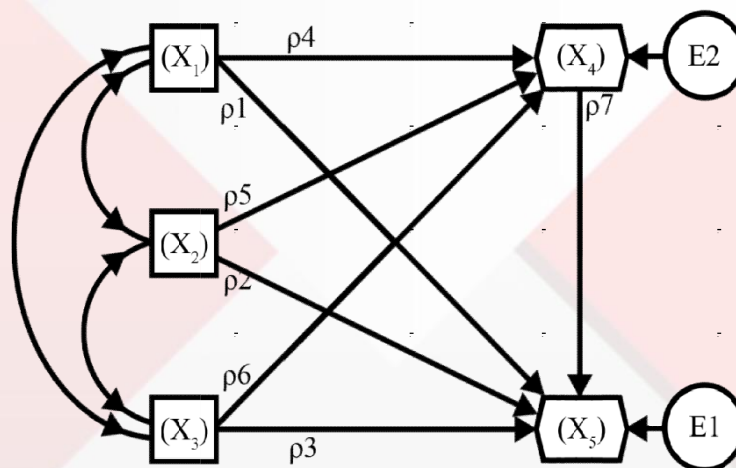
Gambar 3 Model Statistik

model pengaruh
Persamaan struktur dari model di atas dapat ditulis sebagai berikut:

(1) X5 = ρ1X1 + ρ2X2+ ρ3X3+ ρ7X4+ E2 (2) X4 = ρ4X1 + ρ5X2 + ρ6X3 + E1

Struktur I

Secara simultan model 1 maupun model 2, variabel lingkungan keluarga, minat berwirausaha, motivasi kerja dan intensitas belajar berpengaruh terhadap variabel kompetensi lulusan mahasiswa Pendidikan Teknik Mesin Fatek Unima adalah

Tabel 5 Perhitungan Koefisien Jalur Struktur 1

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-1,069	0,206		-5,195	0,000			
	Lingkungan Keluarga	0,001	0,008	0,016	0,108	0,915	0,956	0,014	0,003
	Minat Berwirausaha	0,014	0,003	0,357	4,618	0,000	0,950	0,515	0,127
	Motivasi kerja	0,014	0,007	0,256	2,134	0,037	0,960	0,268	0,059
	Intensitas Belajar	0,015	0,006	0,369	2,340	0,023	0,962	0,291	0,064
2	(Constant)	-1,054	0,146		-7,240	0,000			
	Minat Berwirausaha	0,014	0,003	0,359	4,797	0,000	0,950	0,527	0,131

	Motivasi kerja	0,014	0,006	0,259	2,221	0,030	0,960	0,276	0,061
	Intensitas Belajar	0,015	0,005	0,380	3,321	0,002	0,962	0,394	0,091
a. Dependent Variable: Kompetensi Lulusan Mahasiswa									

Dari table coefficients pada model 1, diperoleh berturut-turut:

ρ_1= 0,016; t0=0,108; p-value = 0,915/2 = 0,457 > 0,05, atau H0diterima, yang berarti tidak terdapat pengaruh signifikan Lingkungan Keluarga (X1) terhadap Kompetensi Lulusan Mahasiswa (X5).

ρ_2= 0,357; t0=4,618; p-value = 0,000/2 = 0,000 < 0,05, atau H0 ditolak, yang berarti Minat Berwirausaha (X2) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa (X5).

ρ_3= 0,256; t0= 2,134; p-value = 0,037/2 = 0,019< 0,05, atau H0 ditolak, yang berarti Motivasi Kerja (X3) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa(X5).

ρ_7= 0,369; t0= 2,340; p-value = 0,023/2 = 0,011< 0,05, atau H0 ditolak, yang berarti Intensitas Belajar (X4) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa (X5).

Sehingga koefisien jalur setelah trimming adalah sebagai berikut:

(1) ρ_2= 0,359; t0=4,797; p-value = 0,000/2 = 0,000 < 0,05, atau H0 ditolak, yang berarti Minat Berwirausaha (X2) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa (X5).

(2) ρ_3= 0,256; t0= 2,221; p-value = 0,030/2 = 0,015< 0,05, atau H0 ditolak, yang berarti Motivasi Kerja (X3) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa (X5).

(3) P7= 0,380; t0= 3,321; p-value = 0,002/2 = 0,001< 0,0005, atau H0 ditolak,

yang berarti Intensitas Belajar (X4) mempunyai pengaruh langsung positif terhadap Kompetensi Lulusan Mahasiswa (X5)

Struktur II
Tabel 6 ANOVA Struktur 2

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3415,728	3	1138,576	636,833	,000b
	Residual	107,272	60	1,788		
	Total	3523,000	63			
2	Regression	3415,488	2	1707,744	968,933	,000c
	Residual	107,512	61	1,762		
	Total	3523,000	63			
a. Dependent Variable: Intensitas Belajar						
b. Predictors: (Constant), Motivasi kerja, Minat Berwirausaha, Lingkungan Keluarga						
c. Predictors: (Constant), Motivasi kerja, Lingkungan Keluarga						

Secara simultan variabel Lingkungan Keluarga, Minat Berwirausaha dan Motivasi Kerja berpengaruh terhadap variabel Intensitas Belajar. Selanjutnya:

Tabel 7 Perhitungan Koefisien Jalur Struktur 2

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
1 (Constant)	-21,401	3,149		-6,795	0,000			
Lingkungan Keluarga	0,824	0,115	0,646	7,197	0,000	0,981	0,681	0,162
Minat Berwirausaha	0,023	0,063	0,023	0,367	0,715	0,922	0,047	0,008
Motivasi kerja	0,436	0,120	0,324	3,640	0,001	0,969	0,425	0,082
2 (Constant)	-21,866	2,863		-7,638	0,000			
Lingkungan Keluarga	0,839	0,107	0,658	7,853	0,000	0,981	0,709	0,176
Motivasi kerja	0,450	0,112	0,335	4,001	0,000	0,969	0,456	0,090

Coefficientsa

Dependent Variable: Intensitas Belajar

Tabel 8 Ringkasan hasil pengujian hipotesis dengan SPSS
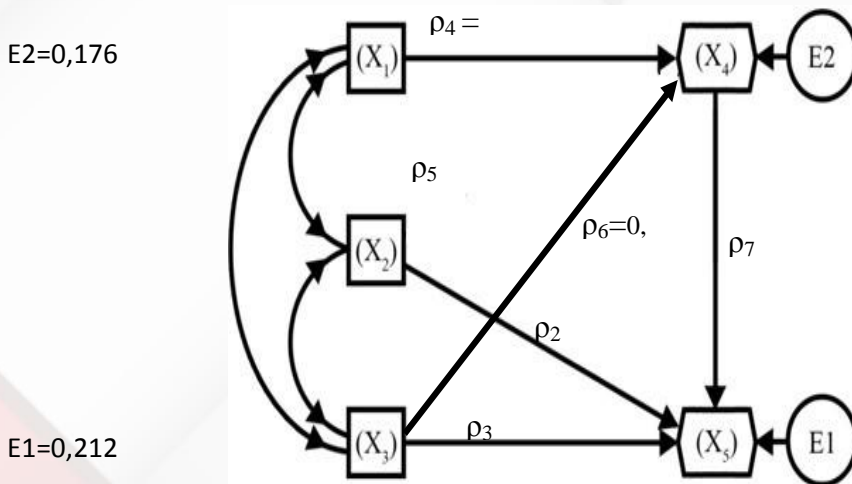
Gambar 4 Model Kausal Empiris Antara X1, X2, X3, X4 dan X5

Pembahasan Hasil Penelitian

Berdasarkan hasil penelitian pengaruh lingkungan keluarga, Minat Berwirausaha, Motivasi Kerja dan intensitas Terhadap kompetensi lulusan mahasiswa pendidikan teknik mesin Fakultas Teknik UNIMA, maka terdapat temuan-temuan sebagai berikut:

Lingkungan Keluarga Tidak Berpengaruh Signifikan Terhadap Kompetensi Lulusan Mahasiswa

Dalam penelitian ini lingkungan keluarga tidak berpengaruh secara langsung terhadap kompetensi lulusan mahasiswa.Hal ini dibuktikan dengan nilai thitung untuk variabel lingkungan belajar terhadap hasil belajar lebih kecil dari ttabel. Dimana thitung = 0,108< ttabel = 1.670 pada α = 0,05. Sehingga pengaruh yang dimiliki oleh lingkungan keluarga terhadap kompetensi lulusan mahasiswa, tidaklah signifikan namun tetap ada pengaruh karena nilai thitung positif.

Minat Berwirausaha positif terhadap kompetensi lulusan mahaiswa

Dalam penelitian ini Minat Berwirausaha berpengaruh secara langsung terhadap Kompetensi Lulusan Mahasiswa.Hal ini dibuktikan dengan nilai thitung untuk variabel Minat Berwirausaha terhadap Kompetensi Lulusan Mahasiswa lebih besar dari ttabel. Dimana thitung = 4,618> ttabel = 1.670 pada α = 0,05. Sehingga pengaruh yang dimiliki oleh Minat Berwirausaha terhadap Kompetensi Lulusan Mahasiswa positif dan signifikan.

Motivasi Kerja Berpengaruh Positif Terhadap Kompetensi Lulusan Mahasiswa

Dalam penelitian ini motivasi kerja berpengaruh secara langsung terhadap Kompetensi Lulusan Mahasiswa.Hal ini dibuktikan dengan nilai thitung untuk variabel motivasi kerjaterhadap Kompetensi Lulusan Mahasiswa lebih besar dari ttabel. Dimana thitung = 2,134> ttabel = 1.670 pada α = 0,05. Sehingga pengaruh yang dimiliki oleh motivasi kerja terhadap Kompetensi Lulusan Mahasiswa positif dan signifikan.

Intensitas Belajar Berpengaruh Positif Terhadap Kompetensi Lulusan Mahasiswa

Dalam penelitian ini Intensitas Belajar berpengaruh secara langsung terhadap Kompetensi Lulusan Mahasiswa.Hal ini dibuktikan dengan nilai thitung untuk variabe; Intensitas Belajar terhadap Kompetensi Lulusan Mahasiswa lebih besar dari ttabel. Dimana thitung = 2,340> ttabel = 1.670 pada α = 0,05. Sehingga pengaruh yang dimiliki oleh Intensitas Belajar terhadap Kompetensi Lulusan Mahasiswa positif dan signifikan.

Lingkungan Keluarga Berpengaruh Posistif Terhadap Intensitas Belajar.

Dalam penelitian ini Lingkungan Keluarga berpengaruh secara langsung terhadap Intensitas Belajar.Hal ini dibuktikan dengan nilai thitung untuk variabel Lingkungan Keluarga terhadap Intensitas Belajar lebih besar dari ttabel. Dimana thitung = 7,197 > ttabel = 1.670pada α = 0,05. Sehingga pengaruh yang dimiliki oleh Lingkungan Keluarga terhadap Intensitas Belajar positif dan signifikan.

Minat Berwirausaha Berpengaruh Posistif Terhadap Intensitas Belajar

Dalam penelitian ini Minat Berwirausaha tidak berpengaruh secara langsung terhadap Intensitas Belajar. Hal ini dibuktikan dengan nilai thitung untuk variabel Minat Berwirausahaterhadap Intensitas Belajar lebih kecil dari ttabel. Dimana thitung = 0,367 > ttabel = 1.670pada α = 0,05. Sehingga pengaruh yang dimiliki oleh Minat Berwirausahaterhadap Intensitas Belajar, tidaklah signifikan namun tetap ada pengaruh karna nilai hitung positif.

Motivasi Kerja Berpengaruh positif Terhadap Intensitas Belajar

Dalam penelitian ini menunjukan bahwa terdapat pengaruh positif motivasi kerja terhadap intensitas belajar. Hal ini dibuktikan dengan nilai thitung untuk variablemotivasi kerjaterhadap intensitas belajarlebih kecil dari ttabel. Dimana thitung = 3,640 < ttabel = 1,670 pada α = 0,05,sehingga pengaruh yang dimiliki oleh motivasi kerja terhadap intensitas belajar positif dan signifikan.

KESIMPULAN DAN SARAN

KESIMPULAN

Setelah melalui serangkaian tahapan penelitaian mulai dari penyusunan proposal penelitian, penyusunan uji coba instrument, kemudian dilanjutkan dengan pengumpulan dan analisis data maka dalam temuan ini dapat diambil kesimpulan sebagai berikut:

Lingkungan keluarga tidak secara signifikan berpengaruh langsung terhadap kompetensi lulusan mahasiswa,namunberpengaruh secara signifikan terhadap intensitas belajar pada mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado.

Minat Berwirausaha secara signifikan berpengaruh langsung terhadap kompetensi lulusan mahasiswa, namun tidak secara signifikan berpengaruh terhadap intensitas belajar pada mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado.

Motivasi Kerja secara signifikan berpengaruh langsung terhadap kompetensi lulusan mahasiswa,juga berpengaruh terhadap intensitas belajar mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado.

Intensitas belajar berpengaruh secara signifikan terhadap kompetensi lulusan mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado dan dipengaruhi secara langsung oleh variable lingkungan keluarga, minat berwirausaha, dan motivasi kerja.

Kompetensi lulusan mahasiswa dipengaruhi secara langsung oleh minatberwirausaha, motivasi kerja dan intensitas belajar mahasiswa,namun secara tidak langsung dipengaruhi oleh lingkungan keluarga melalui variable intensitas belajar pada mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado.

SARAN

Berdasarkan hasil penelitian dan kesimpulan maka dapat dikemukakan saran- saran sebagai berikut:

Dalam kegiatan belajar mengajar ada tugas tambahan yang sepertinya harus dilakukan oleh dosen, yaitu mengeluarkan rasa ingin atau suka dari mahasiswa terhadap pengembangan kompetensi lulusan mahasiswa. Karena dengan besarnya minat berwirausaha itu akan mempengaruhi intensitas belajar dari mahasiswa itu sendiri dan kompetensi lulusan mahasiswa akan tercapai dengan baik sesuai yang diharapkan.

Untuk menuju kompetensi lulusan mahasiswa yang baik ternyata tidak hanya dibutuhkan factor intrinsik dari para mahasiswa sebagai peserta didik, namun dibutuhkan juga factor ekstrinsik yaitu lingkungan keluarga. Ini dibuktikan dengan tidak ada pengaruhnya lingkungan keluarga terhadap kesuksesan mahasiswa dalam memperoleh kompetensi lulusan mahasiswa yang baik. Ini dimungkinkan karena jarak antara orang tua sebagi bagian keluarga dan kurangnya pengawasan dari mahasiswa,maka perlu tambahan intensitas belajar kepada para mahasiswa untuk mendapatkan kompetensi lulusan mahasiswa yang baik sesuai dengan harapan.

DAFTAR PUSTAKA

Agustin, Vony. 2012. Kompetensi Lulusan Sarjana Strata 1 (S1) Psikologi dalam Menghadapi Dunia Kerja Pada Mahasiswa Perguruan Tinggi "X". Jurnal Ilmiah Mahasiswa Universitas Surabaya Vol.1 No.1 dalam https://media.neliti.com/media/publications/186931-ID-kompetensi-   lulusan-sarjana-strata-1-s1-p.pdf diakses tanggal 17 Pebruari 2019

Ahmadi, Abu dan Nur Uhbiyati. 2015. Ilmu Pendidikan. Jakarta: Rineka Cipta.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

Amir Taufik. 2015. MerancangKuesioner; konsepdanpanduanuntukpenelitiansikap, kepribadian, danperilaku. Jakarta: Kencana

Arikunto, Suharsimi. 2010. Prosedur Penelitian: Suatu Pendekatan Praktik. Jakarta: Rineka Cipta.

Badan Pusat Statistik Jakarta Pusat. 2013. Statistik Indonesia Tahun 2013. Jakarta Pusat : Badan Pusat Statistik dalam https://www.bps.go.id/

Badan Standar Nasional Pendidikan. 2006. Standar Isi dan Standar Kompetensi Lulusan untuk Satuan Pendidikan Dasar SD/MI. Jakarta: BP. CIPTA JAYA

Basrowi. 2016. Kewirausahaan, Untuk Perguruan Tinggi. Bogor: Ghalia Indonesia.

Darmadi, Hamid. 2014. MetodePenelitianPendidikandanSosial. Bandung: Alfabeta

Departemen Pendidikan Indonesia (2008). Kamus Besar Bahasa Indonesia. Jakarta: Balai Pustaka

Djaali. 2008. PsikologiPendidikan. Jakarta: BumiAksara.

Edison, Emron, Yohny Anwar, dan Imas Komariyah. 2016. Manajemen Sumber Daya Manusia. Bandung: Alfabeta.

Frinces, Z. Heflin. 2011. Manajemen SDM: Kiat Memenangkan Persaingan Global.Yogyakarta: Gradasi Media.

Fuad, AfdhalAhmad. 2008. Tips dan Trik Public Relations. Jakarta: PT. Gramedia Widiasarana Indonesia.

Griffin, Jill. 2003. Customer Loyalty: Menumbuhkan Dan Mempertahankan Pelanggan. Jakarta: Airlangga

Hasbullah. 2005. Dasar-dasar Ilmu Pendidikan. edisirevisi. Jakarta:PT RajaGrafindoPersada.

Hazim Nurkholif. 2005.Teknologi Pembelajaran. Jakarta: UT PUSTEKOMIPTPI Indarti, Nurul., Rostiani, R. 2008. Intensi Kewirausahaan Mahasiswa: Studi Perbandingan antara Indonesia, Jepang dan Norwegia. Online. dalam http://directory.umm.ac.id/Wirausaha/indarti-rostiani-jebi-2008.pdf diakses tanggal 17 Februari 2019

Juliansya Noor, 2011. MetodelogiPenelitianSkripsi, Tesis, Disertasi&KaryaIlmiah. Jakarta: Kencana

Kadir. 2015. StatistikaTerapan – Konsep, ContohdanAnalisis Data Dengan SPSS /LisrelldalamPenelitian. Jakarta: Rajawali Pers.

KBBI. 2016. Kamus Besar Bahasa Indonesia (KBBI). Online. Diakses pada 27 Juni 2019 dari https://kbbi.web.id/lulus

Kementerian Koperasi dan Usaha Kecil dan Menengah dalam http://www.depkop.go.id/uploads/laporan/1549946778_UMKM%202 016-2017%20rev.pdf diakses tanggal 06 Juli 2019

Majid, Abdul. 2005. Perencanaan Pembelajaran Mengembangkan StandarKompetensi Guru.Bandung: Remaja Rosdakarya

Meredith, Geoffrey G. 2002. Kewirausahaan: Teori dan Praktik. Jakarta: PPM Moeheriono. 2012. Pengukuran Kinerja Berbasis Kompetensi. Jakarta: Raja Grafindo Persada

Mulyasa. 2010. Menjadi Guru Profesional (Menciptakan Pembelajaran Kreatif dan Menyenangkan). Cetakan kesembilan.Bandung: Rosda.

Munthe, Bermawi. 2009. Desain Pembelajaran. Yogyakarta: Pustka Insan Mandiri

Nana SyaodihSukmadinata. (2009). Landasan Psikologi Proses Pendidikan.Bandung: Remaja Rosdakarya.

Pedoman Akademik Universitas Negeri Manado tahun 2016. Universitas Negeri Manado Hal 53-62 Peraturan Menteri Ristek, Teknologi dan Pendidikan Tinggi No 44 Tahun 2015, tentang standar Nasional Pendidikan Tinggi Peraturan Pemerintah RI No.19 Tahun 2005 tentang Standar Nasional Pendidikan Peraturan Presiden No 8 Tahun 2012 tentang Kerangka Kualifikasi Nasional Indonesia

Poerwadarminta. W.J.S. 2003. Kamus Umum Bahasa Indonesia. Jakarta: Balai Pustaka

Purwanto, Ngalim. 2007. Psikologi Pendidikan Remaja. Bandung: Rosdakarya Purwanto. 2009. Evaluasi Hasil Belajar.Yogyakarta: Pustaka Pelajar

Pusat Bahasa, 2008, Kamus Besar Bahasa Indonesia, Jakarta: PT Gramedia Pustaka Utama

Riduwan. 2011. Belajar Mudah Penelitian. Bandung: Alfabeta.

Rifandi, Ahmad. 2013. Mutu Pembelajaran dan Kompetensi Lulusan Diploma III Politeknik. Cakrawala Pendidikan, Th. XXXII, No. 1 dalam http://lppmp.uny.ac.id/sites/lppmp.uny.ac.id/files/12%20Ahmad%20Rifandi%20327edit%20Kastam_.pdf diakses tanggal 06 Juli 2019

Sardiman, A.M. 2014. Interaksi dan Motivasi Belajar-Mengajar. Jakarta: PT RajaGrafindo Persada.

Seftiawan, Dhita,. 2018, 630.000 Orang Sarjana Masih Menganggur. dalam https://www.pikiran-rakyat.com/pendidikan/2018/03/26/630000- orang-sarjana-masih-menganggur-421873 diakses tanggal 17 Pebruari 2019

Setiadi. 2008. Konsep Dan Proses Keperawatan Keluarga. Yogyakarta: Graha Ilmu.

Shakir, R. 2009. Soft skills at the Malaysian Institutes of Higher Learning. Asia Pacific Educ. Rev., 10:309 315.

Siagian, Sondang P. 2003. Teori & Praktek Kepemimpinan.Jakarta :Rineka Cipta

Sifa, Nurkhin. (2016). Pengaruh Pendidikan Kewirausahaan, Lingkungan Keluarga, dan Self Efficacy Terhadap Minat Berwirausaha Siswa siswa kelas XI Program Keahlian Akutansi SMK Negeri 9 Semarang. Universitas Negeri Semarang, Indonesia. Economic Education Analysis Journal. p-ISSN 2252-6544, e-ISSN 2502-356X. diakses 19 Pebruari 2019.

Slameto. 2013.Belajar dan Faktor-Faktor yangMempengaruhinya. Jakarta: PT. Rineka Cipta.

Soemanto, Wasty. 2012.Psikologi Pendidikan.Jakarta: PT Rineka Cipta

Sofyandi, Herman dan Garniwa, Iwa. 2007. Perilaku Organisasional, Yogyakarta: Graha Ilmu.

Sudjana, Nana. 2010. Cara Belajar Siswa Aktif dalam Proses Belajar Mengajar. Bandung: Sinar Baru Algensindo

Sudjana, Nana. 2011. Penilaian Hasil dan Proses Belajar Mengajar. Bandung: Rosda Karya

Sudjana, Nana. 2012. Penelitian Hasil Proses Belajar Mengajar. Bandung: Remaja Rosda Karya.

Sugiyono.2014. MetodePenelitian Kuantitatif Kualitatif danR&D.Bandung: Alfabeta

Sukardi.2013. Metodelogi PenelitianPendidikan Kompetensi dan Praktiknya. Jakarta: BumiAksara.

Supardi. 2015. Penilaian Autentik Pembelajaran Afektif, Kognitif, danPsikomotor: Konsep dan Aplikasi. Jakarta: Rajawali Pers.

Suryana, Yuyus dan Bayu, Kartib. 2011. Kewirausahaan Pendekatan Karakteristik Wirausahawan Sukses. Jakarta: Kencana.

Sutrisno, Edy. 2011. Manajemen Sumber Daya Manusia. Jakarta: Kencana.

UIN Jakarta. 2017. Kualitas Pendidikan di Indonesia Masih Memprihatinkan tanggal 5 November 2017 dalam https://www.uinjkt.ac.id/id/kualitas- pendidikan-di-indonesia-masih-memprihatinkan/ diakses tanggal 17 Pebruari 2019

Undang-undang No. 14 Tahun 2005 Tentang Guru dan Dosen

Undang-undang No. 20 Tahun 2003 tentang Sistem Pendidikan Nasional

Undang-undang Republik Indonesia No.13 tahun 2003 Tentang ketenagakerjaan. www.pendidikandiy.go.id/file/uu/uu_13_2003.pdf . Diakses pada tanggal 01 Juli 2019

UU RI No 12 Tahun 2012 tentang Pendidikan Tinggi

UU RI No 5 Tahun 2003 tentang Sistem Pendidikan Nasional

Wikipedia bahasa Indonesia. diubah pada 16 Februari 2019. Taksonomi Bloomdalam https://id.wikipedia.org/wiki/Taksonomi_Bloom diakses tanggal 17 Pebruari 2019

Winkel, W.S. (1999). Psikologi Pengajaran. Jakarta: Gramedia.

Wirawan. 2009. Evaluasi Kinerja Sumber Daya Manusia Teori Aplikasi dan Penelitian. Jakarta: Penerbit Salemba Empat

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PROJECT MANAGEMENT AND CHALLENGES TOWARDS THE INDUSTRIAL ERA 4.0

Muhammad Giatman, Hendra Pratama, Sri Siswati

Abstract

Project Management is one of the areas of expertise that is needed in project work activities, especially in building construction services. Because a project work is a unique and complex product, which is carried out by many professions and expertise, in various stages, starting from the initiation stage, planning/design, bidding/auction, physical implementation, and Delivery and Operation. For this reason, good managerial skills are needed in managing through good work collaboration between time and between disciplines related to the needs of the project. Based on the results of research by Egan and Teicholz (2004) found that the productivity of construction workers decreased from 100% to 80%, while non-agricultural productivity increased from 100% to 220% from 1998-2004. This indicates the need to improve the productivity of construction work. By developing a construction project management system through the implementation of Building Information Modeling (BIM), it has been proven to be able to significantly improve the effectiveness and efficiency of construction work. Therefore, the introduction and implementation of BIM as a whole needs to be done in order to improve the productivity of project work in accordance with the direction of the development of the industrial revolution 4.0.

Keyword: Project management, Productivity, Industry revolution 4.0, Building Information Modeling

Preliminary:

Project management is a scientific discipline in terms of planning, organizing, implementing and controlling, project work. The project itself is an activity that is temporary and unique which is characterized by the start time and completion time of the work. Time itself is always limited, in addition to limited resources and funds in achieving specific and unique goals and results (Nokes, Sebastian: 2007). Projects are always temporary or temporary which is very different from the nature of work in the Production (Operation-Production) Industry (Paul C. Dinsmore et al:2005). The Production Industry has a repetitive nature, where activities are usually permanent or maybe semi-permanent in producing products or services (services). Therefore, in practice, the type of management for these two systems is quite different, with technical capabilities. and specific strategic management decisions.

The main challenge of a project is to achieve the project goals and objectives properly, effectively, and efficiently, and to be aware of the previously understood limitations. These three things are called " triple constraints " or "three constraints". With the increasing awareness of the dignity of the individual in carrying out the project, this limit is then developed by adding a fourth limitation, namely the safety factor (K3) . (Lewis R. Ireland: 2006).

The next challenge is how to optimize and allocate all resources and integrate them to achieve the project objectives that have been determined.

Project Process

As previously explained, a project is an activity in order to produce a specific product (uniq) which is very different from production line/factory activities that produce uniform (mass-product) and repetitive production . Therefore, the production process and its management require specific methods and strategies for each product, which is called a project. The product of the project is not always found in the form of goods, but also in the form of services. An activity or product can be said to be a project if three main characteristics are met, namely (1) the activity and its results are unique, (2) the production process is complex, and (3) is limited by the completion time. The main challenges in project work are also known as

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triple-constraints , namely Quality, Cost, and Time. Therefore, in the project implementation process, a separate management process is needed that is in accordance with the needs and problems of the project work itself which is called project management.

Because the scope and field of project activities are not limited, almost all human activities and activities can be made the object of project work. However, conceptually and the characteristics of the plurality and complexity of the project are found in civil engineering work, especially in construction work, construction work can be used as a general reference as a characteristic of project work. So by discussing Construction Project Management will be able to represent a discussion of project management in general.

Phased projects in the "traditional approach", there are five main stages of a project called the " Project Life Cycle ". In general, the project life cycle is a method to describe how a project is planned, controlled, and monitored from the time the project is agreed to be carried out until the final project objectives are achieved, namely:

a) Initiation stage, is the initial stage of project activities since a project is agreed to be carried out. At this stage, the problem to be solved will be identified. Several solution options to solve the problem are also defined. A feasibility study can be carried out to select a solution that has the greatest possibility to be recommended as the best solution in solving the problem that will be guided in a Term of Reference (TOR). Once a solution has been defined, a project manager will be appointed so that a project team can be formed.

b) Planning and Design Phase, at this stage, detailed planning documents will be prepared as a guide for the project team during project activities. The activities that will be carried out at this stage are making project plan documentation , resource plans , financial plans , risk plans , acceptance plans , communication plans , procurement plans , supplier contracts and perform phase reviews.

c) Construction stage, namely the execution stage or project implementation. At this stage, the deliverables or project objectives are physically built. All activities contained in the project plan documentation will be executed.

d) Control Phase, while development activities take place, several management processes need to be carried out to monitor and control the completion of deliverables as the final project result.

e) Closing and Operational Phase, this stage is the end of project activities. At this stage, the final project deliverables and their documentation are submitted to the customer (user), contact with the supplier is terminated, the project team is disbanded and reports to all stakeholders stating that the project activities have been completed. The final step that needs to be done at this stage is to conduct a post implementation review to determine the level of project success and record every good lesson (best practice) obtained during project activities as lessons for future projects.

Considering that each stage requires its own process with various fields of knowledge and expertise, skills, involving all factors of production, both human, material, machine and equipment, work methods, money, science and technology, information, and energy (5M+2I, E) which are mutually interact in an integral system in order to achieve project objectives within a limited time , cost and quality . Then the role of project management will be very strategic in achieving the project's goals.

Project Management Triangle (PMBOK)

There are three main aspects that need attention in project management activities, known as the triangle constraint, namely:

Cost : relates to the cost of the resources needed to complete project activities. However, project cost management must also consider the effect of project decisions on the cost of using project products. For example, limiting the number of design reviews can reduce project costs at the expense of increasing customer operating costs.

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Quality : Project quality management should address the project management of the product of the project. Failure to meet quality requirements in any of the dimensions, can have serious negative consequences for any or all of the project stakeholders

Time: Any of several projects, especially smaller ones, sequencing activities, estimating activity durations, and developing schedules so closely related that they are viewed as a single process

A project manager is a professional in the field of project management. The project manager has the responsibility for planning, executing and closing a project. A good project manager must have competencies that include elements of knowledge, skills and attitudes. These three elements are one of the important factors in determining the success of the project. A project will be declared successful if the project can be completed in accordance with the planned time, scope and cost. The project manager is the individual who most determines the success / failure of the project. Because in this case the project manager is the person who plays an important role in integrating, coordinating all the resources owned and fully responsible for the success in achieving project goals. The functions of project management are:

As Quality Control so that it can maintain conformity between planning and implementation

Anticipating changes in uncertain conditions in the field as well as overcoming the constraints of limited implementation time.

Monitor the achievements and progress of the projects that have been achieved. This is done with daily, weekly and monthly hospitalizations

The results of the evaluation can be used as action in making decisions on problems that occur in the field.

The managerial function of management is a good information system that can be used to analyze performance in the field To be a good project manager, there are 9 skills that must be mastered (PMBOK). That is:

a) Scope Management;
b) Time Management;
c) Cost Management;
d) Quality Management;
e) Human Resource Management;
f) Procurement Management;
g) Communication Management;
h) Risk Management;
i) Integration Management.

A good project manager must also prepare and complete the skills that can be obtained through project management courses. The international standard reference guide that is often used in the field of project management is PMBOK (Project Management Body of Knowledge). After a project manager is deemed sufficient to master the field of work being undertaken, it is advisable to be able to take a project management certification. Those who succeed in obtaining this certification will receive a PMP (Project Management Professional) title behind their name as proof of their related abilities.

Problems in the Construction Industry:

Construction project performance, construction project portfolios, companies involved in construction, regional and national construction sectors, and the international construction sector have been topics of research discourse for decades. Starting from Sir John Egan's (1998) report entitled "Rethinking Construction" (Rethinking Construction), Teicholz (2004) has sparked heavy discussion by highlighting the comparison of construction productivity with non-agricultural productivity in the US from 1998-2004.

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where "Productivity Construction Workforce decreased from 100% to 80%, while non-farm productivity increased from 100% to 220%. Egan and Teicholz started the research focusing on the importance of measuring construction sector performance at various levels; focus more on output to a country's Gross Domestic Product.

According to Teicholz, the main problems of low labor productivity in the construction industry are caused by the following:

a) The construction industry project management approach is still fragmented due to the traditional project approach (Design-Biding-Build), where: (a) collaborative involvement of Planners, supervisors and contractors, or construction managers during the project design phase, (b) low labor productivity, (c) the problem of constructability (ability to build).

b) The use of traditional 2Dimensional CAD technology, namely (a) Does not promote a true collaborative approach, (b) Architects and engineers produce their own fragmented CAD documents to convey their designs to owners/Users and contractors, and (c). Drawings are not integrated and usually cause conflicting information resulting in inefficiencies in labor productivity, (d) 2D CAD does not promote the integration of drawings with schedules and costs, and (e). The construction industry has established the basis for modeling object-oriented building products. 3D in the 1990s.

c) The construction industry has reached the point of realizing the true benefits of technological advances. The gap in labor efficiency can be closed through the concept of Building Information Modeling. Only recently, various BIM tools have become available throughout the construction industry (Eastman, 2008).

In addition to the problems above, the world of the Construction Industry in Indonesia, which is included in the group of Construction Services business fields, finds two dimensions of problems that are characteristically very different, namely Problems in the Large-scale Construction Service Business Group and the small-medium scale. For the construction service business group on a large scale, the problems presented by Teicholz are very relevant, but will be very different from the medium and small class construction service business group, which not only talks about the fragmentation of fields and technology, but is still struggling with other matters. Funding (investment), technology and work professionalization. Data from the Ministry of PUPR-2018 recorded 119,236 BUJK (companies in the construction services group), around 87% of companies engaged in construction services were small scale, 11.73% medium scale companies and only 1.03% companies included in the Large scale category , and the rest are individual companies, consisting of the fields of Planning, Supervision, Construction Management, and Contractors and not including material, equipment and labor supply companies (Rosmarini: 2019). In addition, of the ± 8.3 million Indonesian construction workers, about 5% are experts, 15% are skilled workers and the remaining 80% are unskilled. Of this amount, only 20% or 1.6 million people are classified as construction workers, and even then only 195,312 have been certified by certified experts with professional competence as Experts (LPJKN data in 2018).

In cases in the field, various input and process problems as well as regulations were found. Limited funding, technology, and competent human resources are often problems that continue in the activity process, in addition to regulations that are not in favor of the implementation of the process itself. For example, there is often a mismatch between the quality of human resources stated in the contract documents and those present in the field. This of course will have a significant impact on the quality of the project work process, the project completion process and the effectiveness and efficiency of project implementation, both at the planning, implementation and monitoring levels. These medium and small companies certainly need different strategies in an effort to increase their work productivity compared to large companies, so that they can and are able to develop following developments in the needs of construction service management which are moving very dynamically at this time.

The National Construction Services Development Agency (LPJKN)-2019, is an independent official institution tasked with carrying out the Guidance and Development of a national construction service business with

the government in accordance with Law no. 2 of 2017 concerning construction services, which is a refinement of Law No. 18 of 1999 on the same matter. The objectives of the law are as follows:

a) provide a direction for the growth and development of Construction Services to realize a strong, reliable, highly competitive business structure and quality Construction Services results;

b) realize the orderliness of the implementation of Construction Services that guarantees equality of position between Service Users and Service Providers in carrying out their rights and obligations, as well as increasing compliance in accordance with the provisions of laws and regulations;

c) realizing increased public participation in the field of Construction Services;

d) organize a Construction Services system capable of realizing public safety and creating a comfortable built environment;

e) ensure good governance of the implementation of Construction Services; and

f) creating added value integration from all stages of the implementation of Construction Services.

Keeping up with technological advances in the Industrial Revolution 4.0 era. several developed countries such as the USA, UK, Germany, Norway, Denmark, Firland, Hong Kong, South Korea and Singapore have implemented a system called Building Information Modeling (BIM).

Building Information Modeling (BIM)

Definition.
Building Information Modeling (BIM) is a project management method developed in a comprehensive and integrated manner from the conceptual, planning, design, tender, implementation, control, handover, operation to demolishing stages , through a comprehensive and integrated information modeling system. based on big-data as part of the Industrial Revolution 4.0 era. Definitively BIM is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from the earliest conception to demolition. . Thus BIM is:

Information Database in 3D Model
BIM is VISUALIZATION at every stage of the PROJECT
BIM is INTEGRATION
BIM is a METHOD, not software (a. Building Information Modeling (BIM) as a method or workflow, b. Platform/software supports the implementation of the BIM method)
Through the BIM method, various information related to the project planning process which with the conventional method is carried out separately in each stage and by the parties associated with each process through the BIM method can be carried out in an integrated and simultaneous manner, so that it will be faster, more accurate and efficient. process at each stage, and allow optimal results to be obtained (see Figures 3a and 3b)

What is a BIM? - Lifecycle Information View
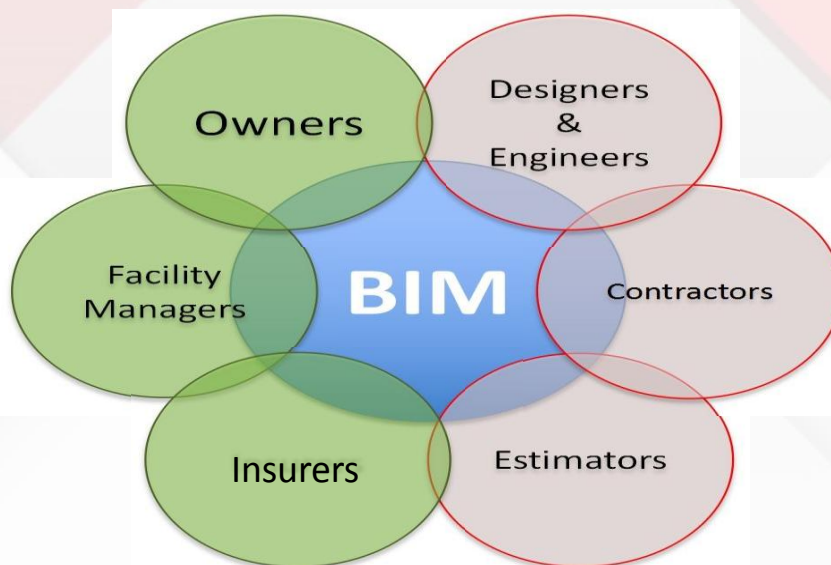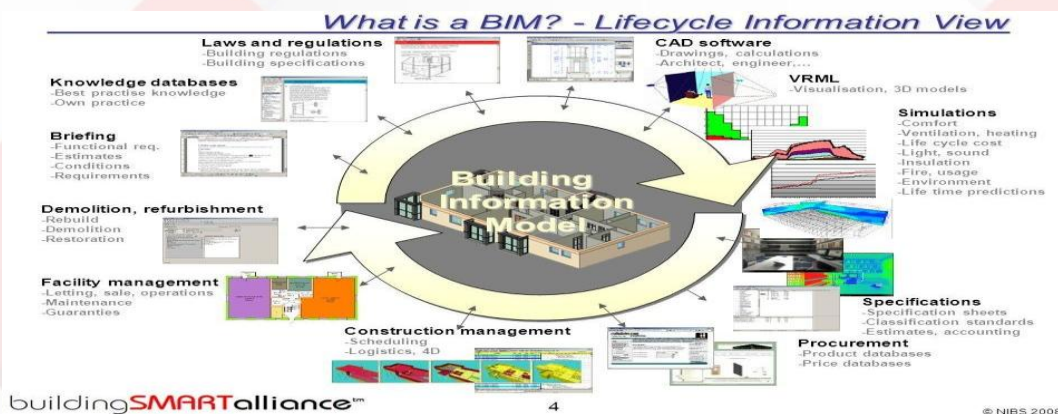
The existence of BIM will be very useful in terms of obtaining visualization & effectiveness of information in the real context, accurately predicting performance according to the required specifications, assisting building owners for decision making throughout the planning, design, construction and asset management processes , and will reduce risks and surprises. unexpected surprise.

BIM as wrong one digital technology will certainly be able to accelerate infrastructure development, because: Era 4.0 has penetrated into the joints of the national economy

The presence of technology will provide added value for the implementation of PUPR infrastructure development

BIM is a digital representation of the physical and functional characteristics of a building (or BIM object).

BIM contains all information about building elements that are used as a basis for decision making in the life cycle of the building, from concept to demolition.

The existence of BIM is very important now and in the future, in connection with a number of project management problems that have so far interfered with its smoothness and success, namely:

Project planning/archiving database system is still not good

Project planning databases are not integrated with each other

In-efficiency and in-effectiveness of project planning and implementation occurs continuously.

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In accordance with the development and progress of community civilization in the era of the industrial revolution 4.0, problems in future project work will develop into:
Project work will become more complex (multi system)
Demand visualization of project design & post implementation.
Demand for savings (low cost) & right on target (efficiency – effectiveness)
Through the implementation of BIM on construction project work, it is not only able to produce 2D information, but will produce dimensional patterns of information up to 7D, with the details:
3D Building data & Information (Project Scope Prefabrication, Structural Detailing Object Specification Field layout & civil data).
4D, Project Schedule & Phasing (Just in Time schedule Installation schedule Payment Approval, Last Planner schedule Critical Point).
5D, Work Breakdown Structures (Conceptual Cost Planning, Quantity Take off Trade Verification Value Engineering, Prebarication).
6D, Energy analysis (Green Building Element, Green Building certification Tracking, Green Building Point tracking).
7D, Building Life Cycles (BIM as built data, BIM cost operation & Maintenance, BIM Digital lease planning)

Thus the construction industry has reached the point of realizing the true benefits of technological advances. The gap in labor efficiency can be closed through the concept of Building Information Modeling. Only recently, various BIM tools have become available throughout the construction industry (Eastman, 2008).

BIM Implementation in Indonesia

In the context of implementing Building Information Models in the country, the Ministry of Public Works and Public Housing (PUPR) has compiled a Roadmap for BIM Development through 4 stages, namely:
1) **Adoption,**
a) Construction stakeholder understanding of "What is BIM, Why BIM, and How to BIM "
b) Standard & protocol (SNI and SKKNI) BIM
c)   Regulations regarding the mandatory use of BIM, incentives, pricing policies, etc.
d) Pilot project

2) **digitization,**
a) Strengthening IT infrastructure (storage, cloud computing, ERP platform)
b) Strengthening the database/BIM library (collaboration with the Ministry of Industry)
c)   Project monitoring and supervision with VR & MR technology

3) **collaboration,**
a) Collaborative standards in the construction industry Setup
b)   platform for BIM integration with e-submission (OSS, SIMBG, etc.) BIM implementation
c)   full-scale project (3D to 7D) with the principles of Virtual Design and Lean Construction (VDC)

4) **integration**
a)   BIM integration in the entire construction process (e-submission, OSS SIMBG, claim, commissioning, handover, etc.)

b)   Platform and policy setup for City Information Modeling (CIM) (Ober Gultom: 2019)
In order to accelerate the socialization of the use of building information modeling in Indonesia, the Indonesian BIM Institute has been established in Standards & Open Collaboration for Design,

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Engineering, Construction & Manufacturing Industries and Engineer consultants. Of course, it Engineering, Construction & Manufacturing Industries and Engineer consultants. Of course, it is also the duty of universities to participate in socializing and developing the use of BIM to prospective project neginer students through the development of teaching materials in project management lectures.

CLOSING

At the end I would like to reiterate several important points that need to be addressed in addressing various future project management issues, namely:

a) Work productivity in the construction services sector is still very low, more tangible productivity improvement efforts are needed.

b) The medium and small business groups that control more than 95% of the construction service industry market segment are still struggling with problems of funding (investment), technology and low work professionalization. Project Management Methods are still partial and not well integrated.

c) Building Information Modeling (BIM) is an alternative in increasing work productivity in the Indonesian construction services sector.

d) The Government of Indonesia through the Ministry of PUPR has initiated to implement BIM in the execution of government projects, through four stages, namely: adoption, digitization, collaboration, and integration.

e) Universities have a responsibility in preparing prospective project workers who can work more productively and professionally.

f) Students should be encouraged to have knowledge of BIM

REFERENCES

Aish, R. (1986) "Building Modelling: The Key to Integrated Construction CAD" CIB 5th International Symposium on the Use of Computers for Environmental Engineering related to Building, 7–9 July.

David I. Cleland, Roland Gareis (2006). Global project management handbook. "Chapter 1: "The evolution of project management". McGraw-Hill Professional, 2006. ISBN 0-07-146045-4

Dennis Lock (2007) Project management (9e ed.) Gower Publishing, Ltd., 2007. ISBN 0-566-08772-3

Eastman, Chuck; Tiecholz, Paul; Sacks, Rafael; Liston, Kathleen (2011). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors (2nd ed.). Hoboken, New Jersey: John Wiley. pp. 36–37

Egan, J. (1998). Rethinking Construction: Report of the Construction Task Force, London: HMSO.

Giatman, M (2013) Manajemen Proyek Konstruksi, Jurusan Teknik Sipil Fakultas Teknik Universitas Negeri Padang

Lewis R. Ireland (2006) Project Management. McGraw-Hill Professional, 2006. ISBN 0-07-147160-X. p.110.

Manlian N Simanjuntak (2019), Industri 4.0, Rantai Pasok, SDM Jasa Konstruksi Indonesia, Permasalahah dan Solusi, Kertas Kerja Seminar/Workshop Konstruksi Indonesia 2019, Jakarta 6-9 November 2019

Martin Stevens (2002). Project Management Pathways. Association for Project Management. APM Publishing Limited, 2002 ISBN 1-903494-01-X p.xxii

Morgen Witzel (2003). Fifty key figures in management101-96 .p .0-36977-415-0ISBN .2003 ,Routledge .

Nokes, Sebastian (2007). The Definitive Guide to Project Management.. 2nd Ed.n. London (Financial Times / Prentice Hall):. 2007. ISBN 978-0-273-71097-4

Ober Gultom (2019), Kebutuhan Standar kompetensi BIM pada Asosiasi Profesi di Indonesia. Kertas Kerja Seminar/Workshop Konstruksi Indonesia 2019, Jakarta 6-9 November 2019.

Paul C. Dinsmore et al (2005) The right projects done right! John Wiley and Sons, 2005. ISBN 0-7879-7113-8. p.35 and further.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

Rosmarini Arifudding (2019), Gambaran Suplay Deman Tenaga Konstruksi Indonesia. Kertas Kerja Seminar/Workshop Konstruksi Indonesia 2019, Jakarta 6-9 November 2019

Ruffle S. (1986) "Architectural design exposed: from computer-aided-drawing to computer-aided-design" Environments and Planning B: Planning and Design 1986 March 7 pp 385-389. Abstract

Teicholz, P. (2004). Labor Productivity Declines in the Construction Industry: Causes and Remedies. AECbytes Viewpoint, Issue 4 April 14, 2004

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

The Necessity of Digitizing Pre-Teacher Learning for Vocational Education in the Field of Civil Engineering Education in the Era of Environmental Turbulence In Indonesia

Machmud Sugand, Imam Alfianto, M. M. Al Ansyori

Abstract— The development of science and technology, globalization in the economic sector, labor disruption, the industrial revolution 4.0, the challenges of the era of society 5.0, and changes in institutional governance policies cause complex and ambiguous uncertainty. This phenomenon is known as environmental turbulence. The phenomenon of uncertainty and also accompanied by the Corona Covid-19 virus outbreak that has hit many countries, adds to the difficulties for a country, especially in providing health services, education, and also results in weakening economic growth. Vocational education, especially in the field of civil engineering, is one of the backbones of the country to be able to immediately recover from an economic downturn in a country. It can be seen that construction projects by the Government are still allowed to carry out activities to complete work even during a pandemic and with strict health protocols. Vocational education in the current era does not only meet the competency needs of industrial workers, but must be proactive in capturing and anticipating the uncertainty that occurs in the environment. Digitization in the field of Civil Engineering is one of the right steps to answer the challenges in the era of environmental turbulence by considering: 1) digitization is faster in responding to changes; 2) more efficient use of resources to make changes; 3) effectively achieve the changes that occur; 4) has high transferability; 5) safe from the spread of the Coronavirus disease (COVID 19) virus because it is carried out remotely; and 6) has an accurate track record in its development. This study will discuss the digitalization of learning in the field of Civil Engineering in vocational education in the era of environmental turbulence in Indonesia.

Keywords— environmental turbulence, digitalization of learning, civil engineering expertise

Introduction

Advances in science, technology, and industry are things that play an important role in the era of the 21st century. Advances in science and technology change life and social order which in turn has an impact on the need for manpower that can meet these changes. Trends of change in the world of work in the future include basic digital skills and literacy, learnability skills; skills needed for greening economies; skills required for engaging in Industry 4.0 occupations, and soft skills that help to improve workplace effectiveness, such as skills for teamwork, problem-solving, creativity, and design-thinking [1]. In the context of the industrial revolution 4.0, changes occur in the world of work along with continuous automation and real-time-oriented production control which brings many consequences for users and providers of vocational education to respond to the needs and expectations of these changes in the world of work [2]. Vocational education institutions as institutions that prepare workers in accordance with the needs of the latest world of work competencies, are also required to make changes both in input, process, and output. The changes referred to in the implementation of vocational education are certainly oriented to the formation of graduate competencies so that they are able to face stiff competition in the world of work in the future.

Globalization cannot be avoided by a country, world issues are also a measure of a country's success in overcoming these problems. The impact of globalization on culture and the education system is a major

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concern. The existence of an effective education system will be the basis for being able to take advantage of the positive impacts and reduce the negative impacts of globalization [3]. The main issues that measure the success of a country include health, education, economy, and the environment. One indicator of success in the field of education services is measured globally from the results of the 2018 Program for International Student Assessment (PISA). When compared to ASEAN countries, Indonesia is only above the Philippines which sits in the most backward position (https://www.kemdikbud.go.id/). The results of the assessment obtained from international institutions are a trigger for the state to make improvements and improve the quality of services which of course lead to a better direction. Therefore, the Indonesian Government's policy in vocational education is to improve the quality of human resources in order to be able to compete globally.

Changes in the world of work in the era of environmental turbulence are triggered by rapid technological changes. The loss of certain types of work and the emergence of new types of work that are loaded with the use of information technology and automation is one sign of a changing world of work. The impact of changes in the world of work is also felt by vocational education, the preparation of the workforce that was originally meant to meet the needs of workers in industry has been replaced by robots. Changes in work in civil engineering have also begun to shift, the type of drafter work in construction work has begun to be abandoned and replaced with modeler work. The emergence of this type of modeling work is because there are demands from stakeholders that to design and carry out complex construction work, you must apply Building Information Modeling (BIM) which is full of the use of digital technology [4].

Digitization in the field of construction services is non-negotiable and is a necessity for construction players to be able to compete globally. The impact of digitalization in the construction sector will save construction time, improve construction quality and cost management, and make reliable management decisions based on the latest data [5]. The big question that arises from the shift in the phenomenon of the type of work that occurs in the construction services sector is "Who is the operator of digitizing the construction sector?" Of course the answer is that the workforce prepared by the campus is in accordance with the required qualifications. To realize the ability of the workforce in the digitalization era, the world of vocational education must be able to produce workers who have digital skills [6]. The concept of digital skills is more than just knowing how to use ICT in jobs that are only capable of using computers and Internet technology to acquire, produce, and share information. Digital skills are used to solve complex problems, process and critically evaluate information to utilize it in solving complex problems and use appropriate techniques to generate or access Internet content.

Vocational education aims to prepare the workforce in accordance with the competency needs of the world of work and the demands of environmental turbulence. It is difficult for vocational education institutions to meet these two demands without having a learning strategy that is systematic, measurable, and adaptable to change without compromising the core of knowledge that must be mastered by graduates. Mastery of technical skills and non-technical abilities must remain a concept in learning in the era of environmental turbulence. Technical capabilities represented by essential competencies will be able to respond to changes in the progress of science and technology in the field of civil engineering, while non-technical competencies are built through integrated learning with hard skills. According to Al-Mamun, soft skills are certain abilities that can improve one's performance and career prospects, vocational teachers must prepare their graduates' soft skills so that they can compete globally [7].

The basic question in this literature study is "How to prepare prospective vocational teachers in the field of Civil Engineering who have the capability and adaptability to environmental turbulence?" Many variables are relevant to the implementation of pre-teacher education to be able to produce as expected.

One of the keys to success in answering these questions is to formulate a c a curriculum which is the spirit of education. The curriculum is designed to contain essential competencies in the field of civil engineering expertise and pedagogic competencies that are in accordance with the characteristics of vocational education and are current in their time. Changes made in the implementation of vocational education are aimed at making vocational education graduates successfully compete in the global market of the 21st century [8].

Digitizing Vocational Learning

The demands of vocational school teachers in the field of Civil Engineering expertise in the era of environmental turbulence are expected to meet the needs of 21st century skills which include; (1) life planning; (2) flexibility and adaptability; (3) initiative and self-management (4) entrepreneurship; (5) social and cultural interactions; (6) productivity and accountability; (7) leadership; (8) critical thinking, (9) problem solving; (10) communication; (11) collaboration and teamwork; (12) lifelong learning; and (13) digital literacy [9]. To achieve the demands of 21st century learning, vocational teachers must have learning experiences obtained directly from campus while attending pre-teacher education and also from industry [10]. Vocational teachers to be able to meet the demands of 21st century skill needs must be able to synthesize and design learning and understand appropriate learning media for students [11]. The use of multimedia games as an instrument for critical thinking activities in learning is able to improve learning outcomes in the current Covid-19 pandemic conditions and is one of the implementations of the results of experience and research to meet the skills needs of the 21st century [12]. In addition to this, the challenge for teachers in the future is not only to have knowledge and skills that continue to develop, they must also be able to apply new teaching and learning approaches to meet the needs of students who may or may not grow in the digital era [13] [14].

Learning by utilizing web based learning as a learning medium in the world of vocational education will provide convenience for students in learning activities such as increasing productivity, being flexible and interactive [15]. Characteristics of learning in vocational education which includes learning theory and practice that are more dominant, efforts are needed to digitize subject content efficiently and effectively. Efficient means using few resources but getting maximum results, while effective means that the learning media used is in accordance with learning outcomes. The demand for digital skills for vocational education graduates is a necessity, so that digital skills can be highly competitive [6]. To obtain efficient and effective learning, the blended learning model in vocational education learning can be used to synthesize face-to-face learning and online-based learning into an integrated mix so as to create high, efficient, and interesting impact [16]. The stages in digitizing vocational education learning can be carried out as follows:

Essential Civil Engineering Competence

The scope of the field of applied civil engineering is very broad, it is necessary to determine the essential competencies of graduates expected for each concentration in the field of expertise so that they do not require large file sizes in the digitization process. The applied science of civil engineering has existed since the time of human civilization and has developed in accordance with advances in science and technology. The civil engineering work area includes designing, implementing, and also supervising project work related to roads, buildings, bridges, dams, airports, roads, tunnels, and other infrastructure. Professional civil engineering workers in the field need to have certain qualifications and demonstrate certain civil engineering skills.

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Referring to the Body of Knowledge Civil Engineering for the 21st Century, the depth and breadth of knowledge, skills, and attitudes required for a person to enter as a civil engineering practitioner at a professional level in the 21st century must be able to have achievements in the following three groups: Foundational Outcomes, Technical Outcomes, and Professional Outcomes [17]. The three groups have 24 minimum achievements obtained from formal education and one's experience as a requirement to become a civil engineer. The minimum achievements that must be mastered by a prospective vocational professional teacher in the field of civil engineering, are study material which is ultimately broken down into several learning outcomes for the subject. Determination of study materials is based on the needs of graduate users and is the direction of essential technical competencies which include: 1) statics; 2) building construction; 3) water structure construction; 4) road and bridge construction, 5) construction design, and 6) project management are the minimum essential technical competencies that must be mastered by graduates of pre-teacher education in civil engineering.

Curriculum Development

A series of learning activities to achieve an educational goal or what is often referred to as a curriculum, is compiled based on the essential competencies that have been determined in the previous stage. The vocational education curriculum in the field of civil engineering was developed to meet the competencies that graduates must possess as specified in the graduate profile. The curriculum is designed not only to fulfill hard skills and soft skills, but also to meet the learning needs of the 21st century and the industrial revolution 4.0. Synergy with the achievements of vocational education graduates in the type of secondary education in the field of civil engineering, in the learning process, ICT must be utilized [18]. The use of ICT is not limited only to students, but teachers are also required to make more use of ICT in order to convey the substance of the material to students so that it is easier to understand and can be accessed anytime and anywhere [19]. The results also show that there is a positive relationship between the skills of teachers and learners in the 21st century era [20].

Determining The Learning Model
The stages in integrating essential civil engineering competencies into teaching and learning in the 21st century can be carried out as follows: 1) focus on 21st century skills, content knowledge, and expertise; 2) Building understanding across and between core courses and interdisciplinary themes; 3) Emphasizing the understanding of in-depth knowledge material; 4) Engage students with relevant data, tools, and real-world work into on-campus learning; and 5) It is possible to carry out an assessment of learning completeness with several measures of completeness [21] [22]. The results of a research on teachers' conceptions of the integration of technology into their teaching from two well-known technical and vocational education institutes (TVE) in New South Wales, Australia. Revealed that there are four qualitatively different things that teachers get in teaching using technology including; (a) increase teacher knowledge, (b) ease of communication, (c) effective teaching, and (d) flexible teaching [23]. The strategy of integrating essential civil engineering competencies into teaching and learning and utilizing ICT, is a challenge in civil engineering vocational education to meet the demands of technology-supported and flexible learning in the face of environmental turbulence [24].

Civil Engineering Teacher
Education is a core element of society to be able to survive in life in the current era of environmental turbulence. People can only contribute to and benefit from this condition if they are endowed with knowledge, skills, and values through education [3]. Vocational education for secondary education in the field of building engineering is one of the core elements of society to equip individuals to survive in life in an uncertain era. Vocational high school graduates who are reliable, of course, need reliable teacher candidates as well. One strategy to meet qualified teacher candidates is to integrate the essential

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competencies in the fields of civil engineering, critical thinking, and social skills in teaching and learning to help students master the multi-dimensional skills needed in the 21st century [21].

Conclusion And Recommendation

The conceptual conclusions of digitalization of vocational learning in civil engineering to face the challenges of environmental turbulence are as follows: 1) digitization responds more quickly to changes; 2) more efficient use of resources to make changes; 3) effectively achieve the changes that occur; 4) has high transferability; 5) safe from the spread of the Corona Covid 19 virus because it is carried out remotely; and 6) have an accurate track record in its development. Technically developing a vocational education curriculum can be done with the following stages: 1) determining the essential competencies in the civil engineering field by conducting curriculum reviews and validation with graduate users; 2) integrating essential competencies into teaching and learning in the 21st century can be done as follows: a) focus on 21st century skills, content knowledge, and expertise; b) Building understanding across and between core courses and interdisciplinary themes; c) Emphasizing the understanding of in-depth knowledge material; d) Engaging students with relevant data, tools, and real-world work into on-campus learning; and e) Allows for an assessment of learning completeness with several measures of completeness; 3) developing learning media to deliver thematically essential content of civil engineering that can be accessed without being limited by the dimensions of time and space; and 4) graduates of pre-teacher education in civil engineering must be able to apply new teaching and learning approaches to meet the needs of students who are growing in the digital era and are adaptable to environmental turbulence.

References

[1]   S. Jagannathan, S. Ra, and R. Maclean, "Dominant recent trends impacting on jobs and labor markets - An Overview," Int. J. Train. Res., vol. 17, no. sup1, pp. 1–11, 2019, doi: 10.1080/14480220.2019.1641292.
[2]   G. Spöttl and L. Windelband, "The 4th industrial revolution–its impact on vocational skills," J. Educ. Work, vol. 34, no. 1, 2021, doi: 10.1080/13639080.2020.1858230.
[3]   S. Bakhtiari and H. Shajar, "Globalization And Education: Challenges And Opportunities," Int. Bus. Econ. Res. J., vol. 5, no. 2, pp. 95–102, 2011, doi: 10.19030/iber.v5i2.3461.
[4]   M. B. Triyono, "TANTANGAN REVOLUSI INDUSTRI KE 4 (i4.0) BAGI PENDIDIKAN VOKASI," Semin. Nas. Vokasi dan Teknol., vol. 4, pp. 1–5, 2017.
[5]   V. A. Kudryavtseva and N. V. Vasileva, "Digitalization as the basis for the construction industry development," IOP Conf. Ser. Earth Environ. Sci., vol. 751, no. 1, 2021, doi: 10.1088/1755-1315/751/1/012100.
[6]   S. Fau and Y. Moreau, "Building tomorrow's digital skills - what conclusions can we draw from international comparative indicators?," Educ. 2030, p. 32, 2018, [Online]. Available: http://unesdoc.unesco.org/images/0026/002618/261853e.pdf.
[7]   M. Abdullah-Al-Mamun, "The Soft Skills Education for the Vocational Graduate: Value as Work Readiness Skills," Br. J. Educ. Soc. Behav. Sci., vol. 2, no. 4, pp. 326–338, 2012, doi: 10.9734/bjesbs/2012/1858.
[8]   P. Galloway, "The 21st century engineer," 2008, doi: 10.1002/inst.200811361.
[9]   T. Wrahatnolo and Munoto, "21St Centuries Skill Implication on Educational System," IOP Conf. Ser. Mater. Sci. Eng., vol. 296, no. 1, 2018, doi: 10.1088/1757-899X/296/1/012036.
[10]   Y. Estriyanto, "A Review of Indonesian Pre-Service Teacher Certification Policy from the Point of View of the Philosophy of Vocational Education," Int. Conference Teach. Train. Educ., vol. 1, no. 1, pp. 245–253, 2016.

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

[11]   T. Sangsawang, "Instructional Design Framework for Educational Media," Procedia - Soc. Behav. Sci., vol. 176, pp. 65–80, 2015, doi: 10.1016/j.sbspro.2015.01.445.

[12]   T. Sangsawang, "An instructional design for online learning in vocational education according to a self-regulated learning framework for problem solving during the covid-19 crisis," Indones. J. Sci. Technol., vol. 5, no. 2, pp. 283–198, 2020, doi: 10.17509/ijost.v5i2.24702.

[13]   G. Subrahmanyam, "The Future of TVET Teaching," W. de R. and P. Gianchandani, Ed. Bonn, Germany: UNESCO-UNEVOC International Centre, 2020.

[14]   A. Subarno, "The Challenge of Vocational High School Teachers in Indonesia," no. June, 2019, doi: 10.2991/icebef-18.2019.147.

[15]   E. D. T. Puspitasari, H. D. Surjono, and A. D. Minghat, "Utilizing web based learning as 21st century learning media for vocational education," Int. J. Eng. Technol., vol. 7, no. 4, 2018, doi: 10.14419/ijet.v7i4.33.23522.

[16]   A. Nuryanto, "The 21st Century Ideal Skills for Vocational High Schools," vol. 401, no. Iceri 2019, pp. 142–147, 2020.

[17]   ASCE, American Society of Civil Engineers Civil Engineering Body of Knowledge for the 21st Century. 2008.

[18]   Z. Arifin, M. Nurtanto, A. Priatna, N. Kholifah, and M. Fawaid, "Technology andragogy work content knowledge model as a new framework in vocational education: Revised technology pedagogy content knowledge model," TEM J., vol. 9, no. 2, 2020, doi: 10.18421/TEM92-48.

[19]   M. B. Triyono, "The Indicators of Instructional Design for E- learning in Indonesian Vocational High Schools," Procedia - Soc. Behav. Sci., vol. 204, no. November 2014, pp. 54–61, 2015, doi: 10.1016/j.sbspro.2015.08.109.

[20]   C. Tican and S. Deniz, "Pre-service teachers' opinions about the use of 21st century learner and 21st century teacher skills," Eur. J. Educ. Res., vol. 8, no. 1, pp. 181–197, 2019, doi: 10.12973/eu-jer.8.1.181.

[21]   H. A. Alismail and P. Mcguire, "21 st Century Standards and Curriculum : Current Research and Practice," vol. 6, no. 6, pp. 150–155, 2015.

[22]   AACTE & P21, "Teachers for the 21st Century," Education, no. September, pp. 22–29, 2013, [Online]. Available: http://www.oecd-ilibrary.org/education/teachers-for-the-21st-century_9789264193864-en.

[23]   M. S. H. Khan, S. Bibi, and M. Hasan, "Australian Technical Teachers' Experience of Technology Integration in Teaching," SAGE Open, vol. 6, no. 3, 2016, doi: 10.1177/2158244016663609.

[24]   C. Gunn, G. Lefoe, A. Graham, P. Left, and C. Smith, "Getting IT Together: A Cooperative Model for Staff Development," 1999, [Online]. Available: http://www.ascilite.org.au/conferences/brisbane99/papers/gunnlefoe.pdf.

[25]   N. Hasanah, M. B. Triyono, G. N. I. P. Pratama, Fadliondi, and I. G. N. D. Paramartha, "Markerless Augmented Reality in Construction Engineering Utilizing Extreme Programming," J. Phys. Conf. Ser., vol. 1737, no. 1, 2021, doi: 10.1088/1742-6596/1737/1/012021.

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SELF DIRECTED LEARNING ABILITY STUDENTS THROUGH WORKSHOPS

Yatti Sugiarti1 ,Asri Oktavianti Rahayu2, Dewi Cakrawati3

ABSTRACT

The purpose of this study is to determine the student learning independence, self-directed learning ability, the relationship of student self-reliance with student ability in self-directed learning, and how much the contribution of student independence to self-directed learning ability through self-employed activities. Subjects in this study were students class of XI Agricultural Product Processing Technology (APPT) program. In measuring the independence of learning, the instrument used to modify the self rating of self-directed learning (SRSDL) is adjusted to the self-employed assessment indicator in SMK Pertanian Pembangunan Negeri Lembang. Instrument used to measure self-directed learning ability of students was adopted from questionnaire self rating scale of self directed learning (SRSSDL). The results showed the independence of learning is in low and medium category. The abilityof self directed learning is in the category of medium, high, and low. The relationship between learning independence and self-directed learning ability, in the medium relationship category. The contrubution of self-learning idependence to self directed learning is in the moderate category.

Key words: self-employed activity, learning independence,self directed learning ability

INTRODUCTION

SMK Pertanian Pembangunan Negeri Lembang has a way of implementing entrepreneurial learning activities through Workshops. Workshops is an activity that supports one of the government programs of the embodiment of PP Nomor 19 Tahun 2005 (SPN), pasal 26 that SKL in vocational secondary education units aims to improve intelligence, knowledge, personality, noble character, and skills to live independently and follow further education in accordance with their vocational. Workshops is one of a series of activities that must be carried out by class XI students for 3 months (conducting core activities) in groups both within and outside the hours of entrepreneurial learning. Each group is under the guidance of one tutor teacher. in addition, Workshops are learning activities programs that train students' hard skills and soft skills to maximize the potential of entrepreneurial spirit that exists in themselves. Hard skills include the ability of students to choose products to market products that have been made, while the soft skills are the development of self-ability and independence of learning. According to Setyawati (2015) that in realizing maximum potential the role of education in addition to providing hard skills provision as for soft skills must be trained to students in order to be able to positively manifest themselves in society, both present and future. This is confirmed by Williamson (2007) that students must have soft skills in the form of good self directed learning skills, as stated by Galinsky (2010) that one of the basic skills that must be possessed by individuals is self directed learning skills, so that keywords in education is independence. Individuals who have high self directed learning will make them able to independently increase their knowledge and insight, complete their knowledge, update their knowledge, and adapt their knowledge in accordance with the demands of life (Setyawati, 2015). Therefore, with a high level of insight and knowledge, individuals will have better quality so they can compete when becoming entrepreneurs.

From the workshops, students are accustomed to practicing aspects of their learning independence, so that after carrying out self-employment activities students are able to develop the learning independence aspects they have at work and apply them when implementing classroom learning and learning independently.

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Preliminary research conducted by Wiryawan (2013) concerning the relationship of the ability of self directed learning with students' problem solving abilities in problem-based learning, as well as research by Setyawati (2015) regarding the improvement of self directed learning using inquiry based learning learning models.

Based on the foregoing description, researchers assume that learning independence in work activities is related to the ability of self directed learning so that it is necessary to conduct research on "Self-Directed Learning Ability of Students Through Workshops".

Formulation of the problem

What is the independence of student learning through self-employment activities?

What is the ability of self directed leaning students through self-employment activities?

How is the relationship between learning independence and students' self-directed learning abilities through self-employment activities?

What is the contribution of learning independence to students' self-directed learning abilities through self-employment activities?

Research Objectives

Get an overview of student learning independence in self-employment activities

Get an overview of the ability of self-learned learning students during carrying out classroom learning and learning that is done independently (outside the classroom).

Knowing the relationship between learning independence and students' self-directional learning abilities through workshops.

Knowing the contribution of learning independence to students' self directed learning abilities through workshops.

RESEARCH METHODS

the research method used is quantitative descriptive. The sample in this study was a class XI student majority of Teknologi Pengolahan Hasil Pertanian (TPHP) SMK Pertanian Pembangunan Negeri Lembang consisting of 45 students (the same poupulation as the sample). through workshops. Schematically, the design of this study is presented in Figure 3.1
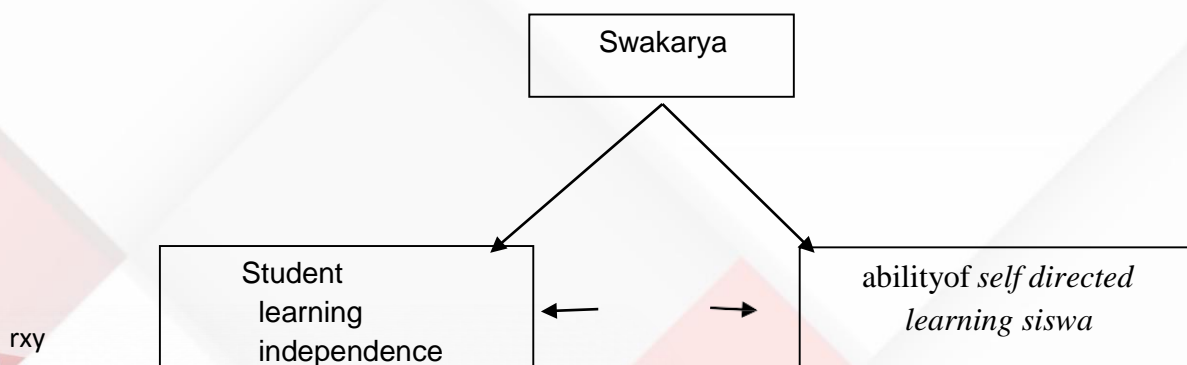
Figure 3.1 Research Design Description: rxy = correlation coefficient

Collecting Data Techniques

The technique of collecting data uses an instrument in the form of a questionnaire. This instrument contains statements based on the five categories of self directed learning abilities, which will then be filled out by the students themselves. Questionnaire given to students twice. The first questionnaire is about student learning independence that relates to the assessment indicators given by the school to students during the workshops, while the second questionnaire is about students' self directed learning ability after conducting workshops (while carrying out classroom learning and learning). students independently).

Data Analysis

. Validity

Arikunto (2011) states that the trial is said to be valid if the test measures what it wants to measure. Validity test is done in class XI ATPH Department as many as 50 people. The given instrument is the ability of self directed learning. Based on the results of the study that of the 60 items in the statement show 8 buttir invalid statements.

. Reliability

Reliability relates to trust. A trial is said to have a high level of trust if the test can provide a fixed result (Arikunto, 2011). By using the reliability coefficient interpretation from Riduwan (2010), the reliability coefficient obtained from the results of the instrument trials in this study was "very high".

Interpreting the learning independence score and ability of self directed learning
Add the scores of the learning independence questionnaire and the ability of self directed learning, then interpret learning independence in Table 3.1, while the self directed learning ability in Table 3.2.

Table 3.1 Student Learning Independence Category

Score	Level of Independence Learning	Interpretation
21-101 (8,015%-38,549%)	Low	students need guidance from the teacher, to determine what needs to be identified and what methods to use for learning
102-181 (38,931%-69,084%)	Medium	Students can identify, evaluate and adopt their learning strategies but with guidance from the teacher when needed

182-262 (69,465%-100%)	high	Students are indicated to have effective self directed learning abilities. Students can identify skills and learning methods that students have to do to learn independently.

Modifiksai Williamson (2007)

Tabel 3.2 Self Directed Learning Ability Category

score	Level of The ability of Self Directed Learning l	Interpretation
60-140 (20%-46,6%)	Rendah	Students need guidance from the teacher, to determine what needs to be identified and what methods are used for learning
141-220 (47%-73%)	Medium	Students can identify, evaluate and adopt their learning strategies but with guidance from the teacher when needed.
221-300 (74%-100%)	High	Students are indicated to have effective self directed learning abilities. Students can identify skills and learning methods that students have to do to learn independently.

Williamson (2007)
Calculating the Level of Achievement of the Aspects of Learning Independence and Self Directed Learning Ability in Each Category

Calculating the level of achievement of aspects by making the average score of each aspect, determining the number of actual scores from each aspect, by multiplying the number of items in each aspect with the highest score on the instrument, determining the ideal score by dividing the average score average of each aspect with the actual score, then determine the percentage of achievement by means of the ideal score of x 100.

Determine the relationship of learning independence with students' self directed learning abilities Before determining the relationship, it is necessary to know in advance the research data obtained is normally distributed or not. In this study, in determining the normality of the data, we use the liliefors test. Based on the results of calculations that L0> Ltabel, then the data is not normally distributed.

in determining the relationship test using the Spearman test

Calculating the Contribution of Learning Independence to Students' Self Directed Learning Ability Through Workshops To find out how much the contribution of learning independence to students' self directed learning abilities, the equation of the coefficient of determination is used. Determination coefficient of magnitude r2x100% which shows the amount of percentage contribution from a variable to other variables.

RESULTS AND DISCUSSION

Independence of Student Learning Through Workshops
Students with "low" learning independence consist of 35 students with a range of scores ranging from 64 (23,664%) to 64 (38,168%). Student learning independence in the "low" category shows the characteristics of students who have not been able to learn in independent situations when doing self-employment activities, so that what will be carried out must always depend on the instruction from the tutor's teacher. with the highest percentage of achievement which is mostly mastered by students on the learning independence of the "low" category, namely learning activies, while the achievement aspect is the lowest namely awareness. The level of achievement of the learning independence aspects in the "moderate" category that the highest achievement percentage aspect with the most students mastered in this category is interpersonal skills, while the lowest achievement aspect is awareness. This is in accordance with Nugrahani's statement (2013) that the higher the interpersonal skill (self-efficacy) that is owned by someone, the higher the independence of learning.

Based on the percentage of the level of achievement of the independence aspects for all students, it shows that the aspects with the highest percentage of achievement are the most mastered by students, namely learning activities and aspects with the lowest percentage of achievement, namely awareness. The level of achievement of the learning independence aspects of all students is presented in Table 3.1.

Table 3.1 Level of Achievement of the Aspects of Independence of All Student Learning

No	CapabilityAspects Self Directed Learning	Actual Score	Ideal score	Achievement Percentage	Criteria
1	Awareness	11,956	15	79,703	Good
2	Learning strategies	16,644	20	83,222	Very well
3	Learning activities	26,689	30	88,963	Very well

| 4 | Evaluation | 17,155 | 20 | 85,778 | Very well |
| 5 | Interpersonal skill | 17,613 | 20 | 88,068 | Very well |

Regarding the level of achievement of the learning independence aspects of all students, the aspects that must be developed are aspects of awareness and learning strategies. This shows that the awareness aspect of learning strategies still has to be developed a lot by the teacher as the mentor and by the school. One key that can develop aspects of learning independence in workshops is the strategy that must be formed by the school in carrying out workshops. The strategy can be in the form of an SOP given by the school to students and providing training for students who will carry out workshops.

According to Basri (1994) in Bangun (2011) that learning independence can be influenced by several factors, namely factors that are inside themselves (endogenous) which means all influences that originate from within themselves, and factors that exist outside themselves (exogenous) that is, all circumstances or influences that originate from outside.

Self Directed Learning Ability Students Through Workshops
The ability of self directed learning students with low ability as many as 3 people, moderate ability as many as 31 people or high ability as many as 11 people. Based on the level of achievement of the ability aspects of self directed learning for the category of "moderate" that the aspect with the highest percentage of achievement is the most mastered by students, namely evaluation, while the aspect with achievement is limited namely learning activies.

Accoriding to level of achievement of aspects of the ability of self directed learning students in the "high" category that the aspect with the highest percentage of mastery of students is the interpersonal skills and aspects with the lowest percentage of achievement is learning activies Because in this study the prominent aspects are at the highest level, namely aspects interpersonal skills and aspects of learning strategies then these two aspects must be sharpened. While aspects of evaluation, awareness, and learning activies must be re-developed. Because these three aspects if left alone can affect other aspects that have developed.

According to level of achievement of aspects of the ability of self directed learning students in the "low" category that the aspect with the highest percentage of achievement was the most mastered by students namely interpersonal skills, while the lowest aspect of achievement percentage was found in the awareness aspect. Students with low self-directed learning abilities must be given special attention by the teacher so that students can develop and improve aspects of the ability of self-directed learning. In addition, the teacher must provide a lot of stimulation to students to be actively involved in the learning process, much in providing opportunities for students to produce works and display them when teaching and learning activities take place.

The level of achievement of the ability aspects of self directed learning of all students is presented in Table 3.2.

Table 3.2 Levels of Achievement of All Students' Self Directed Learning Abilities

CapabilityAspects Self Directed Learning	Actual Score	Ideal score	Achievement Percentage	Criteria
Awareness	33,742	45	74,982	Good
Learning strategies	33,677	45	74,839	Good
Learning activies	36,548	55	66,452	Good
Evaluation	41,355	55	75,191	Good
Interpersonal skill	45	60	75	Good

According to Table 3.2 all aspects of the ability of self direced learning owned by students all have the criteria of "good". Related aspects of evaluation and learning activies show that students have a high ability in evaluating or evaluating themselves from the results of the work they have done during learning which they feel are not good and are able to judge what is good to improve their learning outcomes. When students have been able to evaluate their self well, but have not been able to apply from what has been evaluated into their daily learning activities, so this is what causes the ability of self directed learning in the learning activies aspect to be low. age factor, daily environment of students when learning can affect the ability of self- directed learning they have. One of the environmental factors is the habit of learning treatment given by the teacher to students who are fixated on the KTSP curriculum, so the teacher does the learning only fixated on the teacher center.

Relationship between Independent Learning and Self Directed Learning Ability Students Through Workshops Based on the calculation results obtained the correlation coefficient (ρ count) of 0.558, while at ρ table for N = 45 obtained a value of 0.248. Because ρ count is greater than ρ table, then H0 is rejected and H1 is accepted. So it can be concluded that there is a relationship between learning independence and students' self directed learning abilities. That is, if learning independence is low, the ability of self-directed learning that students have is low. From the results of the relationship coefficients obtained, the level of relationship of these abilities is included in the "moderate" category.

If the test want to have a relationship with the "strong" category between student learning independence with the ability of self directed learning, the test should learn the conditions between work activities with student learning so that learning is independent, but it cannot be separated from intensive teacher direction. For example, such as when students ask teachers about material that does not yet understand, the teacher only directs students to implement it themselves, such as by advising students to see the learning resources they have, namely textbooks or modules that are related or by the way teachers can ask questions back to students which provokes students to return to work alone. Thus when students are given assignments or problems, students are really trained to develop learning independence and students' self directed learning abilities.

Contribution of Independent Learning to Self-Directed Learning Ability Students Through Workshop According to the results of the calculation of the coefficient of determination that the contribution of student learning independence to students' self directed learning abilities through self-employment activities amounted to 31,188%. This shows that the contribution of learning independence ability at work towards the ability of self directed learning is in the "moderate" category.

To increasing the contribution of learning independence during workshops, it is necessary to develop the aspects of the assessment given by the school to students, clarity of direction in the implementation of work activities, as well as clarity of sanctions in each violation committed by students during the implementation of employee activities. In addition, there is a great guidance role in guiding students who are only serving as facilitators so that with this, students are accustomed to carrying out their learning independently and are expected to be able to develop aspects that include the ability of self directed learning.

CLOSING CHAPTER

Conclusions
Student learning independence is in two categories, namely low and medium. The highest percentage of aspects achieved by all students is learning activies.
Students' self directed learning abilities through workshops are in three categories: low, medium, and high. The aspect with the highest percentage of achievement is the most mastered by all students, namely evaluation.
There is a relationship between learning independence and students' self directed learning ability through workshops with "moderate" categories.
Learning independence contribution to students' self directed learning abilities through self-employment activities was 31,188% and was in the "moderate" category.

Suggestions
The guiding teacher in the workshops can maximize the provision of guidance services to students to help students improve their learning independence.
During student work and learning activities in the classroom, students are conditioned in the same circumstances, namely being trained to learn independently
The researchers are expected to be able to further enrich this research by looking at other factors such as family social conditions, teacher teaching methods, and psychological conditions of students.

BIBLIOGRAPHY

Arikunto, S. (2010). Prosedur Penelitian Suatu Pendidikan Praktik. Jakarta : Rineka Cipta. Bangun, Gladys, Ema, Sarlina. (2011). Perbedaan Self Directed Learning Siswa Sekolah
Menengah Atas dan Sekolah Menengah Kejuruan di Yayasan Dharma Bakti Medan.(Skiripsi). Jurusan Psikologi.
Galinsky, Ellen. (2010). Mind in the Making: The Seven Essential Live Skill Every Child Needs.
USA: Harper Collins Publisher.
Hasan, Basri. (1994). Remaja Berkualitas. Yogyakarta: Pustaka Belajar.
Nugrahani. (2013). Faktor-faktor yang mempengaruhi penetapan Fee Audit Eksternal pada Perusahaan yang Terdaftar di BET.
Riduwan, (2009). Pengantar Statistika Sosial. Bandung: Alfabeta
Setyawati, Panca, Sri. (2015). Keefektifan Model Pembelajaran Inquiry Based Learning untuk Meningkatkan Self Directed Learning Mahasiswa. (Prosiding Seminar Nasional). Universitas Nusantara PGRI Kediri.
Williamson. (2007). Development of a elf Rating Scale of Self Directed Learning. Nurse Researcher. 14(2).
Wiryawan, Ferry. (2013). Hubungan Kemampuan Self Directed Learning dengan Kemampuan Problem Solving Siswa Melalui Pembelajaran Berbasis Masalah. (Skripsi). Universitas Pendidikan Indonesia.

LEARNING MEDIA BASED ON MACROMEDIA DIRECTOR TO IMPROVE LEARNING OUT COMES OF STUDENTS IN VOCATIONAL SCHOOLS

Wahyu Dwi Mulyono, Soeparno, Gde Agus Yudha Prawira Adistana

Abstract.

Learning outcomes of students need to be improved. The one of the ways is by innovating in learning. Information technology that has developed can be an opportunity to create interesting learning media. More interesting learning activities will make students happier and easy to learn. Macromedia director is a program that can be used to create media that is interesting and able to be integrated into learning. The purpose of this study was to find out the learning outcomes of students, teacher teaching activities, learning activities of students, and responses of students in the application of interactive learning media based on macromedia director. This research is a classroom action research. The research was conducted at SMK Negeri 5 Surabaya. Data collection uses tests, observation, and questionnaire responses to students. Data analysis using quantitative descriptive techniques. The results of this study are as follows. (1) Learning outcomes of students after the application of interactive learning media based on macromedia director has increased (2) Teacher teaching activities are included in the good category. (3) Student learning activities are included in the good category. (4) Student responses are included in the excellent category.

Keywords— Interactive Learning Media, Macromedia Director

INTRODUCTION

Learning occurs when learners process new information, and that information is meaningful to them in their terms of reference. Learning consists of two important activities namely learning and teaching. Learning refers to activities carried out by students, while teaching refers to activities carried out by teachers. Both of these activities must occur in reciprocal relationships (interactions) between teachers and students to create an active and conducive atmosphere. Learning needs to be packaged in an interesting and fun way, but there are still many teachers who use conventional learning methods in their teaching and learning activities. So that maximum learning outcomes have not been achieved.

Students tend to forget what they hear and will tend to remember what they saw and did. Students who are active in the class will be easy to understand the knowledge or obtain new information. Students will also tend to remember things that are interesting and fun. For this reason, many creative learning methods are pursued that can help students in teaching and learning activities. The method aims to make students better understand the lesson and can improve student learning outcomes [1].

The learning process needs to be supported by learning media, one of which is electronic media such as radio, tape, video, interactive animation, etc. [2]. Interesting and interactive learning media is one method that can increase students' interest in subjects. Interactive learning media can help students to understand lessons more easily, so they can improve student learning outcomes [3].

Information technology that is experiencing development can be an opportunity to create interesting learning media [4]. There is a lot of software that can be used to create interactive learning media. Macromedia director is one of the software commonly used to make interactive multimedia easily with good results. Macromedia (director & flash) can produce multimedia with good and interactive animation [5].

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Learning

Learning is a relatively permanent change in behavior and potential behavior as a result of strengthened experience or training. Learning is due to the interaction between stimulus and response [6]. Learning is a mental process that occurs within a person to gain mastery and absorption of information in the cognitive, affective, and psychomotor domains. Learning is a social experience that is through an interactive process so that positive and permanent changes emerge. Learning occurs in all conditions and from everyday experience [7]. Learning is a change in oneself that can be expressed by the mastery of a new welcome pattern, in the form of understanding, skills, and attitudes as a result of the process of experience. Learning that provides a permanent experience for students is that provides an active opportunity, not only memorizing but is directly involved in finding the experience [8].

Based on the results of the description above, it can be concluded that learning is a change that occurs in a person both in the cognitive, affective, and psychomotor, which is positive and permanent. Learning takes place through a continuous process, each of our experiences and information increases, so we will always learn.

Learning is the process of interaction of students with teachers and learning resources in a learning environment. Learning is an accumulation of teaching concepts and concepts of learning [7]. Learning shows the effort of learners to learn lesson material as a result of the treatment of teachers. The treatment of teachers here has a different role between past and present. Teachers are initially the main learning resources for students, but are now different, namely as facilitators who direct learning activities. Students must be active in learning. Science will be easily remembered and stored in students, as long as they are active. Learning is an investment process, if during learning does not get good results, it will lose both energy, cost, and time [8].

Interactive learning

Interactive learning is a method or learning technique that is used by teachers when presenting learning material where teachers are the main actors in creating educational interactive situations, namely between teachers and students, students with students, and with learning resources to support the achievement of learning goals. Interactive learning shows the existence of positive interactions between teachers and students. Interactions that occur to make it easier to understand the lesson. Interaction makes learning not passive or one-way. Interactive learning must make students actively search for knowledge or "adventure of knowledge" so that it is more memorable well [1]. Interactive learning requires students to assemble and gradually understand "construct" [9].

Students as the main actors in learning must play an active role. Teachers as facilitators who direct learning become conducive. Interactive learning with the media will add to the positive learning situation.
Active learning consists of four components. First, it must involve an interactive and participatory teaching strategy that requires an egalitarian relationship and is built on the knowledge and experience of previous students as part of the curriculum content. Second, active learning empowers students to analyze information, explain their analysis, and create knowledge. Third, encourage students to contextualize their knowledge in explaining their analysis. Fourth, it must support opportunities for students to engage in collaborative actions by applying analysis that aims to improve relations with the environment [10].

Learning media

Learning media is everything that can be used to channel messages from the sender to the recipient so that it can stimulate the thoughts, feelings, attention, and interests of students. Learning media can help the teaching and learning process. The media should be manipulated, seen, heard and read. Media has long been used in learning. The media used are from conventional to modern. Conventional media such as books, film projectors, radio, television, and cassettes. Modern media such as computers, CD-ROM or DVDs, the Internet, tablets, and smartphone devices [3].

Learning media is a tool in the learning process both inside and outside the classroom. Learning media is used in the context of the interaction of teachers and students in the teaching and learning process. Learning media has an emphasis on visual and audio. Learning media is something that is used to help in the learning process. Learning media must be able to attract the attention of students in learning. A good learning media consists of at least audio and visual sources. The media must be able to make learning more enjoyable and include all students both in front and behind [2].

Learning media need to be well prepared before being used in learning. Learning media must be selected according to the subject matter to be delivered. The choice of media is very important because it will affect the success in learning. Effective media will facilitate students in achieving learning goals [11].

Learning media can make students learn actively and independently, but cannot escape the role of teachers. Students must be controlled and reminded of existing tasks. Teachers must be prepared when there are questions from students. Learning media must follow technological developments, so it must be developed regularly [12].

Learning outcomes

Learning outcomes are the occurrence of changes in behavior to someone from not knowing to know and from not understanding being understanding. Changes in knowledge and skills will occur after the learning process. Learning outcomes are abilities that have been obtained by students after following a series of learning processes [13].

Learning outcomes can be known after the evaluation of learning outcomes. Evaluation of learning outcomes is a process for gathering information, holding considerations towards the information, and making decisions based on consideration. Evaluation of learning outcomes is important, so it is necessary to make an evaluation tool that is appropriate to the learning outcomes to be measured [14].

The measuring instrument must be by its realm, be it knowledge, skills or attitudes to produce good measurements [15].

Learning outcomes are the output of the learning process. The learning process is an activity carried out by students in achieving learning goals. While learning outcomes are the abilities possessed by students after receiving their learning experience. Learning outcomes are indicated by changes that have occurred to students compared to before getting learning.

Macromedia director

Macromedia director is software developed by macromedia (such as flash and dreamweaver), which is commonly used in creating multimedia easily with satisfactory results. Macromedia director has advanced features and is easier to create than macromedia flash [16]. Macromedia director can be used to create interactive learning media with high-quality animation [5].

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Macromedia director can be used to create media on CDs/DVDs for tutorial CDs, games or learning, personal or corporate profiles, accompanying CDs of books, comics, and presentations. The macromedia director is very good at managing multimedia files. The macromedia director can import many file formats [16].

System requirements for the macromedia director program are pentium MMX processors that support multimedia. The minimum processor needed to create files without 3D files is Pentium 200 while playing it can use Pentium 166. But when making 3D files the minimum processor used is the Pentium II 266 by using an adequate video graphic adapter (graphics card). For files that use full 3D, you must at least use a Pentium III 450. RAM of at least 32MB, it is recommended 64MB or more so that the computer processor can run smoothly. Display adapter with 8MB of memory, it is recommended 16MB or greater so that the image display can be accurate with a detailed color depth of the image. Adequate memory allows for previews into a lower color system.

Based on the description stated above, research on interactive learning media based on the macromedia director to improve student learning outcomes in vocational schools needs to be done. The purpose of this study was to find out the learning outcomes of students, educator teaching activities, learning activities of students, and responses of students in the application of interactive learning media based on the macromedia director.

Method

This type of research is classroom action research. This is research by conducting planned actions and observations used to improve learning outcomes [17]. Classroom action research design consists of four components, namely planning, action, observation, and reflection.
The location of this research is SMK Negeri 5 Surabaya. The population is all students of SMK Negeri 5 Surabaya. The sample of this study was the students of class XI TGB SMK Negeri 5 Surabaya.

The study was conducted in two cycles, each cycle consisting of two meetings. The stages of the research are planning (preparation of learning devices and research instruments), actions (carrying out learning activities with interactive learning media based on macromedia director), observation (observing the activities of teachers and students during learning), and reflection (reviewing the results of learning).

Learning tools used in the form of interactive learning media based on the macromedia director syllabus, lesson plans, assessment sheets, and teaching materials/hand out. The research instruments were in the form of soft learning outcomes tests, observation sheets of educator teaching activities and student learning activities, and questionnaire responses to students.

The validity of learning devices is carried out with content validity with rational judgment. Data collection techniques use test methods, observation methods, and questionnaire methods. The data analysis technique uses quantitative descriptive techniques and conducts assessments by comparing scores from the assessment results with criteria scores based on normal curves in table 1 below.

Table 1.
Evaluation criteria for each variable

No.	Score range	Criteria
1.	X > Mi + 1,5 SDi	Very good
2.	Mi + 0,5 SDi < X ≤ Mi + 1,5 SDi	Well
3.	Mi - 0,5 SDi < X ≤ Mi + 0,5 SDi	Enough
4.	Mi - 1,5 SDi < X ≤ Mi - 0,5 SDi	Less
5.	X ≤ Mi – 1,5 SDi	Very less

RESULTS AND DISCUSSION

Learning activities
Before learning, activities need to be prepared in advance learning tools such as syllabus, lesson plan, teaching materials, and evaluation of learning outcomes in the form of post-tests, as well as interactive learning media based on macromedia director. Display media opener with macromedia director can be seen in figure 1 below.

Figure 1. Display media opener with macromedia director

Learning activities in cycle one were followed by 28 students, one educator, and three observers. Observations made are the activities of educators and students during learning. Observations are made using observational instruments that have been provided. To find out the response of students to interactive learning media based on macromedia director, at the end of cycle one each student is given a questionnaire to give a response or opinion on learning.

Teacher activities in first cycle learning begin with educators delivering opening greetings, conveying learning objectives to be achieved, and motivating students to learn about the importance of the material. Educators explain the material with the help of interactive learning media based on macromedia director.

The activities of students in the learning cycle one are learners observing learning material provided by educators. Learners work on assignments. Learners conduct joint discussions to solve problems in the task.

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Students present assignments in front of the class. Students take a post-test assessment to find out the learning outcomes of cycle one students.

The weakness in cycle one is that students do not fully understand the workings of interactive learning media based on the macromedia director, students do not ask if they do not understand, educators lack motivation for students, educators do not master the class during the learning process due to new media use. The solution to overcome these weaknesses is that after the implementation of learning in cycle one, training on the use of interactive learning media based on the macromedia director is conducted for educators and students so that in the second cycle they can apply to learn well. Students are given certain times by educators to ask questions, educators motivate interesting students and can increase enthusiasm in learning. Educators use LCDs to display media by showing material and practice with videos.

Second cycle learning activities need to first correct the shortcomings of the first cycle by providing training in the use of interactive learning media based on the macromedia director for educators and students outside of learning so that in the second cycle they can apply the macromedia director-based interactive learning media properly.

Develop learning devices such as syllabus, lesson plans, learning resources, and evaluation of learning outcomes in the form of post-tests. Setting up interactive learning media based on the macromedia director is equipped with motivation in the form of pictures and videos.

The learning activities in the second cycle were followed by 29 students, an educator, and three observers. Observations made are the activities of educators and students during learning. Observations are made using observational instruments that have been provided. To find out the response of students, at the end of the second cycle each student is given a questionnaire to give a response or opinion on learning.

The teacher's activities in learning using interactive learning media based on the second cycle of macromedia director begin with educators delivering opening greetings, conveying the objectives of learning to be achieved, and motivating students by providing pictures and videos in the interactive learning media based on the macromedia director. Educators carry out teaching and learning activities using educators explaining using LCD to display material that is- on interactive learning media based on macromedia directors to students and assign assignments to students through interactive learning media based on macromedia director. Educators provide opportunities for students to ask questions.

The activities of students in learning by using interactive learning media based on the second cycle of macromedia director are learners observing motivational videos from educators. Learners observe the learning material provided by educators. Learners ask about the material presented by educators. Students work on assignments on interactive learning media based on macromedia directors with computers. Learners conduct joint discussions to solve problems in the task. Students present assignments in front of the class. Students follow a post-test assessment to find out the learning outcomes of two-cycle students.

Learning activities with interactive learning media based on macromedia director in the second cycle experienced a lot of progress from the first cycle. Students are more enthusiastic and motivated by the video. Students are more active in asking educators. Learning outcomes of students also experienced an increase from the previous cycle.

Learning outcomes of students after the application of interactive learning media based on macromedia director

Learning outcomes are indicated by a change in a person compared to before, to find out the results of learning, then an assessment of learning outcomes is carried out. Students are declared to have passed or completed the course if they have a learning result test score of more than 2.7 with a scale of 4.

Cognitive test results in the cycle of one of the 28 students who attended the study, 17 students completed and 11 students who did not complete, and had an average value of 2.76. Student learning outcomes have increased in the second cycle, namely the results of cognitive tests after applied interactive learning media based on macromedia directors of 29 students who attended the study 25 students completed and 4 students who did not complete and had an average value of 3,17.

Based on the value of learning outcomes and mastery learning, it can be determined the percentage of completeness or graduation of students by comparing the number of students who graduate with the total number of students multiplied by 100%. Based on Table 2, it can be seen that the percentage of students' cognitive learning completeness has increased. The percentage of students 'cognitive learning completeness after the first cycle of action was 60.71%, and the percentage of students' cognitive learning completeness after the second cycle of action was 82.76%. The percentage of students' mastery learning has increased and has exceeded 75% of all students. This completeness cannot be separated from the improvement of the shortcomings in the previous cycle. The completeness achieved by most students shows that mastery and the level of understanding of students towards the material increases after students use interactive learning media based on macromedia director.

Table 2.
Comparison of the percentage of students 'cognitive learning

No.	Information	Learning	
		Cycle 1	Cycle 2
1	Percentage pass	60,71%	82,76%
2	The percentage that did not pass	39,29%	17,24%

Teaching activities in implementing interactive learning media based on macromedia director The assessment of educator teaching activities is obtained from the observation sheet which includes several activities, namely preliminary activities, core activities, concluding, and the use of learning strategies. The results of the ability or teaching activities of educators in using interactive learning media based on the macromedia director were conducted by 3 observers on the observation sheet. Assessment is carried out in each learning cycle. Assessment of the ability or teaching activities of educators is done by comparing the number of average scores with the assessment criteria.

The results of teaching activities using interactive learning media based on cycle one macromedia director get an average number of scores of 55. According to the criteria in table 3, the results of teaching educator activities using interactive learning media based on macromedia director in cycle one are included in the sufficient category. The lowest number of scores is in motivating students and in mastering learning strategies, the highest number of scores is in explaining goals, explaining subject matter, and centering on learners. In cycle one shows that educators better master the material and make learning centered on students, while in mastering learning strategies are still lacking.

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Table 3.
Teaching activities criteria

Score Range	Criteria
X > 80	Very good
66,7 < X ≤ 80	Well
53,3 < X ≤ 66,7	Enough
40 < X ≤ 53,3	Less
X ≤ 40	Very less

The results of teaching activities using interactive learning media based on the second cycle of macromedia director after improvement, then the number of average values of the results of teaching activities of educators has increased, amounting to 68.33. The assessment criteria in the second cycle according to table 3 are included in the good category. Aspects that have increased in cycle two are educators motivating students through interactive learning media based on macromedia directors with interesting videos and images, going around checking each student's work, using interactive learning media based on macromedia director, enthusiastic educator, and mastery of learning strategies.

Learning activities students in implementing interactive learning media based on macromedia director
Assessment of student learning activities is obtained from the student observation sheet which includes several aspects including attitudes, disciplines, interests, and responsibilities. Assessment of student learning activities was carried out by 3 observers by filling in the observation sheet. Assessment is carried out in each learning cycle. Assessment of student learning activities is carried out by comparing the number of average scores with the assessment criteria.

The results of the learning activities of students using interactive learning media based on cycle one macromedia director have an average value of 26,33. Criteria for learning activities of students in using interactive learning media based on macromedia director cycle one according to table 4 are included in the less category. The lowest score is in the aspect of learners being motivated in learning, students can use the media correctly, and students ask educators when difficulties. This shows that students have not been able to use the media well, so they have not been motivated in learning.

The results of the learning activities of students using interactive learning media based on the second cycle of macromedia director experienced an increase with the number of students' average learning outcomes of 35.00. Criteria for evaluating student learning activities using interactive learning media based on the second cycle of macromedia director, according to table 4 are included in the good category. There is an increase in the results of observation of the learning activities of students from cycle one, this is due to improvements in learning based on practice and problems that occur in cycle one. Aspects that experienced an increase in the second cycle were students performing individual tasks correctly, students following the learning enthusiastically, students asking educators when faced with difficulties, students could use the media correctly, and students were motivated in learning.
Observation results of student learning activities have increased each cycle. This completeness cannot be separated from the improvement of the shortcomings in the previous cycle. The completeness achieved by students shows that attitudes, disciplines, interests, and responsibilities are well implemented and students feel enthusiastic about following the learning process.

Table 4.
Criteria for assessing student learning activities

Score Range	Criteria
X > 40	Very good
33,3 < X ≤ 40	Well
26,7 < X ≤ 33,3	Enough
20 < X ≤ 26,7	Less
X ≤ 20	Very less

The response of students in implementing interactive learning media based on macromedia director. Analysis of students' responses is obtained by filling out questionnaires using respondents from the class studied. Questionnaires distributed to respondents contained statements of several aspects during the learning process with interactive learning media based on the macromedia director. Assessment of students' responses to interactive learning using the macromedia Director is done by comparing the number of average scores with the assessment criteria. Categorizing these criteria can be seen in Table 5 below.

Table 5.
Criteria of student response assessment

Score Range	Criteria
X > 40	Very good
33,3 < X ≤ 40	Well
26,7 < X ≤ 33,3	Enough
20 < X ≤ 26,7	Less
X ≤ 20	Very less

The results of the response to 28 students received a total score of 1177, with an average number of 42.04. Based on Table 5 the response of students to the application of learning with interactive learning media based on macromedia director is included in the range of scores of X>40 and very good categories. The highest score is learning with interactive learning media based on the macromedia director to create a pleasant new atmosphere and learners are more independent in doing assignments when the following learning with interactive learning media based on macromedia director.

The results of observations of students' responses showed very good results. Students feel happy with the application of learning with interactive learning media based on macromedia director. Gifted students have better value if students actively participate in learning and feel happy in the learning process.

Conclusions

Based on the results of research and discussion, it can be concluded as follows. (1) Learning outcomes of students after the application of interactive learning media based on macromedia director has increased (2) Teacher teaching activities are included in the good category. (3) Student learning activities are included in the good category. (4) Student responses are included in the excellent category. The results of observations and responses of students showed good results indicating that the interactive learning media based on the macromedia director could be well received in learning. Students love learning, so learning outcomes also increase.

References

[1]   Ġ. Crengu, "Interactive and Creative Learning of The Adults," Procedia - Soc. Behav. Sci., vol. 142, pp. 493–498, 2014, doi: 10.1016/j.sbspro.2014.07.654.

[2]   N. Hidayati and A. I. Wuryandari, "Media Design for Learning Indonesian in Junior High School Level," Procedia - Soc. Behav. Sci., vol. 67, no. November 2011, pp. 490–499, 2013, doi: 10.1016/j.sbspro.2012.11.354.

[3]   D. L. Linebarger, "Educational Media: Potentials for Learning," Int. Encycl. Soc. Behav. Sci. Second Ed., vol. 6, pp. 246–254, 2015, doi: 10.1016/B978-0-08-097086-8.92031-2.

[4]   A. El Saddik, Interactive Multimedia Learning. Berlin: Springer, 2001.

[5]   E. Gómez, P. Maresca, J. Caja, C. Barajas, and M. Berzal, "Developing a New Interactive Simulation Environment with Macromedia Director for Teaching Applied Dimensional Metrology," Measurement, vol. 44, pp. 1730–1746, 2011, doi: 10.1016/j.measurement.2011.07.004.

[6]   R. E. Slavin, Educational Psychology : Theory and Practice. New York: Pearson, 2018.

[7]   M. S. Schiering, D. Bogner, and J. Buli-holmberg, Teaching and Learning A Model for Academic and Social Cognition. Lanham: Rowman & Littlefield Education, 2011.

[8]   J. M. Alan Crawford, Wendy Saul, Samuel R. Mathews, Teaching and Learning Strategies For The Thinking Classroom. New York: The International Debate Education Association, 2005.

[9]   F. Ceresia, "Interactive Learning Environments (ILEs) as Effective Tools for Teaching Social Sciences," vol. 217, pp. 512–521, 2016, doi: 10.1016/j.sbspro.2016.02.031.

[10]   D. E. Wright, Active Learning: Social Justice Education and Participatory Action Research. New York: Routledge, 2015.

[11]   O. Michael and S. A. Jones, Educational Media and Technology Yearbook, vol. 38. New York: Springer, 2014.

[12]   T. Sangsawang, "Instructional Design Framework for Educational Media," Procedia - Soc. Behav. Sci., vol. 176, pp. 65–80, 2015, doi: 10.1016/j.sbspro.2015.01.445.

[13]   A. R. Pesimo, "Developing the Learning Outcomes of the Students through Microscale Experiments in Chemistry," Open Access Libr. J., vol. 1: e479, pp. 1–11, 2014, doi: 10.4236/oalib.1100479.

[14]   O. Zlatkin troitschanskaia, M. Toepper, H. Anand, C. Lautenbach, and C. Kuhn, Assessment of Learning Outcomes in Higher Education. New York: Springer, 2018.

[15]   W. Dick, L. Carey, and J. O. Carey, The Systematic Design of Instruction, 8th ed. New York: Pearson, 2015.

[16]   D. Mennenoh, Macromedia Director MX 2004 Training From The Source. Berkeley: Macromedia Press, 2005.

[17]   S. Kemmis, R. McTaggart, and R. Nixon, The Action Research Planner Doing Critical Participatory Action Research. New York: Springer, 2014.

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CORRELATION OF PARENTAL SUPPORT WITH STUDENT LEARNING MOTIVATION DURING THE COVID 19 PANDEMIC

Pudji Astuti, Fakhruddin, Fatah Syukur, I Made Sudana, and Sita Nurmasita

Abstract The COVID-19 pandemic has had a strong impact on all fields, including education. Learning is done online. Many students learn independently. The purpose of this study was to determine the relationship between parental support and student learning motivation. The research method used is a survey with a quantitative approach. The data collection technique was carried out by using a questionnaire using a linkert scale. Questionnaires were distributed online via google form to students of the Department of Family Welfare Education. The data analysis technique used is the product moment correlation. The results of the study are rx2y of 0.482. So there is a correlation between parental support and student learning motivation. The correlation is in the moderate category. The effective contribution of the correlation is 23.23%. This shows that there are other variables related to student learning motivation in addition to the parental support variable. In addition, there is a positive relationship, namely the higher parental support, the student's learning motivation also increases. In conclusion, to increase student learning motivation, parental support is needed in the form of attention and material, especially during the pandemic.

Keywords: learning motivation, coorlation, parental support

INTRODUCTION

During the COVID-19 pandemic, all essential and non-essential sector activities are regulated through the instructions of the Minister of Home Affairs, then followed up by their respective institutions, as well as Universitas Negeri Semarang. Learning activities are carried out online. Online learning is carried out synchronously and asynchronously, that is, it can be carried out via zoom or other platforms, and/or students are given assignments. It is undeniable that the condition of online learning is something new. There are also many obstacles that occur when online learning takes place, for example the internet network, limited quota, or even the device, namely a laptop or smartphone. The results of the study stated that the negative impacts of distance learning were inadequate networks, students did not understand the learning material, students felt less enthusiastic about participating in online learning, limited facilities in online learning made it difficult for students and expensive internet quotas. [1]. However, it is still related in the research that online learning can reach more students.

 In learning activities, parents have an important role. Support that can be done by parents include financial support, emotional support, material support and help in learning. According to Slameto, the family is the first and foremost educational institution [2]. Parental support in education is the provision of assistance or encouragement in the form of verbal or non-verbal so that children feel happy, cared for, directed in learning activities. The support was asked regarding financial, material, emotional, and support in the form of providing advice or advice. This will support the achievement of children's achievements.

The involvement of parents in their children's education decreases along with the higher level of education of children because children are more independent in managing themselves. But on the other hand according to the results of a survey from the University of California Davis, USA in Alfikalia conducted on 3187 students in 2004, it showed that 60% stated that parents were involved in their education and liked parental involvement in education [3].

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It was also revealed that the perception of benefits and parental support can effectively encourage students' learning motivation [4]. Comes and Debard, 2002 in Pizzalota and Hicklen said that millennials accept and depend on their parents' guidance [5]. Alfikana stated that 91.7% stated that students felt the involvement of parents. In addition, the benefits that are felt by students from the involvement of their parents are that the enthusiasm for college occupies the highest percentage. [3].

This shows that attention, students as adults still need parental support for educational activities. Even though students are included in the psychological development that they achieve socially responsible behavior. Especially during the COVID-19 pandemic, where students are highly required to be able to study independently. Likewise, parents' attention and support for their children's learning activities are also needed. Sardiman stated that the learning process will run if it is accompanied by interest [6]. Uno also stated that the nature of learning motivation is internal and external encouragement for students who are learning to make changes in behavior, generally with several indicators or supporting elements [7]. Motivation is an effort that makes an individual or group motivated to take an action that has a goal to get the desired satisfaction. So motivation is the driving force or driving the individual to achieve something. In students, motivation will provide the impetus for learning. Dimyati and Mudjiono stated that learning motivation can arise from intrinsic factors and extrinsic factors [8]. The motivation for learning from the students themselves and from outside.

The Home Economic Department in learning activities carries out theoretical and practical learning. During the pandemic, learning activities are carried out online, so students can carry out practical activities at home. Online learning activities require support from parents both in terms of material and attention. The purpose of the study is to know the correlations between parental support and student learning motivation during the COVID-19 pandemic?

methods

The research method used in this research is a survey method with a quantitative approach. Respondents in the study were 218 students from the Home Econimic Departement. The data collection technique was carried out with a questionnaire distributed to students online via google form. Questionnaires were distributed to students in the form of parental support and learning motivation questionnaires, where in the questionnaire there were statements or questions that were using a likert scale. The normality test used the Kolmogorov-Smirnov test at a significance level of 0.05%. The test results on the parental support variable are 0.475 so that it is greater than 0.05 then the parental support data is normally distributed. Similarly, the variable of learning motivation is 0.240, so that the data on student learning motivation is normally distributed The data that has been collected was analyzed using the product moment correlation. The interpretation of the coefficients guided by the following table.

Table 1. Interpretation of correlation coefficient

Coefficient Interval	Correlation Level
0.80 – 1.000	Very Strong
0.60 – 0.799	Strong
0.40 – 0.599	Moderat
0.20 – 0.399	Low
0.00 – 0.199	Very Low

RESULTS

Parents have a role in the success of children's education. Parental support for children's education during the pandemic can include material support, for example, smartphones are provided in addition to providing quotas to be able to study synchronously or asynchronously. Other support can be in the form of attention related to learning tasks that must be completed, providing a comfortable atmosphere for learning and so on. The results of the description analysis on parental support data are presented in table 2

Table 2. Students Parent Support of Home Economic Department

No	Frequency	Percentage (%)	Category
1	5	2.29	Very high
2	52	23.9	High
3	125	57.3	Medium
4	36	16.5	Low
5	0	0	Very low

In table 2, it appears that the most parental support is in the moderate category as much as 57.3%. Support for the very high category is at least 2.29%. There are many factors that can affect parental support for children in terms of education, including economic conditions and parents' busy work, parental education level.

Economic conditions are influenced by the level of income, and the level of expenditure. In general, parents who are in the middle to upper economic level will provide direction, attention to children's education. Similarly, the level of education of parents. On the other hand, parents from middle to lower economic levels will pay less attention to their children's education. The busyness of parents can reduce parental attention. The support given to children is mostly material support.
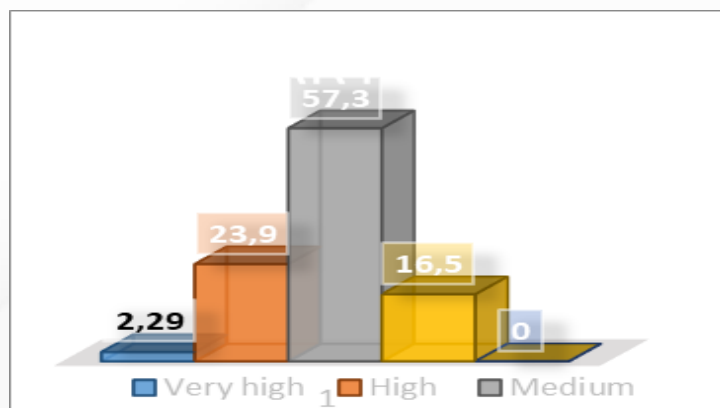
Figure 1. Parenting Sipport Graph.

Table 3. Students Learning motivation of Home Economic Department

No	Frequency	Percentage (%)	Category
1	46	21.1	Very high
2	140	64.22	High
3	30	13.76	Medium
4	2	0.92	Low
5	0	0	Very low

Table 3 shows that students majoring in Home Economic Department have learning motivation in various categories. Most of the students' learning motivation is in the high category as much as 64.22%. In the very high category as much as 21.1%. in the medium category of 13.76% and learning motivation in the low category of 0.92%. Despite the pandemic conditions where students study online, students' motivation to learn is good because most of them are in the high category. Students have good learning motivation to study independently at home on theoretical and practical learning activities that are carried out synchronously or asynchronously.

Motivation is the power to do something to achieve a goal. Learning motivation encourages students to study with various objectives including getting good grades, graduating on time, getting awards, showing others about their quality and others.

To reinforce the data on student learning motivation, it is shown in figure 2.
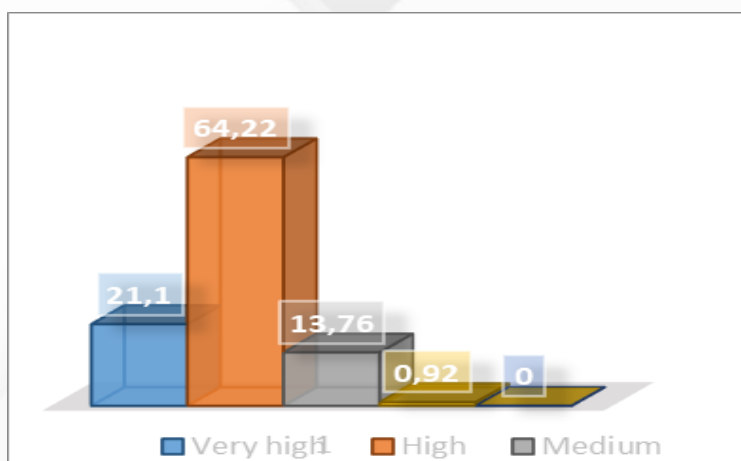
Figure 2. Student Learning Motivation Graph

In the analysis of product moment . correlation, it was found that there was a relationship between parental support and learning motivation in Home Economic Department. The data can be seen in table 3 as follows

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Table 3. The results of the significance test of parental support with student learning motivation

	Varia-ble (X)	Varia-ble (Y)	Number of Respon-dents	Correlation coefficient	Signifi-cance	decision
The	Parental sup-port	Learing motiva-tion	218	0,482	0,000	There is a correla-tion between parental support and student learning motivati-on

results showed that there was a relationship between parental support and learning motivation at the value of r = 0.482 and p = 0.000. This also shows that the higher the parental support, the higher the student's learning motivation is marked by a positive correlation coefficient. The effective contribution of the relationship between parental support and student learning motivation is 23.23%, other from variables outside of parental support. As it is said that learning motivation is influenced by intrinsic and extrinsic factors, these factors include student aspirations, student abilities, student conditions, student environment and dynamic elements in learning activities. The results of the study in line with Jamco's research stated that the attention given by parents to children can foster individual learning motivation when doing school assignments [9]. In addition, the teacher's creative behavior has a positive and significant relationship with students' learning motivation [10]. There are also research results that support and commitment from a good family to children's education will make children have high motivation in achieving achievements [11]
.

Parental support has an influence on student motivation to learn. Parental support that can be given to students includes attention, material, direction, and acomfortable atmosphere fo learning which is also needed by student. Learning activities at home and on campus are very differen. The design of the home environtment is not for learning like the campus environment. Especially if in practical cources not all student have the equipment used for practitice. This is needed parental support grouw up student motivation.

Conclusion
Family is a very important element in children's education. The role of the family in the education of children is not only material but also requires attention. If family support is lacking, it can result in less learning motivation. The results show that there is a coorelation between parental support and student learning motivation with a coefficient value of 0.482. The effective contribution of the relationship between parental support and student learning motivation is 23.23%, other from variables outside of parental support.

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References

[1] Ni Nyoman Serma Adi, Dewa Nyoman Oka, Ni Made Serma Wati (2021) Dampak Positif dan Negatif Pembelajaran Jarak Jauh di Masa Pandemi COVID-19. JURNAL IMIAH PENDIDIKAN DAN PEMBELAJARAN Volume 5 Nomor 1 2021, pp 43-48 E-ISSN: 2615-6091; P-ISSN: 1858-4543 DOI: http://dx.doi.org/10.23887/jipp.v5i2.

[2] Slameto. 2013. Belajar dan Faktor-Faktor yang Mempengaruhinya. Jakarta: Rineka Cipta

[3] Alfikana (2017) Keterlibatan orang tua dalam pendidikan mahasiswa di perguruan tinggi. journal inquiri jurnal ilmiah Psikologi, vol. 8 no 1, Juli 20217, hlm 42-54

[4] Siu-Cheung Kong, Yi-Qing Wang (2021) The influence of parental support and perceived usefulness on students' learning motivation and flow experience in visual programming: Investigation from a parent perspective. British Journal of Education Technology, Vol 52, Issue 4. July 2021, Pages 1749-1770.

[4] Pizzolato, J. E. and Hicklen, S, (2011) Parent involvement : Investigating the parent-child relationship in millennial collage students. Journal of collage student development, S2 (6), 671-686.

[6] Sardiman. 2008. Interaksi dan Motivasi Belajar Mengajar. Jakarta: Raja Grafindo Persada

[7] Uno, Hamzah B.. 2013. Teori Motivasi dan Pengukurannya. Jakarta: Bumi Aksara

[8] Dimyati, & Mudjiono. (2013). Belajar dan Pembelajaran. Jakarta: Rineka Cipta

[9] Jamco, m. taher. (2015). Jurnal Biology Science & Education 2015 ANGGI TIAS. P. Gottfredson, 4(1), 74– 82. http://dx.doi.org/10.33477/bs.v4i1.531

[10] Wahyu, Venny, Eliana, Sugiarto (2021) Apakah Perilaku Kreatif Guru memengaruhiMotivasi Belajar Siswa di masa pandemi Covid-19?. Jurnal Jendela Pendidikan Volume 01 No 03 Agustus 2021 hal 176 – 185

[11] Helker, K. Wosnitza, M. (2016). "The Interplay of Students' and Parents' Responsibility Judgements in The School Context and Their Associations with Student Motivation and Achievement". http://www.sciencedirect.com/science/ar ticle/pii/S0883035515301373.

DIFFERENCE PERCEPTIONS OF ACTIVE STUDENTS AND ALUMNI TO THE ESSENTIAL FACTORS AFFECTING FACULTY PERFORMANCE TO BECOME CENTER OF EXCELLENCE

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Abstract

Students' evaluations have long been used to determine the success of a learning and teaching program. Active students are only aware of the impact of learning in class and are unaware of the implications of learning in the workplace. As a result, when evaluating the performance of a university, faculty, or department, it is necessary to consider alumni perceptions. The purpose of this research is to learn more about what graduates and alumni think about the performance of the Faculty of Engineering at the State University of Malang. This study took an evaluation approach, employing the CIPP model and data collection tools in the form of a questionnaire. As a result, there is no significant difference in perceptions of faculty performance between active students and alumni of the engineering faculty at the State University of Malang. Looking at the perception results of the two elements, it can be said that FT UM has improved the facilities and infrastructure, as well as the tridharma process. However, at this time, the emphasis should be on improving human resource quality.

Keywords: Evaluation, Perception, Center of Excellence

Introduction

Students' participation in evaluations of learning and instructional effectiveness has long been a regular practice in measuring the overall success of a program (Muhie, Wolde, Tesfay, & Bedada, 2020; Pelayo, Mallari, & Mungcal, 2017). As well as for competency improvement objectives, feedback is frequently utilized in order to identify quality educators who require extra training as well as courses that require revisions or reorganization (Abedin, Taib, & Jamil, 2014; Retnowati, Mardapi, Kartowagiran, & Hamdi, 2021). A program's success or the performance of a university or faculty, on the other hand, is considered ineffectual if its evaluation analysis is restricted to a small number of active students (Retnowati et al., 2021). Active students are only aware of the influence of their learning in the classroom; they are not aware of the ramifications of their learning in the workplace. It is therefore vital to incorporate alumni perceptions while evaluating the performance of a university, a faculty, or a department during the evaluation process (Abedin et al., 2014).

As a result, alumni are considered to be important stakeholders in the faculty performance evaluation process because they are considered to be the only constituents who have had a lifelong relationship with an educational institution (Edwards and Phillips (1982); Sahan & ahan (2021); Wilby, Alamri, & Monfared (2019). Due to the fact that alumni are typically seen as the most loyal supporters of the institution, alumni comments are an important component of the institutional improvement process (McAdoo, 2010). The integration of various activities carried out by the faculty must foster positive relationships with alumni, because the results of the evaluation will be a significant investment in the advancement of the institution, and this will be accomplished through identifying, informing, attracting, and involving alumni.

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McKeogh (2010) and Sahan and Shahan (2021) have both written about this topic. Exactly this is the concern of the Faculty of Engineering, State University of Malang, which is currently analyzing the performance of the Faculty of Engineering, State University of Malang in an endeavor to become a Center of Excellence in the field of engineering (Center of Excellence). Not only are students active, but so are alumni as well.

The purpose of this research study is to determine more exactly what is understood by students and alumni who graduate from the Faculty of Engineering at the State University of Malang in terms of the performance of the faculty. The term "evaluation" refers to efforts to make decisions on the quality of program outcomes as well as student performance and ability (Gunung & Darma, 2019; Umam & Saripah, 2018). It is necessary to have an appropriate evaluation system or model in place in order to determine the quality of program achievements at the tertiary level in order to deliver reliable information to stakeholders.

This study makes use of the widely used program assessment model (CIPP), which is composed of context measures, input measures, process measures, and product dimensions introduced by Stufflebeam and includes context measures, input measures, process measures, and product dimensions. (2012); (Basaran, Dursun, Gur Dortok, and Yilmaz, 2021); (Hakan and Seval, 2011; Stufflebeam, 1983; Basaran et al., 1983). It is comprised of four key components, and in order to arrive at a legitimate assessment, the available data is correlated in each case in the context of multiple frameworks, which will be detailed in greater detail in the Methods and discussion chapter.

Method

The approach taken in this study is an evaluation study based on the CIPP model, with data collected utilizing a questionnaire as the data collection device. An information gathering instrument such as a questionnaire is composed of a series of questions designed to gather information from a respondent (Creswell, 2014; Sugiyono, 2012). The intended audience consists of current students at the Faculty of Engineering, State University of Malang, as well as alumni of the Faculty of Engineering, State University of Malang, who are interested in participating in the program. Using the use of online surveys disseminated through the Google form platform, researchers ask participants to take part in their research. Two sets of surveys were administered to 262 current students and 98 graduates, with the results being combined. Using a Likert scale, responses to the questionnaire were selected and entered into the questionnaire. Respondents can readily operationalize attributes or perceptions using the Likert scale, which is popular in survey research (Creswell, 2014; Muhie and colleagues, 2020; Pelayo et al., 2017; Siregar, Lumbanraja, and Salim 2016, Tuna and Başdal, 2021; Tuna and Başdal, 2021).

The framework of the two questionnaires is divided into four sections, each of which contains a grid including information regarding the context, input, process, and product of the Tridharma activities, as well as the supporting activities carried out by the Faculty members. A summary of the questionnaire grid can be seen in Table 1 below.

Table 1. Summary of the questionnaire grid

Indicator	Variable	Respondent		Answer Options			
		Active student	Alumni	1	2	3	4
Context	Curriculum	v	v				
Input	Infrastructure	v	v				
	Lecturer Quality	v	v				

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		v	v				
	Quality of Education Personnel	v	v				
Process	Learning process	v	v				
	Research Process	v	v				
	Community Service Process	v	v				
Product	Learning outcomes	v	v				

The variables above are considered important because they are the basis for implementing the Tridharma in higher education in the form of education and teaching, research, and community service (Bungai & Perdana, 2018; Daulay, Syafaruddin, & Calam, 2020; Lippe & Carter, 2018; Pinem, Luqman, Lituhayu, Marlina, & Paramasatya, 2020; Setyowati & Purwantoro, 2020). Supporters of the Tridharma activities are of course human resources, facilities and infrastructure, as well as students and alumni. The survey results were then strengthened by conducting a Focus Group Discussion (FGD) with stakeholders, including alumni and students. FGD is one way in evaluation research to complete research data so that it is clear and there is no ambiguity (Warju, 2016).

Result and Discussion

Curriculum

The curriculum currently run by the Faculty of Engineering, State University of Malang, which is based on life skills and independent learning is expected to provide a foundation for good practice in the teaching and learning process. In accordance with current conditions, according to the perception of the majority of active students and alumni, they have the opinion that the curriculum implemented by the engineering faculty of the State University of Malang can be said to be very good, although there are a small number of people who think that the curriculum used is still bad and even very bad (Figure 1) .
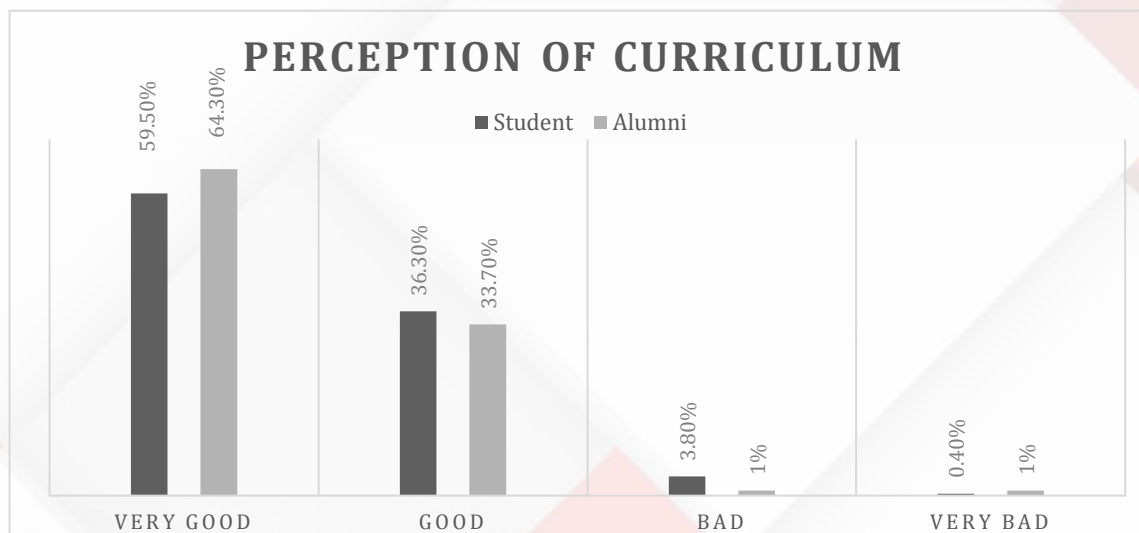
Figure 1. Perception of curriculum

Through a Focus Group Discussion, the results of this survey were clarified by the demands for the Faculty of Engineering, State University of Malang to always adapt the curriculum to the latest conditions and see

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the needs of the world of work. This is so that the existing curriculum makes it easier for students and alumni to get and carry out their work (Tuna & Başdal, 2021).

Infrastructure

Universities, especially engineering faculties with vocational-based strengths, of course must have complete facilities and infrastructure (Daulay et al., 2020; Galguera, 2018) to support faculty performance if you want to become a center of excellence in its field. The perception of students and alumni of the Faculty of Engineering, State University of Malang on the facilities and infrastructure of the faculty is good, but there are more than 10% of alumni who state that the facilities and infrastructure of the faculty are still poor (Figure 2). This indicates that there has been an improvement in performance in the field of infrastructure so that the current condition represented by active students is better than alumni.

PERCEPTION OF FACILITIES AND INFRASTRUCTURE

■ Student ■ Alumni

	VERY GOOD	GOOD	BAD	VERY BAD
Student	38.50%	52.70%	8%	0.80%
Alumni	40.80%	49%	10.20%	0%
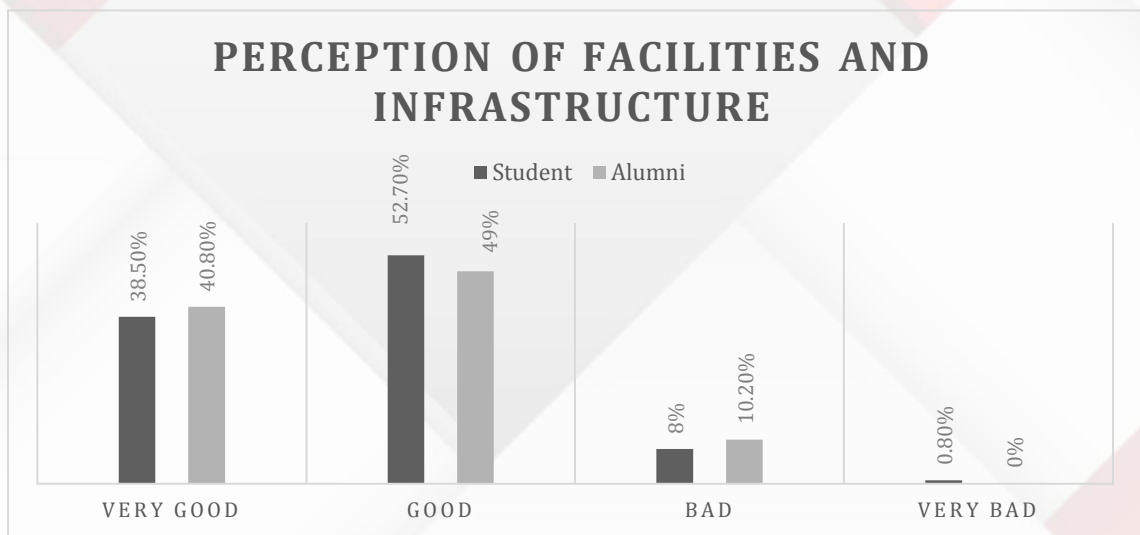
Figure 2. Perception of facilities and infrastructure

Kualitas Sumber Daya Manusia

The quality of human resources in this case is assessed through the quality of education staff and teaching staff (lecturers). The majority of students and alumni perceive that the quality of lecturers and education staff is good, only a small proportion state that the quality of lecturers and education personnel is poor (Figure 3). Improving the performance of lecturers and education staff is usually influenced by professional competence and commitment to the profession (Setyowati & Purwantoro, 2020) so this needs to be a concern of the engineering faculty of the State University of Malang

PERCEPTION OF THE QUALITY OF HUMAN RESOURCES

■ Sangat baik ■ Baik ■ Buruk ■ Sangat buruk

56.90	36.60%	6.50%	0%	
7	25.50%	3.10%	0%	
51.50	43.90%	3.80%	0.80%	
50%	45.90%	4.10%	0%	

MAHASISWA ALUMNI
KUALITASDOSEN

MAHASISWA   ALUMNI
KUALITASSTAF
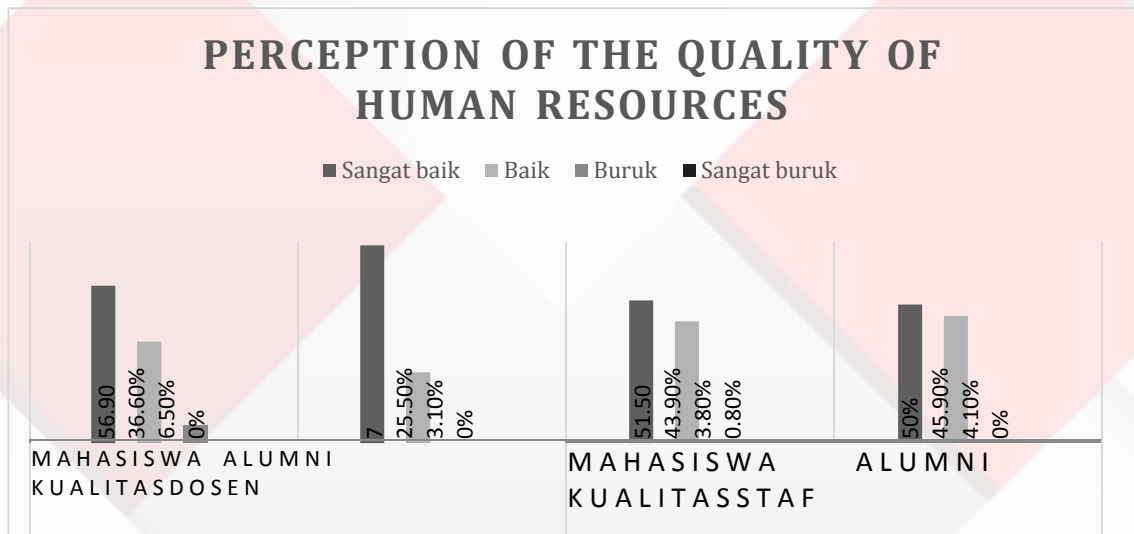
Figure 3. Perceptions of the quality of human resources

The Tridharma Implementation Process

The challenge for a Faculty that seeks to become a Center of Excellence is to improve the quality of the tridharma so that it can compete with other institutions. Tridarma covers education, research and community service (Asmah & Rompegading, 2021; Bungai & Perdana, 2018; Daulay et al., 2020; Pinem et al., 2020; Setyowati & Purwantoro, 2020).

The process of implementing Tridharma according to the perceptions of students and alumni can be seen in Figure 4. Below. The perception of students and alumni of the Faculty of Engineering, State University of Malang on the tridharma process of the faculty is good, but alumni who state that the tridharma in the engineering faculty of UM are still poor (Figure 4). This indicates that there has been an improvement in performance in the field of tridharma so that the current condition represented by active students is better than alumni

PERCEPTION OF THE TRIDHARMA PROCESS

Sangat baik   Baik   Buruk   Sangat buruk

42.70%	41.20%	14.10%	1.90%			
50%	45.90%	4.10%	0%			
42.40%	42.70%	13.70%	1.10%			
33.70%	35.70%	22.40%	8.20%			
37.40%	45.80%	15.30%	1.50%			
35.70%	32.70%	19.40%	12.20%			

MAHASISWA
MAHASISWA
MAHASISWA

ALUMNIPROSESPEMBELAJARAN
ALUMNIPROSESPENELITIAN
ALUMNIPROSESPENGABDIANMASYARAKAT

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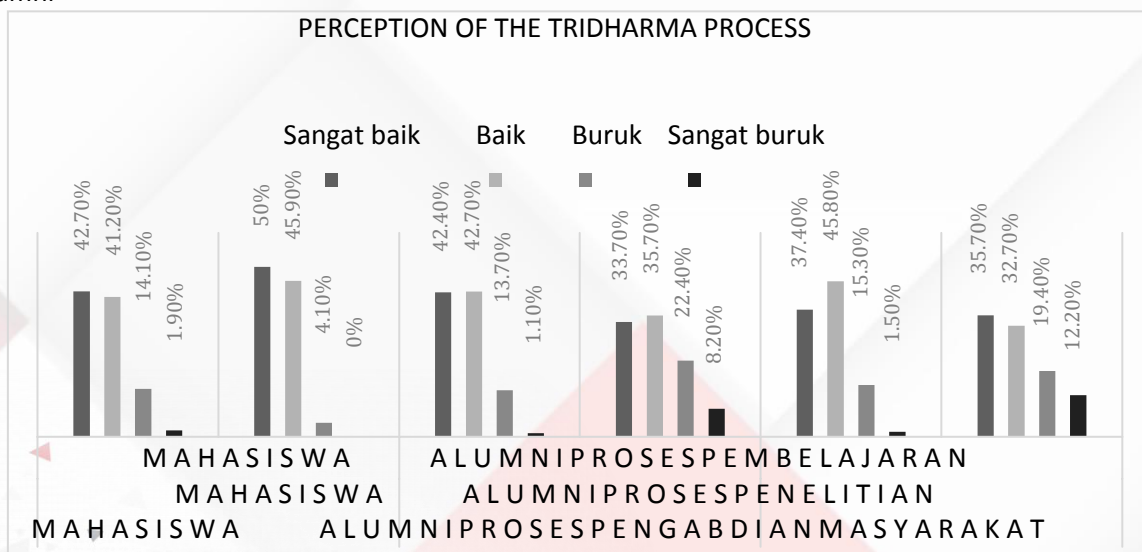
Figure 4. Perception of the tridharma process

Learning Outcomes

One of the successes of implementing the performance of educational institutions can be seen from the learning outcomes (Daulay et al., 2020). Students and alumni in this study were asked to assess whether the learning outcomes could be applied in everyday life, the result was that the majority of students and alumni stated that the learning outcomes were very good and could be implemented in everyday life and the world of work (Figure 5).

PERCEPTION OF LEARNING RESULTS

■ Student ■ Alumni

- VERY GOOD: Student 62.20%, Alumni 58.20%
- GOOD: Student 32.40%, Alumni 35.70%
- BAD: Student 5%, Alumni 5.10%
- VERY BAD: Student 0.40%, Alumni 1%
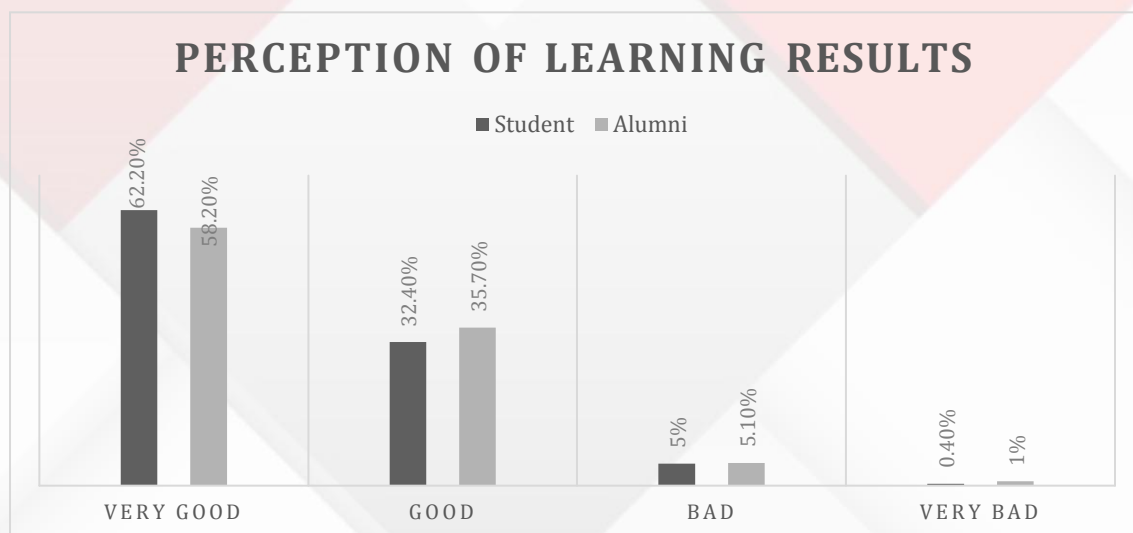
Figure 5. Perception of learning outcomes

Synthesi

In general, there is no significant difference between the perceptions of active students and alumni of the engineering faculty of the State University of Malang on the performance of the faculty. However, in particular there are some essential points that can be considered in this study (Figure 6). Alumni consider that the infrastructure and the tridharma process are the things that most need to be improved, while according to students the important thing that needs to be improved from the performance of the faculty is the quality of its human resources. The results of this study can be understood that the perception attached to alumni and students is when direct experience is in the study process (McAdoo, 2010; Wilby et al., 2019) di Faculty of Engineering, State University of Malang. Alumni perceptions can be regarded as initial conditions that can be used as material for further evaluation, while student perceptions can be used as current conditions that must be improved. If you look at the results of the perception of the two elements, it can be said that the facilities and infrastructure as well as the tridharma process are things that have been improved by FT UM. However, at this time the focus must be on improving the quality of human resources.

High quality human resources, one of the efforts that must be improved is education (Askar, 2019). The quality of the teaching and learning environment and it is also important to improve the performance of lecturers and education staff in bringing excellence in learning and teaching (Bhatnagar & Saxena, 2017).

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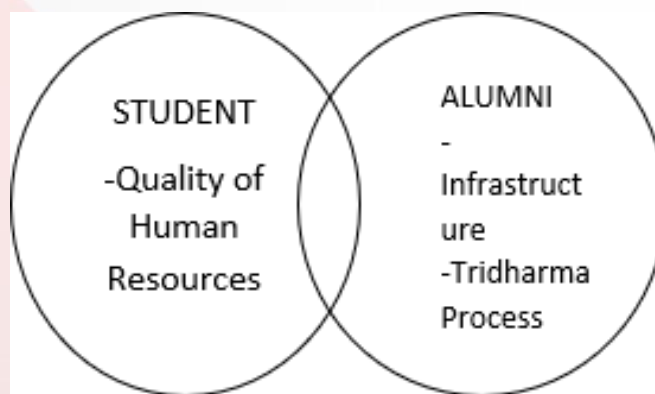
Figure 6. Differences in essential factors that need to be improved by FT UM according to students and alumni

Conclusion

The perspectives of current and former students and graduates must be taken into consideration during the evaluation process of an educational institution. This pair of factors, in addition to serving as a validation tool, can serve as an indicator of the performance and good practices of an institution that is regarded better or inferior. In reality, there is no statistically significant difference between the perceptions of active students and graduates. Alumni perceptions, on the other hand, can be used as an initial indicator of evaluation, whilst student perceptions can be utilized to identify present problems that need to be improved. If you look at the results of the perception of the two elements, it can be said that the facilities and infrastructure, as well as the tridharma process, have all been enhanced as a consequence of FT UM's efforts. However, at this point in time, the emphasis must be on strengthening the overall quality of human capital. It is necessary to improve the quality of human resources by enhancing the education of lecturers and personnel, which must be accompanied by favorable environmental conditions, among other things.

References

Abedin, N. F. Z., Taib, J. M., & Jamil, H. M. T. (2014). Comparative Study on Course Evaluation Process: Students' and Lecturers' Perceptions. Procedia - Social and Behavioral Sciences, 123, 380-388. doi:10.1016/j.sbspro.2014.01.1436

Askar, M. (2019). Faculty Target-Based Engagement Assessment Statistical Model for Enhancingn Performance and Education Quality. IAFOR Journal of Education, 7(2).

Asmah, A., & Rompegading, M. (2021). The Role of Higher Education in Fulfilling the Right of Tri Dharma in the Covid-19 Pandemic Era. doi:10.4108/eai.4-11-2020.2304607

Basaran, M., Dursun, B., Gur Dortok, H. D., & Yilmaz, G. (2021). Evaluation of Preschool Education Program According to CIPP Model. Pedagogical Research, 6(2), em0091. doi:10.29333/pr/9701

Bhatnagar, S., & Saxena, P. S. (2017). Factors in Faculty Performance Analysis. International Journal of Computer Techniques, 4(6).

Bungai, J., & Perdana, I. (2018). Evaluation of Performance Lecturer on Implementing Tridharma College. Indonesian Journal of Educational Review, 5(1).

Creswell, J. W. (2014). Research design : qualitative, quantitative, and mixed methods approaches. New Delhi: SAGE Publications.

Daulay, H. P., Syafaruddin, & Calam, A. (2020). The Implementation of Lecturers' Development Wisdom on Private University. Journal of Critical Reviews, 5(7).

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Edwards, F., & Phillips, R. W. (1982). Teaching Evaluation: A Survey of Alumni Perception: Robins School of Business.

Galguera, M. P. (2018). Globalization, Mass Education and Technical and Vocational Education and Training. Switzerland: Springer Nature

Gunung, I. N., & Darma, I. K. (2019). Implementing the Context, Input, Process, Product (CIPP) Evaluation Model to Measure the Effectiveness of the Implementation of Teaching at Politeknik Negeri Bali (PNB). INTERNATIONAL JOURNAL OF ENVIRONMENTAL & SCIENCE EDUCATION, 14(1).

Hakan, K., & Seval, F. (2011). CIPP evaluation model scale: development, reliability and validity.

Procedia - Social and Behavioral Sciences, 15, 592-599. doi:10.1016/j.sbspro.2011.03.146 Lippe, M., & Carter, P. (2018). Using the CIPP Model to Assess Nursing Education Program Quality and Merit. Teaching and Learning in Nursing, 13(1), 9-13. doi:10.1016/j.teln.2017.09.008

McAdoo, A. D. (2010). Factors Affecting the Institutional Perception of Alumni of the University of Arkansas. University of Arkansas, US.

Muhie, Y. A., Wolde, A. B., Tesfay, C. H., & Bedada, B. A. (2020). Improving Quality of Education by Evaluating the Capacity of Lecturers Using a Web Based System. Journal of Software Engineering and Applications, 13(10), 288-302. doi:10.4236/jsea.2020.1310019 Pelayo, J. M. G., Mallari, S. D. C., & Mungcal, I. G. M. (2017). Student Perception towards Educators, the School and Self-Image as Learners: Assessment, Counseling, Alumni and

Placement Center.

Pinem, R. J., Luqman, Y., Lituhayu, D., Marlina, N., & Paramasatya, S. (2020). The Challenges in The Implementation of University's Tri Dharma during the Covid-19 Pandemic. PSYCHOLOGY AND EDUCATION, 57(8).

Retnowati, T. H., Mardapi, D., Kartowagiran, B., & Hamdi, S. (2021). A Model of Lecturer Performance Evaluation: Sustainable Lecturer Performance Mapping. International Journal of Instruction, 14(2), 83-102. doi:10.29333/iji.2021.1426a

Sahan, K., & Şahan, Ö. (2021). Investigating student and alumni perspectives on language learning and career prospects through English medium instruction. Teaching in Higher Education, 1-22. doi:10.1080/13562517.2021.1973407

Setyowati, L., & Purwantoro. (2020). Determinan yang Mempengaruhi Kinerja Dosen dalam Pelaksanaan Tridharma Perguruan Tinggi. Bongaya Journal of Research in Management, 3(2).

Siregar, Z., Lumbanraja, P., & Salim, S. R. A. (2016). The implementation of Indonesia's three principles of higher education standard towards increasing competitiveness of local universities for ASEAN economic community. Pertanika J. Soc. Sci. & Hum, 24(1).

Stufflebeam, D. L. (1983). The CIPP Model for Program Evaluation. In: Evaluation Models.

Evaluation in Education and Human Services, 6(7).

Sugiyono. (2012). Metode Penelitian Kuantitatif Kualitatif dan R&D. Bandung: Alfabeta.

Tuna, H., & Başdal, M. (2021). Curriculum evaluation of tourism undergraduate programs in Turkey: A CIPP model-based framework. Journal of Hospitality, Leisure, Sport & Tourism Education, 29, 100324. doi:10.1016/j.jhlste.2021.100324

Umam, K. A., & Saripah, I. (2018). Using the Context, Input, Process and Product (CIPP) Model in the Evaluation of Training Programs. International Journal of Pedagogy and Teacher Education, 2. doi:10.20961/ijpte.v%vi%i.26086

Warju. (2016). Educational Program Evaluation using CIPP Model. Innovation of Vocational Technology Education, XII(1).

Wilby, K. J., Alamri, M., & Monfared, S. (2019). Student and Graduate Perceptions Regarding Canadian-based Accreditation of a Pharmacy Program in Qatar. American Journal of Pharmaceutical Education, 83(6).

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COMPETENCE OF CONSTRUCTION WORK ATTITUDES OF VOCATIONAL HIGH SCHOOL STUDENTS ACCORDING TO THE NEEDS OF CONSTRUCTION SERVICES

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Abstract—The purpose of this study was to determine the minimum competency standards for work attitudes of VHS (vocational high school) students that match the needs of construction services, in carrying out the work of making shallow foundation construction. This study uses a descriptive research approach. The research data was obtained through FGD activities with construction service actors with consider into the SKKNI (Indonesian national work qualification standards). The respondents of construction service elements represent the representation of 5 companies of construction service recorded in LPJK (construction service development agency) North Sulawesi. The description of students' work attitude competencies in accordance with the needs of construction services is reflected in 3 work indicators, namely the preparation of supporting materials, preparation of work sites, and work implementation. The results showed that the minimum competency standards for work attitudes of VHS students needed by construction service actors in carrying out foundation construction work is to carefully determine the foundation point according to the working drawings, carefully measure the height difference and carefully install the bowplank.

Keywords— student work attitude, student competence, construction services.

Introduction

The preparation of competent human resources who are ready to work is the goal of the implementation of vocational education. This is the vision of Indonesia's development. The development of Indonesia 2020-2024 is aimed at forming quality and competitive human resources, namely human resources who are healthy and intelligent, adaptive, innovative, skilled, and with character [1].

Vocational education is currently not able to optimally meet the needs of the business world and the industrial world. This means that the need for skilled, creative, innovative and adaptive workforce has not been optimally met. The low quality of the workforce who has not responded to the development of labor market needs is one of the reasons why Indonesia's productivity and competitiveness is still lagging behind. Currently, the proportion of workers in medium and high skill areas in Indonesia is only around 40.60 percent, lower than other ASEAN countries. Meanwhile, workers are still dominated by junior high school graduates and below (57.54 percent or 72.79 million people), while the Open Unemployment Rate (TPT) for middle and high school graduates reaches 8.01 percent. The unavailability of a reliable workforce and low industry involvement have resulted in a mismatch between the provision of educational services, including vocational education and training, and the needs of the labor market [1].

Vocational education graduates are still a contributor to unemployment. Data from the Central Bureau of Statistics (BPS) shows that unemployment in Indonesia amounts to 7.01 million people as of February 2017. The data indicates that the unemployment rate is predominantly graduates by vocational high school (SMK) by 10% as of February 2017 [2]. If you look at the existing labor absorption conditions, shows the most labor absorption occurred mainly in the construction sector as much as 930 thousand people or by 12.77%.

This proves that the continuous improvement of infrastructure development conducted by the government has an impact on the greater demand for competency workers as vocational graduates. SMK graduates are expected to fill positions in jobs as skilled workers in the implementation of construction services as an operator or executor of construction works.

This means that the vocational school students must have a working competency standard with sufficient knowledge in doing the work in the field of expertise. Thus, students must equip themselves with working competence in the implementation of construction works [3] [4].

Competence is a of how one can demonstrate: his skills, knowledge and attitude in the workplace in accordance with Industrial standards or in accordance with the requirements statement by the workplace. Catts, Falk and Wallace mention that competence can be defined as the impact of individual performance at work [5]. Thus the competence becomes a reflection of the ability of each individual in performing a specific job tasks in accordance with their areas of expertise in the workplace. The Indonesian National Qualification Framework (KKNI) states that the graduates of SMK are equivalent to 2 (two) levels, with job description, including having basic operational knowledge and factual knowledge of specific work areas, so as to be able to choose available solutions to common problems. Competency-based work is defined as the ability of work required to demonstrate knowledge, skills and abilities [6]. This means that the competence of work attitudes is a determining factor for each individual in doing work according to his field of expertise.

Vocational education through the learning process in vocational high schools (SMK) is considered to have provided work attitude competence for students. But the work attitude given to students in schools is still considered not in accordance with the needs of the construction service industry. Attitude competence given to students through subjects at school, has been carried out according to the curriculum prepared by the school, but it has not been seen whether it has accommodated all the competence needs of students' work attitudes in the implementation of construction services. This is a consideration so that this research was carried out with the aim of finding the Minimum Competency Standards for Work Attitudes of Vocational High School Students that Suit the Needs of Construction Services, in carrying out the work of making shallow foundation construction.

METHOD

Research design
This study uses a descriptive research approach. This study will describe the Work Attitude Competence of Vocational High School Students which is the minimum standard required by construction service actors, in every construction work, where the level of construction work that is used as the basis for research considerations is the level of vocational secondary education such as vocational high school. The construction work that is the focus of the research is the work of making shallow foundation construction.

Population, sample and respondents
This research involves construction service actors registered at the LPJK North Sulawesi, who are domiciled or work activities in carrying out construction work in the province of North Sulawesi and its surroundings. The involvement of the construction service actors was taken at random from 5 construction service companies, which have and are currently employing workers from vocational high school alumni in North Sulawesi. The selected construction service companies involved their technical leaders as respondents for this research, to attend the FGD activities.

Data collection

The research data was collected through FGDs involving construction service actors. FGD activities were carried out with a focus on discussing the description of the competence of vocational students' work attitudes on shallow foundation construction work. The description of the work attitude competencies of SMK students was used as a discussion material for the FGD, developed from theoretical analysis with consideration of the work description on the Indonesian National Work Competency Standard (SKKNI).

Research instrument

The research instrument used is a description of the competence of vocational students' work attitudes which is the subject of discussion in the FGD with construction service actors. The instrument describing the competence of students' work attitudes is described with 3 work indicators, namely the preparation of supporting materials, preparation of work locations, and work implementation. Each of these work indicators has several items of work attitude statements that are adjusted to the Indonesian National Work Competency Standards (SKKNI)..

Analysis of research data

Analysis of the data in this study used descriptive analysis techniques. The research data were processed and tabulated from the response scores of the research respondents through FGDs. The respondent's response score raises indicators of need and or criteria for work attitudes, which are the types of work attitude indicators that most often arise from discussions and responses with construction service actors in North Sulawesi. The respondent's response score was analyzed so that the minimum standard of student work attitude competence was found.

RESULTS AND DISCUSSION

The results of the study provide an overview of the minimum standards of competency for vocational students' work attitudes on shallow foundation work. Through FGDs conducted with construction service actors, several indicators of the minimum standard of work attitudes that students must have on the dimensions of shallow foundation work. This indicator is a criterion for the level of student work attitudes as a result of discussions and responses given by most construction service actors in North Sulawesi. These indicators are the result of an inventory and identification of several indicators that emerged from discussions with construction service actors. The determination of these indicators is based on the qualifications of SMK students (level 2 KKNI) because from the discussions carried out, several indicators have emerged which, if understood, are no longer at the level of SMK students. Furthermore, there are several indicators of work attitude that become the qualification level of students, but are no longer approved by the majority of existing construction service actors, on the grounds that these work indicators are no longer the authority of students as prospective skilled workers, but are the work authority of carpenters as laborers. experienced freelancer. However, through discussion and deepening of work indicators that are in accordance with the level of work assignments of students as SMK graduates, several work indicators are raised which then become the competency standards for construction work for SMK students. Some of these work indicators, such as a careful attitude in digging the foundation soil and a careful attitude in carrying out foundation work.

The research data were processed and tabulated from the response scores of the research respondents through FGDs. Respondents' response scores gave rise to indicators of need and/or criteria for work attitudes, which were the most dominant types of work attitude indicators mentioned from discussions and responses with construction service actors in North Sulawesi. The respondent's response scores were analyzed so that a minimum standard of student work attitude competence was found.

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Furthermore, through the FGD, it can be stated that the minimum standard of attitude competence achieved by students is minimal competence with a classification of A, or B, or C. Where classification A means being in the good or most appropriate category, classification B means being in the quite appropriate category and C means being in the category not suitable for the needs of construction services. Then the minimum standard classification of attitude competence that must be shown by students, in order to suit the needs of construction services is the classification of attitude competence A with indicators that must carefully determine the foundation point according to the working drawings, carefully measure the height difference and carefully attach the bow plank.

Student work attitude is one of the important aspects, which is characterized by the ability of vocational students to show careful and thorough behavior in doing certain jobs according to their field of expertise. This shows that the attitude aspect is one of the important standards needed to demonstrate the competence of a workforce [7]. The attitude aspect is one of the basic aspects for the recognition of an individual's competence [8]. The attitude aspect is one of the aspects needed to work in certain jobs according to the field of expertise. A person is said to be competent or has the ability to show his expertise, meaning that person has good work competence in doing his job [9]. Thus the competence of student work attitudes becomes an important aspect for success in work according to the field of expertise, which is characterized by a careful and thorough attitude in doing work.

The work attitude of students in carrying out construction work is one of the complementary work competencies that must be prepared properly, in order to guarantee the implementation of effective and efficient construction project work. Construction work is a type of work that has a high level of risk to occupational safety and health, so the aspect of work attitude is an important thing to pay attention to. Work attitude is a more important aspect than the knowledge aspect [10]. The cultivation of good work attitudes for workers needs to be considered [11]. The competence of students' work attitudes must always be relevant to the needs of construction service actors [12]. So it can be said that from several aspects of forming competence, the aspect of work attitude becomes an important aspect compared to other aspects of forming competence.

CONCLUSION
Minimum Standards of Competence The work attitude of SMK students needed by construction service actors in carrying out foundation construction work is to carefully determine the foundation point according to the working drawings, carefully measure the height difference and carefully install the bowplank.

References
Dirjen Pendidikan Vokasi, 2020, Renstra Dirjen Pend Vokasi 2020-2024, Kemdikbud RI, Jakarta. Indonesia.
Kementerian Tenaga Kerja: Alumni SMK Terbanyak Menganggur - Kompas.com (online) diakses tanggal 6 Maret 2018.
Allen, E., & Iano, J. 2009. Fundamentals of Building Construction: Materials and Methods, Fifth Edition. Hoboken: John Wiley & Sons, Inc.
Ching, Francis, D.K. 2014. Building Construction Illustrated, Fifth Edition. Hoboken, Hoboken: John Wiley & Sons, Inc.
Catts, R., Falk, I., and Wallace, R., 2011, Vocational Learning, Innovative Theory and Practice, Springer. London.
Winterton, J., Delamare, F. Le Deist., & Stringfellow, E. 2006. Typology of Knowledge, Skills and Competences: Clarification of the Concept and Prototype. Luxembourg: Cedefop Reference series.
Maclean, R., & Wilson, D. 2009. International Handbook of Education for the Changing World of Work Bridging. Academic and Vocational Learning. Springer Science+Business Media B.V.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

Rauner, F., & Maclean, R. 2008. Handbook of Technical and Vocational Education and Training Research. Bremen: Springer.

Oroh, R.R., AS Haris, Sugandi, R.M., 2017, What are the Dominant Factors of Students' Productive Skills in Construction Services?, IOP Conference Series: Materials Science and Engineering.

Setiawan, H., and Raharjo, F., 2019, Knowledge, skills and attitudes of civil engineers in Indonesia, 7th International Conference on Euro Asia Civil Engineering Forum, IOP Conf. Series: Materials Science and Engineering.

Petersen, A.K., Reynolds, J.H., & Ng, L.W.T., 2008, The attitude of civil engineering students towards health and safety risk management: a case study, European Journal of Engineering Education, 33:5-6, 499-510, DOI: 10.1080/03043790802564053

Oroh, R.R., Runtuwene, J.P.A., Tumanduk, M.S.S., & Palilingan, V.R., 2020, Relevance of student productive skills competencies based on construction services needs, International Journal of Innovation and Learning, vol. 28, issue 1, p. 4-11.

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and Vocational Competence
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RELATIONSHIP OF LEARNING ENVIRONMENT WITH LEARNING MOTIVATION AND STUDENTS OF TATA BOGA UNNES-EDUCATION AS A FORM OF EVALUATION OF MBKM PROGRAM IN 2021

Saptariana. Author, Wahyuningsih, Author, Siti Fathonah, Author
and Romiyatun Mijiling Astuti, Author, Unnes

Abstract (Pogram MBKM, has been written in Permendikbud No. 3 of 2020 on National Standards of Higher Education Article 18 which states that undergraduate students are allowed to choose a maximum of 3 semesters of learning outside their study program. The existence of this program is a challenge for students because students will pursue different learning environments, different ways of learning, different learning methods. Of all these factors, it will affect student learning motivation and ultimately affect student learning achievement. Objective: a.Knowing the learning motivation of students of Tata Bog Education MBKM program b.Knowing the learning environment felt by students of Tata Boga Education MBKM program c. Knowing the relationship of the learning environment with the motivation of learning students of Tata Boga Education mbkm program. Technology or Method: This type of research is correlational or associative research. Research variables are learning motivation, learning environment and climbing achievement. The instrument used is a questionnaire with the form of google form. The data analysis used is descriptive of the percentage and correlation of moment products. Results: 1) The learning environment of students of the Tata boga Education study program outbond MBKM is a very bad learning environment 11.11%, not good 58.3$%, Enough 27.7% 2) The motivation to study students of the Study Program Tata boga outbond MBKM program is motivation quite 33.3%, high 63.9%, very high 2.7 7% 3) There is no relationship of learning environment with learning motivation (sig.t (0.167) ≥ α (0.05).

Keywords: MBKM program, Learning motivation, Learning environment and Prestassi learning

INTRODUCTION

MBKM program, has been written in Permendikbud No. 3 of 2020 on National Standards of Higher Education Article 18 which states that undergraduate students are allowed to choose a maximum of 3 semesters of learning outside their study program.

Through the Merdeka Belajar-Kampus Merdeka (MBKM) Program, students get the opportunity for 1 (one) semester (equivalent to 20 credits) to study outside the study program at the same college; and a maximum of 2 semesters or equivalent to 40 credits studying in the same study program at different universities, learning on different study programs at different universities; and or study outside of college.

The MBKM program in the Tata Boga Education program of Semarang State University is carried out by studying in the same study program at different universities, namely at the universities of Malang State University, Surabaya State University and Padang State University.

The existence of this program is a challenge for students because students will pursue different learning environments, different ways of learning, different learning methods. Of all these factors, it will affect student learning motivation and ultimately affect student learning achievement.

The environment is one of the factors that affect students' learning motivation. Man during his life will always be influenced by family, school, and society atlarge. These three are called learning environments, which are often referred to as educational tripusats that will affect humans in a variety of ways (Umartirtarahardja 2015:163). According to M. Ngalim Purwanto (1995: 72) that what is meant by environment is: All conditions in this world that in certain ways affect the behavior, growth, development

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or life processes of a person except genes and even genes are also seen as preparing the environment (to provide environment) for other genes.

In line with that, Sutari Imam Barnadib (1989: 118) stated that the so-called environment or environment is something that is around it. Zakiyah Daradjat et al (1996: 63) in the broadest sense of the environment are: Covering climate, shelter, customs, knowledge, education and nature. In other words, the environment is everything that appears and exists in the ever-evolving nature of life. Thus, it can be concluded that the environment is all that is visible around us and there are many factors that influence human development and behavior. Aspects of the learning environment according to Dewantoro (in Watoyo, 2008), the environment includes the family environment, the school environment, the community environment. The school environment consists of one consisting of the teacher's relationship with the student, the student's relationship with the student, the learning tools, curriculum, school discipline, and the learning atmosphere. The learning environment affects the success of children in learning and children's success in learning can not be separated from the role of motivation, because the place of learning is the main requirement that must be met to be able to learn well and good achievement, in accordance with the expectations of one's ideals. The family environment also affects the motivation of learning children in school, the conditions here are the way parents educate children at home, social relationships in the family and how the educational background of the child's parents. The construction in question is to provide motivation to the child.

The community environment can also affect children's learning motivations derived from the community such as the influence of mass and electronic media, the influence of playmates, activities outside the school, and the environment where they live. The school environment also affects learning motivation, learning outcomes obtained by children from the school such as teacher interaction with children, the way teachers teach, the use of available media, and children's attitudes towards gurnya and their learning environment.

The environment is a component of the system that determines the resultsof the education process. A conducive learning environment is the backbone and driving factor that can provide its own attraction to the learning process, conversely a less pleasant learning environment will cause saturation and boredom (Mulyasa, 2004: 91). So a good learning environment will add to students' motivation in learning.

Learning motivation is a non-intellectual psychic factor. His role as a growth of passion, feeling happy and eager to learn (sardiman 2012). Encouragement in a student who will move to do something that suits the impulse in him. If the studentis highly motivated in learning, it is possible to obtain high learning achievement, meaning that the higher the motivation, the higher the intensity of effort and effort made. According to the results of research conducted by Said Alhadi and Wahyu Nanda Eka Saputra (2017) there is a positive relationship between acceptance style, learning motivation, learning strategies and student achievement.

According to Sardiman (1992: 39) a person will succeed in learning, if in himself there is a desire to learn. This is the first principle and law in educational and teaching activities. This desire or drive to learn is called motivation. Motivation in this case includes two things: (1) knowing what to learn and (2) understanding why it is worth learning. By contrastingthese two elements of motivation can be used as a good starting base in learning. Because without motivation (not understanding what will be learned and not understanding why it needs to be learned) teaching and learning activities are difficult to succeed.

The results of research conducted by safitri et al (2014) concluded that the socio-economic conditions of parents and the school environment affect economic learning achievement by 79.6%, learning interest affects economic learning achievement by 8.70%, socio-economic conditions of parents affect economic

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learning achievement by 8.29%, and school environment influences economic learning achievement by 22.85%.

Research according to Kristianto (2012), the school environment has the strongest relationship and the community environment has a weak relationship with the learning achievement of students of class IX Department of Otomatif Vocational Education in Sleman Regency.

Based on the study of existing theories and research it can be known that what affects learning motivation is the learning environment, so in this case researchers will examine the relationship of learning motivation with the learning environment in students of mbkm program.

Based on the focus of research The objectives to be achieved from this research are:
Knowing the motivations of learning students of Tata Bog Education MBKM program
Knowing the learning environment felt by students of Tata Boga Education MBKM program
Knowing the relationship of the learning environment with the learning motivation of students of Tata Boga Education MBKM program

METHOD

This type of research is correlational or associativeresearch. The free variable in this study is the learning environment and the bound variable is learning motivation. The population in this study is all students whoare participating inmbkm outbond program with partner universities of Malang State University, Surabaya State University and Padang State University which amounted to 36 students. In this study, all members of the population were sampled, because the number of relatively small members of the population was less than 100. The reason for taking total sampling is because according to Sugiyono (2011) the number of populations that are less than 100 per population is made a sample of all research.

The research instrument used in this study is a questionnaire in the form of google form. The questionnaire instruments in this study are used to obtain data related to the learning environment and learning motivation.

A good instrument must meet two important requirements, namely valid and reliable, toget a good insrumen then first try out.

The validity used inthis research is the validity of the factor. The results of the validity test compare the validity coefficient value with the pearson correlation coefficient value /pearson table (r-table) at the level of significance (usually selected 0.05) and n = the amount of data that corresponds to the criteria of the valid instrument, if r-calculated > r-table and invalid instrument, if r-calculated < r-table,with df, calculated by the formula: N - 2

The reliability test in this study used composite reliability. If the coefficient of reliability obtained >0.70, thenthe instrum ent of the study is highlyreliable, if the reliability coefficient value is 0.50 - 0.70 then reliability is moderate. And the value of the relibelity coefficient < 0.50 then low reliability. (Ghozali, 2018: 46).

Factors in the variables of learning motivation are diligent in facing the task, tenacious in difficulty, showing interest, gymnastics working independently, not getting bored quickly on tasks, being able to maintain his opinion, not easily letting go of what is believed, happy to find and solve problems problems. While the variables of the learning environment consist of factors: 1) social: family, friends, school 2) non-social: places of learning (home and campus), learning atmosphere (home and campus), learning tools

Based on the results of try outs conducted on pkk study students where the student took the MBKM program outside the population members. The validity value of the learning environment variable factor indicates a value of 0,2 to 0.98. This value is compared to the significance value of 0.05.

So it can be said that the details of the problem in the factors in the variables of the learning environment have support for the problems as a whole.

The validity value of the learning motivation variable factor indicates a value of 0.12 to 0.832. The value obtained compared to the value of significance is 0.05. so it can be said that the details of the problem in the learning motivation factor have support for the problems as a whole.

Based on reliability calculations, learning environment data and learning motivation obtained reliability coefficient greater than 0.5 so that it can be said that the instrument can be trusted to produce a good score. Based on the results of the test validity and reliability so it can be said that research instruments can be used to retrieve research data.

The data analysis method used in this study isdescriptive, and correlational analysis. Descriptive analysis aims to get an overview of the learning environment and learning motivation of students of Tata Boga outbound mbkm program. Descriptive analysis used is a descriptive analysis of percentages. The correlation analysis used is a simple correlation analysis with the moment product correlation formula to test the hubugan of the learning environment with the learning motivation of students of Tata Boga outbound mbkm education program.

RESULTS AND DISCUSSION

A. Results

Analysis of learning environment data can be seen in table 1 below:

Table 1 Percentage of Learning Environments

No	Criterion	Percentage
1	Very bad	11,11%
2	Bad	58,35%
3	Pretty good	27,7%
4	Good	0%
5	Very Kind	0%

Based on the picture of the learning environment of students, the learning environment is not good or not good to support for learning.

Based on the analysis of data obtained motivational data can be seen in table 2 below:

Table 2 Percentages of Learning Motivation Data

No	Criterion	Percentage
1	Very low	0%
2	Low	0%
3	Enough	33,3%
4	Tall	63,9%
5	Very high	27,7%

From the data above it is known that the motivation to learn education Tata Boga mbkm program motivation learning average high and nothing low.

The results of the analysis of the relationship of the learning environment with student learning motivation can be seen in the following table

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Table 3 Correlation and learning environment with student learning motivation
Correlations

		MotvBelajar	LingkBelajar
MotvBelajar	Pearson Correlation	1	,235
	Sig. (2-tailed)		,167
	N	36	36
LingkBelajar	Pearson Correlation	,235	1
	Sig. (2-tailed)	,167	
	N	36	40

Based on the data above sig 0.167 This value is compared to the probability value. If probability (sig. Q) ≥α (0.05) then Ho isaccepted and Ha is rejected. So Ho is accepted which means there is no relationship between the learning environment and learning motivation.

B. Discussion

Based onha sil research in can be good student learning motivation and the learning environment is less supportive, and there is no relationship of learning environment with learning motivation, although the learning environment is less supportive but high learning motivation.

This is in line with merli puspita research (2008) stated the results of his research showed 1) there is no positive influence of the family environment on student learning motivation (β3 = 0.007; ρ = 0.124 >α =0.05) 2) There is no positive influence of the school environment on student learning motivation ((β3 = 0.003; ρ = 0.077 >α =0.05) 3) there is no positive influence on the community environment on student learning motivation (β3 = 0.007; ρ = 0.062 >α =0.05).

Research conducted by Mahdalena (2012) states a different thing that is konstribution of learning environment to student learning motivation obtained a value of r (observation) 0.3, with df = 113, greater than r (table) at a significant level of 5% or 1% which is 0,174<0.3>00,228, this means Ha accepted, Ho rejected. Which means there is a relationship of the learning environment with learning motivation.

From the two studies above can be said there are supportive and some are contrary to the results of research conducted by researchers. Although according to the concept of theory conveyed by Purwanto (2014, p. 102) Says "factors that affect the learning of learners among others": 1) Individual factors usually affect learning, among others, factors of maturity and growth, intelligence, exercise, motivation and personal factors. 2) Factors that exist from outside the individual called social factors that affect learning and other family factors or household circumstances, teachers and how to use it, media used in learning activities, the surrounding environment, opportunities owned.

This haal is strengthened by the opinion of Umar Tirtarahardja, 2005: 163)

The wording of Man during his life will always be influenced by the family, school, and wider community The three are called the learning environment, which is often referred to as the tripusat of education, which will affect humans in a variety of ways.

A learning environment is everything that is around students. The learning environment can be physical, such as classrooms, classroom furniture, classroom cleanliness, table-chairs, and others. Classroom environments can also be non-physical, such as interaction, calmness, and comfort. The learning environment affects the success of children in learning and the success of children in learning can not be separated from the role of motivation.

The learning environment affects learning motivation, because the place of learning is the main requirement that must be met to be able to learn well and Good performance, in accordance with the expectations of one's ideals. Family environment It also affects the motivation to learn children in school, the conditions here are how parents educate children at home, social relationships in the family and how the educational background of the child's parents. The construction in question is to provide motivation to the child.

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Conclussion and Suggestion
The conclusions of this study are as follows:
The learning environment of students of the Tata Boga Education study program Outbond MBKM program is a very bad learning environment 11.11%, notgood 58.3$%, Enough 27.7%
Motivation to study students of Tata Boga Education study program Outbond MBKM is motivation cukup 33.3%, tggi63.9%, agat high 2.7 7%
3. There is no relationship between a learning environment and learning motivation (sig. t (0.167) ≥ α (0.05)

Suggestion
Thesran given after the research is:
It is necessary to review other factors that affect learning motivation that have not been studied in the study.
Giving input to institutions that the student learning environment is not good, thus determining the next policy.

REFERENCES
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1. The learning environment of students of the Tata Boga Education study program Outbond MBKM program is a very bad learning environment 11.11%, notgood 58.3$%, Enough 27.7%
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Appendix

Appendixes, if needed, appear before the acknowledgment.

Acknowledgment

References

G. O. Young, "Synthetic structure of industrial plastics (Book style with paper title and editor)," in Plastics, 2nd ed. vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15–64.

W.-K. Chen, Linear Networks and Systems (Book style). Belmont, CA: Wadsworth, 1993, pp. 123–135.

H. Poor, An Introduction to Signal Detection and Estimation. New York: Springer-Verlag, 1985, ch. 4.

B. Smith, "An approach to graphs of linear forms (Unpublished work style)," unpublished.

E. H. Miller, "A note on reflector arrays (Periodical style—Accepted for publication)," IEEE Trans. Antennas Propagat., to be published.

J. Wang, "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," IEEE J. Quantum Electron., submitted for publication.

C. J. Kaufman, Rocky Mountain Research Lab., Boulder, CO, private communication, May 1995.

Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interfaces (Translation Journals style)," IEEE Transl. J. Magn.Jpn., vol. 2, Aug. 1987, pp. 740–741 [Dig. 9th Annu. Conf. Magnetics Japan, 1982, p. 301].

M. Young, The Techincal Writers Handbook. Mill Valley, CA: University Science, 1989.

J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility (Periodical style)," IEEE Trans. Electron Devices, vol. ED-11, pp. 34–39, Jan. 1959.

S. Chen, B. Mulgrew, and P. M. Grant, "A clustering technique for digital communications channel equalization using radial basis function networks," IEEE Trans. Neural Networks, vol. 4, pp. 570–578, Jul. 1993.

R. W. Lucky, "Automatic equalization for digital communication," Bell Syst. Tech. J., vol. 44, no. 4, pp. 547–588, Apr. 1965.

S. P. Bingulac, "On the compatibility of adaptive controllers (Published Conference Proceedings style)," in Proc. 4th Annu. Allerton Conf. Circuits and Systems Theory, New York, 1994, pp. 8–16.

G. R. Faulhaber, "Design of service systems with priority reservation," in Conf. Rec. 1995 IEEE Int. Conf. Communications, pp. 3–8.

W. D. Doyle, "Magnetization reversal in films with biaxial anisotropy," in 1987 Proc. INTERMAG Conf., pp. 2.2-1–2.2-6.

G. W. Juette and L. E. Zeffanella, "Radio noise currents n short sections on bundle conductors (Presented Conference Paper style)," presented at the IEEE Summer power Meeting, Dallas, TX, Jun. 22–27, 1990, Paper 90 SM 690-0 PWRS.

J. G. Kreifeldt, "An analysis of surface-detected EMG as an amplitude-modulated noise," presented at the 1989 Int. Conf. Medicine and Biological Engineering, Chicago, IL.

J. Williams, "Narrow-band analyzer (Thesis or Dissertation style)," Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993.

N. Kawasaki, "Parametric study of thermal and chemical nonequilibrium nozzle flow," M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.

J. P. Wilkinson, "Nonlinear resonant circuit devices (Patent style)," U.S. Patent 3 624 12, July 16, 1990.

IEEE Criteria for Class IE Electric Systems (Standards style), IEEE Standard 308, 1969.

Letter Symbols for Quantities, ANSI Standard Y10.5-1968.

R. E. Haskell and C. T. Case, "Transient signal propagation in lossless isotropic plasmas (Report style)," USAF Cambridge Res. Lab., Cambridge, MA Rep. ARCRL-66-234 (II), 1994, vol. 2.

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

E. E. Reber, R. L. Michell, and C. J. Carter, "Oxygen absorption in the Earth's atmosphere," Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (420-46)-3, Nov. 1988.

(Handbook style) Transmission Systems for Communications, 3rd ed., Western Electric Co., Winston-Salem, NC, 1985, pp. 44–60.

Motorola Semiconductor Data Manual, Motorola Semiconductor Products Inc., Phoenix, AZ, 1989.

(Basic Book/Monograph Online Sources) J. K. Author. (year, month, day). Title (edition) [Type of medium]. Volume (issue). Available: http://www.(URL)

J. Jones. (1991, May 10). Networks (2nd ed.) [Online]. Available: http://www.atm.com

(Journal Online Sources style) K. Author. (year, month). Title. Journal [Type of medium]. Volume(issue), paging if given.   Available: http://www.(URL)

R. J. Vidmar. (1992, August). On the use of atmospheric plasmas as electromagnetic reflectors. IEEE Trans. Plasma Sci. [Online]. 21(3). pp. 876–880.
Available: http://www.halcyon.com/pub/journals/21ps03-vidmar

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J. P. Wilkinson, "Nonlinear resonant circuit devices (Patent style)," U.S. Patent 3 624 12, July 16, 1990.

IEEE Criteria for Class IE Electric Systems (Standards style), IEEE Standard 308, 1969.

Letter Symbols for Quantities, ANSI Standard Y10.5-1968.

R. E. Haskell and C. T. Case, "Transient signal propagation in lossless isotropic plasmas (Report style)," USAF Cambridge Res. Lab., Cambridge, MA Rep. ARCRL-66-234 (II), 1994, vol. 2.

E. E. Reber, R. L. Michell, and C. J. Carter, "Oxygen absorption in the Earth's atmosphere," Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (420-46)-3, Nov. 1988.

(Handbook style) Transmission Systems for Communications, 3rd ed., Western Electric Co., Winston-Salem, NC, 1985, pp. 44–60.

Motorola Semiconductor Data Manual, Motorola Semiconductor Products Inc., Phoenix, AZ, 1989.

(Basic Book/Monograph Online Sources) J. K. Author. (year, month, day). Title (edition) [Type of medium]. Volume (issue. Available: http://www.(URL)

J. Jones. (1991, May 10). Networks (2nd ed.) [Online]. Available: http://www.atm.com

(Journal Online Sources style) K. Author. (year, month). Title. Journal [Type of medium]. Volume(issue), paging if given.   Available: http://www.(URL)

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Use of Animation In Improving Learning Areas of Expertise Braking System In Automotive Department At SMK Negeri 1 Airmadidi

Penggunaan Animasi Untuk Meningkatkan Hasil Belajar Bidang Keahlian Sistem Pengereman Pada Jurusan Otomotif SMK Negeri 1 Airmadidi

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Abstract: The purpose of this study was to determine the effect of the use of animation in improving learning outcomes braking system expertise in the automotive department of SMK Negeri 1 Airmadidi. The design of this experimental study monequivalent contorl group design. The number of respondents as many as 28 people. Learning outcomes data collection instrument was a test. Data were analyzed with parametric statistics, the t-test with techniques independent sample t-tests were calculated using the Statistical Product and Service Solution. The result is a significant influence on the results of the use of animated learning material braking system subjects in class X Automotive at SMK Negeri 1 Airmadidi, of student learning outcomes that are taught by the media microsoft office powerpoint 2010.

Keywords: animation media, learning outcomes.

Abstrak: Tujuan penelitian ini untuk mengetahui pengaruh penggunaan animasi dalam meningkatkan hasil belajar bidang keahlian sistem pengereman pada jurusan otomotif SMK Negeri 1 Airmadidi. Penelitian eksperimen ini menggunakan desain monequivalent contorl group design. Jumlah responden sebanyak 28 orang. Instrumen pengumpulan data hasil belajar adalah tes. Data dianalisis dengan statistik parametris, yaitu uji-t dengan teknik independent sample t-test yang dihitung dengan menggunakan Statisticall Product and Service Solution. Hasilnya adalah terdapat pengaruh yang signifikan dari penggunaan animasi terhadap hasil belajar materi sistem pengereman Jurusan Otomotif pada siswa kelas X Teknik Kendaraan Ringan di SMK Negeri 1 Airmadidi, dari hasil belajar siswa yang diajarkan dengan media microsoft office powerpoint 2007.

Kata Kunci: Media Animasi, Hasil Belajar

Indonesia merupakan Negara yang mengutamakan pendidikan dalam meningkatkan sumber daya manusia. Dengan perkembangan zaman yang mengharuskan manusia harus berpikir secara matang mengenai kelangsungan hidupnya didunia ini. Dengan dasar bahwa Indonesia adalah Negara pendidikan, maka ada beberapa tingkatan pendidikan yang di terapkan di Negara ini, mulai dari pendidikan anak usia dini sampai pada pendidikan di sekolah menengah atas. Dimana dengan pedidikan maka manusia bisa lebih mengenal jati dirinya dan mengembangkan pengetahuannya agar bisa lebih bersaing di masa yang akan datang. Status Indonesia yang juga sebagai negara berkembang, memberikan dampak pada agresifnya pembangunan di negara ini. Manusia dalam hal ini masyarakat indonesia adalah tumpuan utama dari pembangunan yang ada di Indonesia, sehingga pembangunan moral dan mental masyarakat adalah yang paling pokok, dimana masyarakat memiliki dua peran penting dalam pembangunan yaitu sebagai objek dan juga subjek.

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Pendidikan juga tidak bisa dipisahkan dengan teknologi, karena teknologi saat ini sudah menjadi cara yang paling efektif untuk mencapai suatu tujuan yang sangat memuaskan. Teknologi yang penulis akan terapkan pada penelitian ini yaitu teknologi komputerisasi yang digunakan oleh para pengajar untuk meningkatkan hasil belajar kepada para siswa. Tentunya untuk menggunakan teknologi ini dibutuhkan keterampilan khusus dari para tenaga pengajar. Pada penelitian ini penulis akan menerapkan sistem komputer yang berbasis pada design grafis dalam hal ini metode Animasi dalam kegiatan belajar mengajar. Untuk menjadi pembanding dalam metode yang akan penulis terapakan ini adalah metode pembelajaran dengan cara ceramah.

Metode pembelajaran dengan animasi sangatlah berpengaruh pada interaksi belajar mengajar di dalam kelas. Siswa dapat memahami lebih dalam materi yang diberikan oleh guru karna bisa memperhatikan materi yang diberikan oleh guru melalui gambar-gambar animasi. Dengan cara ini maka siswa akan berimajinasi mengenai materi yang diberikan oleh guru. Imajinasi inilah yang nantinya akan memberikan dampak perkembangan pengetahuan siswa terhadap materi yang diberikan.

Metode animasi tentunya sangat penting untuk meningkatkan hasil belajar siswa disekolah. Karena daya tarik siswa terhadap kegiatan belajar mengajar dikelas tentunya akan semakin tinggi, dibandingkan dengan metode ceramah yang selama ini umumnya digunakan oleh para tenaga pengajar. Dengan metode animasi inilah maka akan muncul nuansa baru di dalam kelas. Selain itu juga daya serap siswa dalam pemberian materi bidang keahlian sistem pengereman bisa meningkat, karena siswa bisa melihat proses dan langkah-langkah dalam perbaikan sistem pengereman, cara kerja sistem pengereman, fungsi-fungsi bagian rem dan lain-lain. Dengan peningkatan daya serap siswa, maka hasil belajar siswa pun akan meningkat.

Maka dari masalah yang penulis temui diatas, sehingga penulis ingin melakukan penelitian tentang metode belajar mengajar yang baru, yaitu dengan menggunakan animasi gambar yang merupakan media belajar siswa di kelas, tentunya metode ini membutuhkan ketrampilan khusus dari para tenaga pengajar. Dimana mereka minimal harus menguasai cara menggunakan design grafis photoshop yang dikombinasikan dengan macromedia flash untuk pemberian materi dalam penggunaan metode belajar dengan menggunakan animasi.

Untuk lebih memahami mengenai penggunaan animasi dalam sistem belajar mengajar, penulis akan melakukan penelitian langsung disekolah untuk mendapatkan hasil dari metode pembelajaran dengan menggunakan media animasi. Pada penelitian ini juga penulis akan melaksanakannya dengan cara mengambil sampel siswa yang merupakan subjek penelitian di jurusan otomotif SMKN Airmadidi, pada bidang keahlian sistem pengereman. Dimana penulis akan menerapkan cara pembelajaran dengan menggunakan animasi dan akan diambil hasil ujian dari para siswa, untuk mengukur seberapa jauh pemahaman mereka jika di bandingkan dengan cara pembelajaran menggunakan metode ceramah.

Oleh karena itu, dari pemaparan diatas penulis akan mengangkat penelitian yang berkenaan dengan metode belajar dengan menggunakan animasi sebagai media pembelajaran bagi para siswa. Dalam penelitian ini penulis mengangkat judul: "Penggunaan Animasi Dalam Meningkatkan Hasil Belajar Bidang Keahlian Sistem Pengereman Pada Jurusan Otomotif SMK Negeri 1 Airmadidi".

METODE PENELITIAN

RANCANGAN PENELITIAN

Berdasarkan sifat dan permasalahannya penelitian ini termasuk penelitian eksperimental. Penelitian eksperimental ini termasuk Pra-Ekperimental (Pre-Experimental) dengan jenis The Static Grup Comparison (Zainuddin Muhammad, 1997:56). Dan berdasarkan analisa datanya penelitian ini termasuk penelitian analisis, artinya dalam penelitian ini data mengarah dari sampel menuju ke populasi untuk

digeneralisasikan. Adapun kerangka konsep dari penelitian ekperimen dapat dilihat pada gambar dibawah ini:
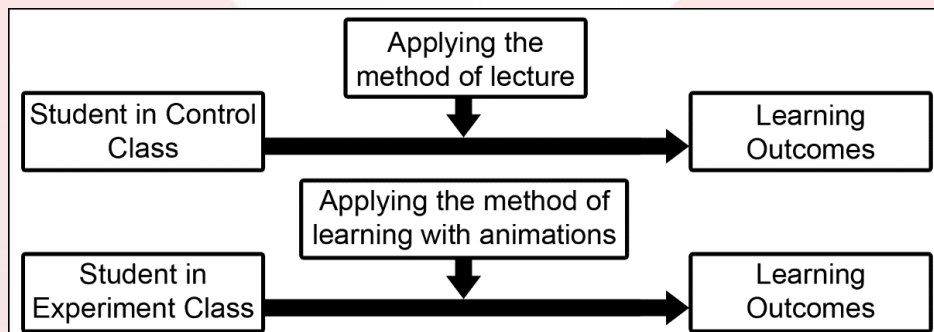
Image 1. Rancangan Kelas Penelitian

TEMPAT DAN WAKTU PENELITIAN

Penelitian ini dilaksanakan di SMK Negeri I Airmadidi. Dan penelitian ini dilaksanakan selama 3 bulan.

TEKNIK PENGUMPULAN DATA

Data yang digunakan dalam peneltitian ini adalah data primer, yaitu data yang didapat langsung oleh peneliti.

Teknik yang digunakan dalam pengumpulan data dengan melakukan pengukuran atau evaluasi berupa tes pada mata pelajaran bidang keahlian sistim pengereman. Dan wawancara langsung tentang kesulitan-kesulitan siswa dalam mengikuti pembelajaran.

POPULASI DAN SAMPEL

Populasi seluruh siswa kelas X teknik kendaraan ringan yang terdiri dari 2 kelas yang berjumlah 28 siswa. Sampel yang diambil dari keseluruhan populasi dengan jumlah 28 yang mengikuti mata pelajaran bidang keahlian sistim pengereman.

VARIABEL PENELITIAN

Variabel penelitian dalam penelitian adalah 2 variabel bebas (independen variable), yaitu hasil belajar dengan mengunakan metode ceramah (X1) dan hasil belajar dengan menggunakan metode animasi (X2).

DEFINISI OPERASIONAL

Hasil belajar dengan menggunakan metode metode ceramah adalah hasil ujian siswa pada mata pelajaran bidang keahlian sistim pengereman dengan interval nilai 0 – 100, yang pada proses pengajarannya diterapkan metode ceramah.
Hasil belajar dengan menggunakan metode animasi adalah hasil ujian siswa pada mata pelajaran bidang keahlian sistim pengereman dengan interval nilai 0 – 100, yang pada proses pengajarannya diterapkan metode animasi.

ANALISIS DATA

Untuk menganalis data dalam penelitian ini digunakan uji statistik inferensi dengan 2 sampel bebas (Two Independen Sample) dengan pengujian Uji-T (Test –T). Untuk menghitung statistik ini digunakan SPSS (Statistical Product and Service Solutions) Versi 16.

HASIL
HASIL PENGUKURAN AWAL TES SEBELUM DITERAPKAN METODE CERAMAH DAN METODE ANIMASI

Hasil belajar sebelum diterapkan metode ceramah dan metode animasi adalah hasil belajar yang diukur sebelum dilakukan perlakuan (treatment) pada kedua kelompok, yaitu kelompok kontrol dengan jumlah 14 responden dan kelompok ekperimen dengan jumlah 14 responden. Kedua kelompok ini diberikan tes di awal (pre-test) sebelum dimulai pelajaran bidang keahlian sistim pengereman. Hasil awal tes dari 28 responden dapat dilhat pada tabel 1, sebagai berikut:

Table 1. Hasil Pengukuran Awal Tes Pada Responden

	Value	Control Group			Experiment Group		
		F	%	Cumulative (%)	F	%	Cumulative (%)
1	10	4	28,6	28,6	5	35,7	35,7
2	15	1	7,1	35,7	1	7,1	42,7
3	20	2	14,3	50	2	14,3	5,1
4	25	0	0	50	1	7,1	64,3
5	30	2	14,3	64,3	1	7,1	71,4
6	35	1	7,1	71,4	1	7,1	78,6
7	40	3	21,4	92,9	2	14,3	92,9
8	50	1	7,1	100	0	0	92,9
9	55	0	0	100	1	7,1	100
	Jumlah	14	100		14	100	

Data tes awal seperti yang tertera dalam tabel 4 menunjukan bahwa kemampuan bidang keahlian pengereman pada kelompok kontrol dan kelompok ekperimen relatif sama. Terlihat prosentase terbesar mendapatkan nilai 10, yaitu pada kelompok kontrol ada 28,6% responden dan kelompok ekeprimen ada 35,7%. Kemudian diikuti yang mendapatkan nilai 40, pada kelompok kontrol ada 21,4% responden dan kelompok ekperimen ada 14,3% responden. Mencermati hasil tes pada dua kelompok, ternyata penguasan materi tentang bidang keahlian sistim pengereman hampir belum dikuasai oleh kedua kelompok.

Hasil pengujian homogenitas tes awal pada kelompok kontrol dan kelompok ekperimen dengan pengujian Uji-F dapat dilihat pada tabel dibawah ini:

Table 2. Hasil Pengujian Homogenitas Kelompok Kontrol dan Kelompok Ekperimen

	Tes Awal
Uji – F	0,007
Signifikansi	0,936

Untuk menarik kesimpulan dari pengujian Uji-F harus diuji hipotesanya, dan hipotesa dari UJI-F adalah sebagai berikut:

H0   : Kedua varian dari tes awal (pre-tes) adalah sama atau identik
HA   : Kedua varian dari tes awal (pre-tes) adalah tidak sama atau tidak identik

Pengambilan kesimpulan adalah sebagai berikut:
Jika probabilitas > 0,05 maka H0 diterima dan menolak HA
Jika probabilitas < 0,05 maka H0 ditolak dan menerima HA
Dari hasil perhitungan Uji-F (lihat tabel 4.2) didapat probabilitasnya sebesar 0,936 dan ternyata nilai probabilitas hasil perhitungan lebih besar dari 0,05 yaitu 0,936 > 0,05. Maka dari hasil pengujian ini adalah menerima H0 dan menolak HA, dengan kesimpulannya adalah hasil tes awal antara yang menerapkan

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metode ceramah dan menerapkan metode animasi datanya adalah identik/homogen. Dengan hasil pengujian homogenitas hasil pre-tes, maka kelompok kontrol dan kelompok ekperimen dilanjutkan layak dijadikan untuk pengujian selanjutnya.

HASIL PENGUKURAN HASIL BELAJAR BIDANG KEAHLIAN SISTEM PENGEREMAN DENGAN MENERAPKAN METODE CERAMAH

Pengukuran hasil belajar siswa pada mata pelajaran bidang keahlian sistim pengereman dilakukan ketika siswa sudah mempelajari teori-teori tentang sistim pengereman yang diberikan oleh guru dengan menerapkan metode ceramah. Pengukuran dilakukan dengan ujian yang berbentuk soal. Dari 14 responden yang menjadi sampel penelitian, hasil belajarnya adalah sebagai berikut:

Table 3. Tabel hasil pengukuran tes kelompok kontrol

No	Nilai	Frekwensi	%	Prosentase Kumulatif (%)
1	50	4	28,6	28,6
2	60	6	42,9	71,4
3	70	4	28,6	100
Jumlah		14	100	

Jika dilihat dari tabel 4.3 diatas ternyata responden yang mendapatkan hasil kurang baik ada 4 responden atau 28,6%, dan yang mendapatkan hasil belajar cukup ada 6 responden atau 42,9%, dan yang mendapat hasil belajar baik ada 4 responden atau 28,6%. Apabila dicermati hasil belajar responden pada bidang keahlian sistim pengereman ternyata masih jauh dari harapan terlihat ada sekitar 28,6% hasil belajar responden kurang memuaskan. Dari nilai rata-rata diketahui juga, ternyata responden yang belajarnya dengan menerapkan metode ceramah hasil belajarnya hanya pada kategori cukup dengan hanya mencapai nilai 60.

HASIL PENGUKURAN HASIL BELAJAR BIDANG KEAHLIAN DENGAN MENERAPKAN METODE ANIMASI

Pengukuran hasil belajar responden pada mata pelajaran bidang keahlian sistim pengereman yang menerapkan metode animasi sama dengan yang dilakukan pada pengukuran hasil belajar yang menerapkan metode ceramah. Pengukuran ini dilakukan ketika responden sudah mempelajari teori tentang bidang keahlian sistim pengereman dengan menerapkan metode animasi. Pengukuran dilakukan dengan ujian yang berbentuk soal. Dari 14 responden yang menjadi sampel penelitian hasil belajarnya adalah sebagai berikut:

Table 4. Hasil pengukuran tes kelompok eksperimen

No	Nilai	Frekwensi	%	Prosentase Kumulatif (%)
1	60	2	14,3	14,3
2	70	5	35,7	50
3	80	5	35,7	85,7
4	90	1	7,1	92,9
5	100	1	7,1	100
Jumlah		14	100	

Jika dilihat dari tabel 4 diatas ternyata responden yang belajarnya dengan menerapkan metode animasi, umumnya hasil belajarnya sangat baik. Dan terlihat dari tabel 4 hampir keseluruhan responden tidak ada yang mendapatkan hasil belajarnya kurang baik, yaitu dengan kategori hasil belajar dari kriteria cukup sampai kriteria sangat baik. Data hasil belajar responden rata-rata mendapat nilai 75,71, ini menunjukkan bahwa umumnya responden mendapatkan kriteria baik.

HASIL PENGUJIAN PERBEDAAN ANTARA HASIL BELAJAR BIDANG KEAHLIAN SISTEM PENGEREMAN YANG MENGGUNAKAN METODE CERAMAH DAN YANG MENGGUNAKAN METODE ANIMASI

Pengujian perbedaan ini untuk melihat antara hasil belajar responden pada mata pelajaran bidang keahlian sistim pengereman yang menerapkan metode ceramah dengan hasil belajar responden yang menerapkan metode animasi. Dari pengujian hasil belajar ini, dapat diketahui apakah ada pengaruhnya pengajaran yang menerapkan metode ceramah dengan pengajaran yang menerapkan metode animasi. Karena penelitian ini termasuk penelitian kuantitatif maka pengujian pertama yang harus dilakukan sebagai syarat adalah bahwa data yang akan diuji harus berdistribusi normal. Pengujian normalitas data dilakukan pada hasil belajar yang menerapkan metode ceramah (X1) maupun hasil belajar yang menerapkan metode animasi (X2). Hasil pengujian normalitas kedua data adalah sebagai berikut:

Pengujian Normalitas Data X1
Pengujian normalitas data X1, yaitu hasil belajar yang menerapkan metode ceramah dengan menggunakan uji nilai kurtosis dan skewness   (lihat lampiran 5). Sebagai syarat pada pengujian ini adalah: jika rasio kutosis dan rasio skweness terletak diantara nilai (-2 sampai 2), maka distribusi data dikatakan normal. Dan jika rasio kurtosis dan rasio skweness tidak terletak diantara nilai (-2 sampai 2) distribusi data dikatakan tidak normal. Rasio kurtosis adalah nilai kurtosis dibagi standart eror kurtosis, dan rasio skweness adalah nilai skweness dibagi standart error skweness. Nilai rasio kurtosis dan skweness dapat dilihat pada tabel berikut:

Table 5. Nilai Skweness dan Kurtosis Variabel X1

	Nilai	Hasil Bagi	Kesimpulan
Skweness	0,000	0	Data Normal
Standar Error Skweness	0,597		
Kurtosis	-1,256	-1,088	Data Normal
Standar Error Kurtosis	1,154		

Data tabel diatas menunjukan bahwa rasio skweness adalah 0 dan rasio kurtosis adalah -1,088. Jika diamati hasil rasio skweness dan rasio kurtosis terletak diantara -2 sampai 2, dan dapat disimpulkan bahwa data X1 yaitu hasil belajar yang menerapkan metode ceramah datanya normal. Dan kenormalan data dapat dilihat dari bentuk kurvanya harus berbentuk lonceng, jika dilhat kurva data X1 berbentuk lonceng (lihat lampiran 6), maka dat X1 dapat digunakan untuk pengujian selanjutnya.

Pengujian Normalitas Data X2
 Pengujian normalitas data X2, yaitu hasil belajar bidang keahlian sistim pengereman yang menerapkan metode animasi dengan menggunakan uji nilai skweness dan kurtosis (lihat lampiran 7). Sebagai syarat pada pengujian ini adalah: jika rasio skweness dan rasio kurtosis terletak diantara nilai (-2 sampai 2), maka distribusi data dikatakan normal. Dan jika rasio skweness dan rasio kurtosis tidak terletak diantara nilai (-2 sampai 2) distribusi data dikatakan tidak normal. Nilai rasio skweness dan rasio kurtosis dapat dilihat pada tabel berikut:

Table 6. Nilai Skweness dan Kurtosis Variabel X2

	Nilai	Hasil Bagi	Kesimpulan
Skweness	0,620	1,03	Data Normal
Standar Error Skweness	0,597		
Kurtosis	0,664	0,57	Data Normal
Standar Error Kurtosis	1,154		

Data tabel diatas menunjukan bahwa rasio skweness adalah 1,03 dan rasio kurtosis adalah 0,57. Jika diamati hasil rasio skweness dan rasio kurtosis terletak diantara -2 sampai 2, dan dapat disimpulkan bahwa data X2 yaitu hasil belajar yang menerapkan metode animasi datanya normal. Dan kenormalan data dapat dilihat dari bentuk kurvanya harus berbentuk lonceng, jika dilihat kurva data X2 berbentuk lonceng, maka data X2 dapat digunakan untuk pengujian selanjutnya.

Pengujian selanjutnya adalah uji perbedaan antara hasil belajar bidang keahlian sistim pengereman yang menerapkan metode ceramah dengan hasil belajar bidang keahlian sistim pengeremana yang menerapkan metode animasi. Dan pengujian ini menggunakan Uji-T, akan tetapi untuk mengunakan Uji-T data yang akan diuji, harus diuji dulu dengan pengujian Uji-F yaitu untuk melihat datanya homogen atau tidak homogen.

Hasil pengujian data X1 dan data X2 dengan pengujian Uji-F dapat dilihat pada tabel dibawah ini:
Table 7. Hasil pengujian dengan uji-F

	Hasil Belajar
Uji – F	1,733
Signifikansi	0,199

Untuk menarik kesimpulan dari pengujian Uji-F harus diuji hipotesanya, dan hipotesa dari UJI-F adalah sebagai berikut:

H0   : Kedua varian dari hasil belajar adalah sama atau identik
HA   : Kedua varian dari hasil belajar adalah tidak sama atau tidak identik

Pengambilan kesimpulan adalah sebagai berikut:
Jika probabilitas > 0,05 maka H0 diterima dan menolak HA
Jika probabilitas < 0,05 maka H0 ditolak dan menerima HA

Dari hasil perhitungan Uji-F (lihat tabel 4.7) didapat probabilitasnya sebesar 0,199 dan ternyata nilai probabilitas hasil perhitungan lebih besar dari 0,05 yaitu   0,199 > 0,05. Maka dari hasil pengujian ini adalah menerima H0 dan menolak HA, dengan kesimpulannya adalah hasil belajar antara yang menerapkan metode ceramah dan yang menerapkan metode animasi datanya adalah identik/homogen.

Dengan homogennya data hasil belajar, maka harus diambil pengujian Uji-T dengan persamaannya yang homogen juga. Hasil perhitungan dengan pengujian Uji-T dapat dilihat pada tabel dibawah ini:
Tabel. 4.8 Hasil Pengujian Dengan Uji-T
Table 8. Hasil Pengujian Dengan Uji-T

	Hasil Belajar
Uji-T	- 4,380
Df	26
Signifikansi (2 tailed)	0,000

Untuk menarik kesimpulan dari pengujian Uji-T, harus diuji dulu hipotesanya, dan hipotesa dari pengujian ini adalah sebagai berikut:
H0   : Kedua rata-rata hasil belajar adalah sama atau identik
HA   : Kedua rata-rata hasil belajar tidak sama atau tidak identik

Pengambilan kesimpulan dari pengujian adalah sebagai berikut:
Jika probabilitas > 0,05 H0 diterima dan menolak HA
Jika probabilitas < 0,05 H0 ditolak dan menerima HA

Dari hasil perhitungan Uji-T (lihat tabel 4.8) nilai probabilitas didapat sebesar 0,000, dan ternyata nilai probabilitas hasil perhitungan lebih kecil dari 0,05 yaitu 0,00 < 0,05. Kesimpulan dari pengujian adalah menolak H0 dan menerima HA, yang artinya terdapat perbedaan yang signifikan/berarti antara rata-rata hasil belajar bidang keahlian sistim pengereman antara pembelajaran yang menerapkan metode ceramah dengan pembelajaran menerapkan metode animasi.
Hasil pengujian ini menyimpulkan bahwa ada pengaruhnya jika pembelajaran disekolah menggunakan metode animasi, dan pengaruh ini dapat dilihat dari hasil belajar rata-rata yang diraih oleh responden yang diterapkan pengajaran dengan menggunakan metode animasi lebih baik dibandingkan dengan hasil belajar rata-rata responden yang menerapkan pengajaran dengan metode ceramah.

PEMBAHASAN

Mata pelajaran bidang keahlian sistim pengereman adalah suatu mata pelajaran yang tidak bisa dibilang mudah untuk dipelajari disekolah kejuruan, karena untuk mempelajari mata pelajaran ini bukan hanya semata menguasai pengetahuan (knowledge) saja, melainkan aspek yang lain, seperti pemahaman (understanding), kemampuan (skill), nilai (value), sikap (attitude) dan minat (interest).
Menurut Gordon dalam buku yang ditulis Mulyasa E (2006:38) faktor-faktor pengetahuan, pemahaman, kemampuan, nilai, sikap dan minat adalah suatu cara yang bisa membentuk kompetensi dari siswa dalam mempelajari seluruh pelajaran yang diberikan disekolah. Oleh karenanya setiap guru harus memahami atau dapat memilih suatu metode-metode yang tepat dalam proses belajar mengajar sistim pengereman, sehingga siswa dapat menyerap seluruh materi pelajaran yang diberikan.

 Sesuai pengamatan peneliti, sering dijumpai guru dalam memberikan pembelajaran sistim pengereman hanya aspek pengetahuan saja (knowledge) yang banyak diberikan kepada siswa tanpa memperhatikan aspek yang lainnya. Padahal untuk menguasai materi sistim pengereman bukan hanya faktor pengetahuan saja, melainkan harus ada juga keterampilan yang harus dikuasai yaitu aspek psikomotornya (skill). Belum lagi ditemui didalam kelas, seperti siswa tidak minat (interest) pada mata pelajaran sistim pegereman, dan seorang guru harus tahu bagaimana bisa membimbing dan memberi pemahaman kepada siswa tersebut.

Sesuai pemahaman peneliti dalam mencermati materi sistim pengereman yang diberikan kepada siswa sesuai dengan kurikulum 2010, hal-hal yang banyak ditekankan kepada siswa dalam mempelajari sistim pengereman adalah aspek penguasaan keterampilan (skill) dibandingkan aspek teori. Oleh karenanya jika seorang guru menginginkan hasil belajar siswanya baik, harus pandai-pandai memilih metode yang tepat dalam proses belajar mengajar. Jangan melihat siswa yang mengikuti pelajaran semua sama dalam penyerapan materi yang diajarkan. Sehingga dalam menyajikan pelajaran hanya terpaku pada metode

ceramah dan tanya jawab saja, dan tidak mau tahu terhadap kesulitan siswa.

Hasil penelitian yang peneliti lakukan untuk melihat apakah ada pengaruhnya metode animasi terhadap hasil belajar sistim pengereman, menunjukan bahwa pengaruh metode animasi terhadap peningkatan hasil belajar sistim pengereman sangat besar. Pengaruh ini ditunjukan dari rata-rata hasil belajar yang diraih antara pengajaran yang menerapakan metode ceamah dan pengajaran yang menerapkan metode animasi.

Hasil penelitian menunjukan bahwa hasil belajar siswa yang dalam proses belajar mengajarnya diterapkan metode ceramah didapat rata-rata hasil belajar sistim pengereman ($\bar{X}1$) sebesar 60, sedangkan hasil belajar yang diterapkan metode animasi menunjukan rata-rata hasil belajarnya lebih baik yaitu sebesar ($\bar{X}2$) = 75,71. Dan setelah dilakukan pengujian Ui-T untuk mengetahui apakah ada perbedaan dari rata-rata kedua hasil belajar, ternyata dari kedua hasil belajar tersebut ada perbedaan yang signifikan, dengan didapatkan hasil perhitungan Uji-T sebesar – 4,380.

Kesimpulan ini menunjukan bahwa pengaruh metode animasi sangat besar pengaruhnya terhadap peningkatan hasil belajar. Dan pengaruh ini bisa dilihat juga dari nilai persentil yang didapat (lihat lampiran), untuk pengajaran yang menerapkan metode ceramah 50% siswa yang diteliti mendapatkan nilai (50,00 sampai 70,00), sedangkan pengajaran yang menerapkan metode lanimasi 50% siswa yang diteliti mendapatkan nilai (60 sampai 75).

Mencermati hasil penelitian ini, bahwa metode animasi sangat baik digunakan dalam proses belajar mengajar untuk mata pelajaran bidang keahlian sistim pengereman. Dan peneliti melihat bahwa metode animasi mempunyai keunggulan tersendiri, karena penyerapan siswa terhadap materi pelajaran tidak dipandang sama melainkan penyerapan siswa dipandang berlainan (diferensial). Jika demikian sebagai seorang guru harus sabar membimbing siswa yang jauh tertinggal dibandingkan siswa yang lainnya, walaupun pengajarannya diluar jam pelajaran. Dan tidak dibenarkan seorang guru acuh terhadap siswa, apakah ia mengerti atau tidak, dan kebiasaan ini yang sering dijumpai peneliti, seorang guru hanya mengejar kurikulum tanpa mau tahu siswa tersebut mengerti atau tidak.

KESIMPULAN

Hasil penelitian menunjukan terdapat pengaruh metode animasi terhadap hasil belajar mata pelajaran bidang keahlian pada siswa kelas X jurusan teknik kendaraan ringan. Pengaruh ini ditunjukan dari uji beda dengan menggunakan UJI-T terhadap rata-rata hasil belajar sistim pengereman, dengan menerapkan metode ceramah ($\bar{X}1$) didapat 60 dan yang menerapkan metode animasi ($\bar{X}2$) didapat 75,71. Dari hasil perhitungan Uji-T   nilai probabilitas didapat sebesar 0,000, dan ternyata nilai probabilitas hasil perhitungan lebih kecil dari 0,05 yaitu 0,00 < 0,05. Kesimpulan terdapat perbedaan yang signifikan/berarti antara rata-rata hasil belajar bidang keahlian sistim pengereman antara pembelajaran yang menerapkan metode ceramah dengan pembelajaran yang menerapkan metode animasi. Maka animasi bisa meningkatkan hasil belajar di kelas X jurusan otomotif SMK Negeri 1 Airmadidi.

DAFTAR PUSTAKA

Aunurrahman, Agustus. (2005). Cooperative Learning. Jakarta: Penerbit Pustaka Belajar.

Bustaman, Burmansya. (2001). Web Design Dengan Macromedia Flash 5.0. Ciputat: Penerbit Dinastindo Adiperkasa Internasional

Elcom. (2013). Menguasai Adobe Fireworks CS6. Yogyakarta: Penerbit Andi.

Hamalik, Oemar. (2001). Kurikulum Pembelajaran. Yogyakarta: Penerbit Bumi Askara

Hidayat, Wahyu. (2010). Arti Media Pembelajaran. Jakarta: Penerbit Gunung Mulia

Madcoms. (2013). Kreasi Animasi WEB Dengan Adobe Flash. Yogyakarta: Penerbit Andi.

Madcoms. (2013). Mahir Dalam 7 Hari Adobe Flash Pro CS6.Yogyakarta: Penerbit Andi.

Mulyasa E. (2004). Kurikulum Berbasis Kompetensi. Bandung: Penerbit PT Remaja Rosdakarya.

Prof. Sukardi, Ph.D. (2003). Metodologi Penelitian Pendidikan. Yogyakarta: Penerbit Bumi Askara.

Saftari, Firmansyah. (2009). Utak-atik Otomotif 2. Jakarta: Penerbit PT. Elex Media Komputindo.

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Sanjaya, Wina. (2007). Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta: Penerbit Kencana.

Sanjaya, Wina. (2008). Perencanaan dan Desain Sistem Pengajaran. Jakarta: Penerbit Kencana Prenada Media Group

Sarwono, Jonathan. (2009). SPSS 16.Yogyakarta: Penerbit Andi.

Setiaji, Bambang. (2004). Kimia Untuk Kelas X. Yogyakarta: Penerbit PT. Intan Pariwara

Suciadi, Andreas Andi. (2003). Animasi Dengan Corel Rave. Jakarta: Penerbit Elex Media Komputerindo

Sudjana, DR. Nana dan DRS. Ahmad Rivai. (2005). Media Pengajaran. Bandung : Penerbit Sinar Baru Algensindo

Sudrajat, Suryana. (2010). Strategi Pembelajaran. Jakarta: Penerbit Prenada Media

Suprijono, Agus. (2009). Cooperatif Learning Teori dan Aplikasi Paikem.Yogyakarta: Penerbit Pustaka Belajar.

Sutikno, M. Sobry. Dr. (2007). Metode dan Model-Model Pembelajaran. Surabaya: Penerbit Holistica.

Usman, Moh. Uzer. (1991). Menjadi Guru Profesional. Bandung: Penerbit Remaja Rosdakarya.

W. Arismunandar dan O. Hirao. (1973). Pedoman Untuk Mencari Sumber Kerusakan, Merawat dan Menjalankan Kendaraan Bermotor. Jakarta: Penerbit PT. Pradnya Paramita.

Widada. (2012). Cara Mudah Desain Animasi Menggunakan 3Ds Max. Yogyakarta: Penerbit Gava Media.

Zainuddin Muhammad. (1997). Metode Penelitian, Surabaya: Penerbit Airlangga Press.

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APPLICATION OF ONLINE LEARNING USING "ZOOM MEETING" APPLICATION RESEARCH METHODOLOGY COURSES DURING THE COVID-19 PANDEMIC

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Abstrak

The purpose of this study is 1) Discovering the effectiveness of online learning through the application of the "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education. 2) Find online learning constraints through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 3) Find online learning solutions through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 4) Find the student's response to online learning through the application "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education. This research uses an ex post facto research model.

In general, the results of this study give an idea that online learning using the application "Zoom Meeting" results in success. That's a success rate at a low level. Many obstacles that arise in teaching using this "Zoom Meeting" application, among others: communication is not smooth; The application "Zoom Meeting" is less convenient for learning models that give rise to many anga, such as calculations and formulas, the operation of tables, graphs or learning images.

Keywords: On-Line Learning, Zoo Meeting

INTRODUCTION

The Covid-19 pandemic caused Indonesia to issue several appeals to the public, such as the call for work from home movement and the call for online learning carried out by almost all universities in Indonesia, this is in line with the news on March 14, 2020, the president through the Head of the National Disaster Management Agency, Doni Monardo at the BNPB building has designated the coronavirus outbreak or covid-19 as a National Disaster, source: http://sehatnegeriku.kemkes.go.id (Masyarakat et al., 2020) One of the "learnings" behind the conditions of the Covid-19 pandemic is learning in the online form of most formal educational activities, including lectures. It can be said that one hundred percent of lecture activities are held online, even including final exams at all levels (thesis, thesis or dissertation). It doesn't seem wrong if Covid-19 has changed the way college is done.., this is related to government regulations on 3M (Nurhidayati & Yuliastanti, 2021). This condition forces students who are familiar with digital operations, in addition to the older generation (all generations) forced to operate online applications. This shift from conventional to online lectures is very fast, massive and drastic. Of course, this phenomenon reaps the pros and cons. Some are enthusiastic, but others question, the extent of the effectiveness of online lectures?(Nurhidayati & Yuliastanti, 2021; Saiful Hakim, Ridho Wijaya, & Arta Abhipraya, 2021).

Online lectures do offer a variety of conveniences and practicalities. Among them, it is not dependent on the room and time. Lecturers and students do not have to meet face to face so that lectures can be done anywhere as long as they can be trampled by the internet wave. Likewise against the method of uploading or downloading, lectures can be held at any time as needed. All students can do both at the time that works best for them. Unless there is an agreement or agreement that the lecture is conducted face-to-face at a predetermined time.(Ahmad Khairul Nuzuli, 2021).

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In addition, online lectures allow international relations to be easier and less expensive. Various collaborations, such as research, inter-institutional cooperation, and the exchange of teachers and experts (especially for final assignments) with universities abroad can have the impact of many benefits that accompany it. An outside worker, for example, can give online lectures in agreed classes as guest lecturers. In the same activity can be done against the final exam. It can certainly be its own value to increase the popularity of the institution. (Yuniarti, 2010).

Walaupun, kuliah daring juga have some challenges. Especially the mindset (mindset) of all academic communities that is still strong leaning on conventional fashion. This has implications at least in administrating Prosedur. The paradigm that gives an idea is performance depending on space and time. That is, physical presence makes it important in administrating. Similarly, lecturers as evidence of attendance administration that ensures the number of rights received, as well as for students the number of attendance is an obligation as a consequence of assessment evaluation. (Ahmad Khairul Nuzuli, 2021).

Next is Leadership systems that are not familiar with online learning. Many students and students experience difficulties. This is because due to the availability of internet networks that are often often inadequate, large quotas that result in often unfriendly for student pockets, the designs used are very diverse between lecturers resulting in institutions receiving heavy burdens for administration and students in accessing lectures become difficult, to different levels of digital device operating capabilities. (Setemen, 2010).

Indeed, the main estimate assumes that online lectures are more frugal, but this should be in a whole and applicable system if done thoroughly would be good.. (Kurniawati, 2021). That is, by eliminating conventional lectures. He will cut various financing contained in conventional lectures, such as the cost of housing for students, electricity costs, air arrangements, water usage costs, building maintenance institutions, janitor fees, student transportation costs to get to campus, and other operational costs.(Sadimin, Mustar Aman, 2018). Conversely, when combining conventional and online lectures, financing likely becomes doubled. This is because the cost for regular college still has to travel and plus online tuition financing, such as to buy a mobile phone, fees for internet networks and fees for institutional fees, as well as research conducted by Tri Kurniawati The use of this approach makes students motivated in attending lectures, their ability to be better at autonomous learning, composing ideas or tasks, working with friends, conveying ideas to others or communication, and solving problems. But there are some obstacles that must be minimized, namely the large cost of using quotas, unstable networks, and students who sometimes get bored because they have to stare at the screen "HP" or laptop throughout the lesson (Kurniawati, 2021).

Finally, The purpose of learning becomes the main challenge, especially related to the goal of forming humanist values in the formation of character. Online lectures don't facilitate that intended thing. This is because online meetings do not have much time to develop things related to affection. But the additional thing is communication that tends to be formal and pay less attention to humanist things. Students and lecturers only to fulfill their obligations only. There is little involving both affection and aspects related to motor. This aspect is difficult, for example, how to learn things related to motor, how to form relationships about society. This is in line with the results of Purba's research which writes that the implementation of learning with the WhatsApp application of this group is not necessarily 100% effective, In this case, learning patterns are more effective when combining face-to-face and online learning. Learning the digital age using technological devices has had a lot of positive impacts. Thus, the learning paradigm so far that is only limited to student interaction with lecturers in the classroom alone can develop to be wider, not limited to

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space and time. As is known, learning is the result of social interaction between students in collaborative learning activities.

Activities can include sharing through mobile devices, such as discussion forums, which can be used to share knowledge construction. The construction of knowledge is based on social interaction between students online (Purba, 2021).

Research objectives: 1) Discovering the effectiveness of online learning through the application of "Zoom Meeting" Research Methodology courses in the Department of Mechanical Engineering Education; 2) Find online learning constraints through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 3) Find online learning solutions through the application of "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education; 4) Find the student's response to online learning through the application "Zoom Meeting" Research Methodology course in the Department of Mechanical Engineering Education.

LIBRARY REVIEW

Coronavirus (Covid-19)

At the end of 2019, the world was horrified by the emergence of a new virus called the 2019 Novel Coronavirus (2019-nCoV). Better known as the coronavirus that first appeared in Wuhan city, China. Coronavirus is a collection of viruses that can infect the respiratory system and can be transmitted from human to human. Coronavirus is reported in more than half of the world's countries. More than 113,000 people have been infected with the coronavirus, and more than 4,000 people have died from COVID-19. In Indonesia, the first coronavirus case occurred in early March. Delivered by Indonesian President Joko Widodo in his speech at the Presidential Palace, Jakarta on March 2, 2020. Jokowi said two people who tested positive for the coronavirus were infected by Japanese nationals who came to Indonesia. International media also released news of the confirmation. The Ministry of Health determined the coronavirus case as an extraordinary event, March 3, 2020 (Sambuari, Saerang, & Maramis, 2020).

The COVID-19 crisis has had a sudden and far-reaching effect on consumer behavior. Government regulations issued in this pandemic era have forced many people to stay at home and led to a surge in internet use. Large numbers of consumers experience higher levels of distress caused by direct experience or fear of the health, economic, and social impacts of the crisis, and are vulnerable to commercial exploitation. In addition, border closures, travel restrictions, and social distance measures have limited consumer demand for services such as accommodation, travel, and large-scale events, while demand for other products has skyrocketed. The perceived scarcity due to essential goods and the breakdown of supply chains has led to panic buying in some countries, forcing many stores to impose item restrictions on hygiene products such as hand sanitizers, disinfectants, face masks, and toilet paper. (Retno Sari Dewi, SH, 2020).

The disease is transmitted through droplets (sparks) when talking, coughing, and sneezing from people infected with the corona virus. In addition, this disease can also be transmitted through physical contact (touch or handshake) with the patient as well as touching the face, mouth, and nose by hands exposed to the corona virus. Clean and healthy living behaviors to prevent coronavirus can be a good and correct way to wash your hands, how to apply cough ethics, how to do Physical Distancing (maintain physical distance), and how to maintain personal hygiene. Providing education on how to prevent the transmission of this corona virus can be done by extension or by using media in the form of posters.(Hafizhdillah et al., 2021).

Social distance or maintaining social distance is very possible to be adopted by Indonesian people who are not benny fond to socialize with each other. Some people believe that social distance is the right step to deal with the covid-19 pandemic compared to regional quarantine.

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But some people there are those who do not understand about and are aware of the importance of social distance in efforts to prevent the transmission of the virus, some even respond to social distance as quarantine themselves so that they do not want to socialize at all and there are also some people ignore social distance. Therefore, the government through President Joko Widodo appealed to the public not to panic and each individual applied social distance in daily routines the news writer also gave further explanations about social distance. This is what became the theme of the news.(Silmi Alfaritsi; Dewi Anggraeni; Abdul Fadhil, 2020).

With the coronavirus pandemic or COVID-19 that was initially detected in Wuhan China, it reached various countries in various continents that claimed thousands of lives infected. Coronavirus or covid-19 which at the time of discovery has no vaccine does little impact on separation, vigilance, even fear. These attitudes and behaviors can not be separated from the role of stakeholders, the role of the media, or emotional control by the individual itself in dealing with the issue of the coronavirus pandemic or covid-19. Research conducted online looked at the attitudes and behaviors of Indonesian people related to covid-19 related to 1) emotional response to the COVID-19 virus pandemic, 2) media that serves as a source of information related to the COVID-19 virus, 3) institutions that are trusted to receive any information related to the COVID-19 virus, 4) respondent hopes. Table 1.5 shows the expectations of respondents with the COVID-19 virus pandemic, and 5) the prevention of the COVID-19 virus(Retno Sari Dewi, SH, 2020).

B. Online Lectures

Online learning is learning that is done without doing face-to-face through the platforms that are already available. Educators dwell on conventional learning methods, namely face-to-face in the classroom between teachers and students or lecturers with students. The process of learning, discussion, question and answer, and guidance all take place face-to-face. Now you have to dig yourself into learning methods in networking or abbreviated online (online). As the results of Suriadi's research written as follows: Corona Virus Disease 19 (Covid-19) causes a lot of impacts obtained especially in the world of education, all changes, especially for learners, those who were initially taught by their teachers face-to-face, but the covid-19 pandemic, caused everything to be done online (online learning) so that students in school delayed all their learning because they were used to it. (Suriadi, Firman, & Ahmad, 2021).

Furthermore, Online lectures make international relations cost-effective and easy to do. Cooperation in many ways, among others, research, collaboration in many ways, such as research, cooperation between study programs, expert carpentry. This is a side thing that can be done related to online lectures. An outside expert can give online lectures for certain classes as a guest lecturer. This will certainly increase the popularity of the college. As the results of research Syarifudin and friends: The concept of lifelong learning makes a person can not be discouraged in learning even though obstacles are dating in various forms. As happened when the government set social distancing when there was a coronavirus pandemic disaster that should not be used as a barrier in learning. The defense must continue, despite the global pandemic disaster that makes the government implement social distancing in the world of education. The most appropriate solution is online learning, but how about online learning? Online learning is learning that is done in the virtual hammering virtual applications available. Nevertheless, online learning must still pay attention to the competencies that will be taught (Syarifudin, 2020). However, online lectures also have several challenges. Especially the mindset (mindset) of all academic communities that is still strong leaning on conventional fashion. This has implications at least in administrating procedures. The emerging paradigm is performance on the basis of space and time. That is, physical presence as evidence that ensures for administrative documentation. For lecturers as a sign of certainty of attendance that ensures the number of rights received, while for students attendance is the obligation of evaluation and assessment. (Oktavian & Aldya, 2020).

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This is what indirectly makes lecturers so far reluctant to use the online mode. Because you still have to go to campus to fill out the attendance list. But the pandemic situation has forced such a mode of administrating to be temporarily abandoned. This is certainly a challenge when the situation returns to normal. Next is a management system that is not ready for online mode. Some lecturers and students get into trouble about online teaching. This is because the internet network often does not meet the requirements, excessive quotas so that they cannot meet the student budget, the budget used variously between lecturers that causes problems for the institution to carry out administration in recording student lectures, to different levels of digital device operating capabilities. As the results of Oktavian & Aldya's research found obstacles in online learning including online learning information system is less able to meet good learning and the manager of the learning system program is less able to overcome existing problems related to online learning. (Oktavian & Aldya, 2020).

Interestingly, this pandemic crisis forced many parties to be able to handle. Some institutions issue solutions in the form of quota donations for lecturers and students, budget uniformization for lightning training and operating software applications. which is necessary. Indeed, the main assumption that online lectures are more targeted. But this needs to be done simultaneously and thoroughly. That is, eliminating face-to-face lectures. He will eliminate various budgets that exist on face-to-face learning, such as boarding fees for students, campus building maintenance, cleanliness budget, daily officer budget, daily budget to go to campus. Conversely, when combining conventional and online lectures, financing likely becomes doubled. Associated with the costs required to support online learning, Hutauruk in his research found many obstacles related to the financing and implementation of online learning. (Hutauruk & Sidabutar, 2020).

The main challenge is the purpose of learning, especially related to the formation of humanist values. Online lectures, in the experience of many people, feel unable to get things that are related to humanists. Indeed, online lectures have forced participants not to have much time-consuming pleasantries. But a side effect is that the relationship between lecturers and students tends to be mechanistic as well as less emotional. Students and lecturers only carry out their respective obligations and functions to cancel the obligations. There is little involving the affection and spikomotor aspects. This is certainly a difficult problem, for example, how to train students to face and adapt to society.

Zoom Meet

Zoom Meeting broadly functions as a communication tool by using video and audio over the internet network. This application is very useful for the process of learning to teach online as well as important meetings of the company without the need for us to meet face to face. In the Zoom Meeting application there are various menus, namely, share screen to share the screen to zoom participants, the record is recording all activities carried out during the meeting, share a sound that is to share the sound of video to zoom participants, the background is the background view of zoom participants, link/invitation zoom meeting (Inayah, 2021).

The utilization of video conference does have a very good communication role, let alone done appropriately. Among them this application provides face-to-face communication facilities between educators and students online through conferences using laptops or smartphones with Zoom Meet means, this application is for communication media facilities between time and place, whether it requires students to be active directly in it. Zoom Meet is categorized as an online learning medium that can be interpreted as a way of teaching, learning in which the provision of teaching materials for learners utilizing internet media. Online learning as a way of learning is sourced electronically which is very much useful, especially as an online education process.

In compiling online learning media need to think about the expectations and goals to follow online learning, speed to follow the network, bandwidth limitations, budget for internet budget, and knowledge and background related to learning.One of the technological innovations to make learning interactive, interesting, and can help teachers make assessment evaluations of students is to use Zoom Meet. Zoom Meet is an online learning medium that is one of the alternative options from a variety of interactive learning media that make the learning process less boring both for students and for teachers. This is because Zoom Meet emphasizes learning styles that involve a student's participation relationship with colleagues competitively with learning he or she has learned. Researchers suspect that collaborating with the use of video teaching, messaging, and evaluation features on online learning can improve students' IPS learning activities and achievements. (Kokoh Ferdiansyah Puji Lestari1 & Utami, 2021) .

RESEARCH METHODS

The subject of this study is a student of the Department of Mechanical Engineering class of 2017, who attended the Research Methodology lecture. The number of students is 40 students. Research place in the Department of Mechanical Engineering - Faculty of Engineering, Surabaya State University, Even semester research time 2019-2020.

Data collected through closed questionnaires, Instruments are compiled by paying attention to indicators related to learning research methodology and paying attention to the implementation of lectures conducted online

Data collected through closed questionnaires, Instruments are compiled by paying attention to indicators related to learning research methodology and paying attention to the implementation of lectures conducted online

Total = counting the number of scores on each instrument
Value = (score x 1) + (score x 2) + (score x 3) + (score x 4)
Percentage = (Value/80) x 100
80 = maximum intrusion score
Instrument score: 4 = very can 3 = enough can 2 = less can 1 = can not

No	Statement/Question	score				Sum	Value	%
		1	2	3	4			
1	Can you understand the material delivered through the "Zoom Meeting"?	3	3	4	10	20	61	76.25

Data Analysis Techniques

Data is processed descriptively, taking into account the strength of opinions of respondents, the next conclusion can be drawn from the data obtained. To pay attention to the strength of each item of the instrument by paying attention to the percentage of each item. The maximum percentage is 100%.

The percentage gradation is as follows:

85% - 100% = Very good; 70% - 84 % = Good; 65 % - 69 % = Enough; Less 64 % = Less

The results of the above percentage results are used on the basis to describe the achievements achieved by each respondent regarding the variables of each instrument. Expert validation for the instrument, Instrument before use to retrieve data performed expert validation test. Expert validation tests involve 3 experts. If the validate value is more than the average then the instrument is declared valid and fit for use. If less than the average item is declared invalid and not used (Faisal, Sanafiah, 2001)

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RESULTS OF RESEARCH AND DISCUSSION

The instrument used by this study has been valid, to find out about the validity of the instrument using expert validation as many as 3 instrument experts. Overall the items contained in the instrument are valid. There are some invalid items, in the sense that there are 2 people who declare the item invalid. In this condition, the invalid item is not used. Valid items were used in this study. The results of the data recap below will be discussed in order as follows:
Effectiveness of Online Learning through Application "Zoom Meeting"
Online Learning Constraints through Application "Zoom Meeting"
Online Learning Solution through Application "Zoom Meeting"
Online Learning Constraint through Application "Zoom Meeting"

Each instrument is discussed about the percentage that belongs to the upper group to pay attention to extreme things. The results of the data recap and discussion of each instrument are as follows:

Effectiveness of online learning through the application "Zoom Meeting"
The results of recap and data analysis on the effectiveness of online learning through the application "Zoom Meeting" as seen in table 1. From table 1. This looks at the value and percentage of each item.

Tabel 1. Instrumen valid efektifitas pembelajaran on-line melalui aplikasi "Zoom Meeting"

No	Statement/Question	Value	%
1	Can you understand the material delivered through the "Zoom Meeting"?	61	76.25
2	Do you understand the stages of material presented with "Zoom Meeting"?	62	77.5
3	Can you follow the description of the material submitted with "Zoom Meeting"?	62	77.5
4	Can you operate the formula delivered with "Zoom Meeting"?	50	62.5
5	Can you identify the issues presented with the "Zoom Meeting"?	54	67.5
6	Can you read the table submitted with "Zoom Meeting"?	51	63.75
7	I was able to rearrange the subject matter delivered through the "Zoom Meeting"?	46	57.5
8	Can I describe the material delivered through the "Zoom Meeting"?	45	56.25
9	Can you read the picture submitted with "Zoom Meeting"?	46	57.5
10	Can you answer the question with "Zoom Meeting"?	44	55
Average			65.125

The results of the data recap of the effectiveness of online learning through the application "Zoom Meeting" above have an average of 65,125%. A percentage of this effectiveness of learning falls into the category of sufficient. That's a fair percentage at the bottom. If you look more closely at other percentages, the 3 percentages are the largest in the point of learning effectiveness, sequentially related to the:
1) understand the stages of the material presented with a "Zoom Meeting" of 77.5%;
2) can follow the description of the material submitted with "Zoom Meeting" of 77.5%
3) Can you understand the material delivered through the "Zoom Meeting"? 76.25%.
Other things contained in the learning effectiveness instrument above can be observed in table 1. Valid instruments of online learning effectiveness through the application "Zoom Meeting"

Online learning constraints through the "Zoom Meeting" application
The results of recap and data analysis about online learning constraints through the application "Zoom Meeting" as seen in table 2. From table 2. This looks at the value and percentage of each item.

tabel 2 . Instrumen valid kendala pembelajaran on-line melalui aplikasi "Zoom Meeting"

No	Statement/Question	Value	%
1	Look at the material delivered through the "Zoom Meeting"	65	81.25
2	Indeed, the main stages of the material presented with "Zoom Meeting"	63	78.75
3	Rationalize the description of the material submitted with "Zoom Meeting"	60	75
4	Rationalize the description of the material submitted with "Zoom Meeting"	58	72.5
5	Clarify the issues presented with the "Zoom Meeting"	61	76.25
6	Use tables submitted with "Zoom Meeting"	58	72.5
7	Documenting the subject matter delivered through the "Zoom Meeting"	51	63.75
8	Develop material delivered through "Zoom Meeting"	41	51.25
9	Can you understand the images or graphics submitted with "Zoom Meeting"?	52	65
10	Can you capture the questions presented with "Zoom Meeting"?	57	71.25
Average			70.75

The results of online learning constraint data recap through the application "Zoom Meeting" above have an average of 70.75%. A percentage of this effectiveness of learning falls into the good category. That's a good percentage that's within the lower limit. If you look more closely at the other percentage, the 3 percentages are the largest in the point of learning constraints, sequentially related to the:
Looking at the material delivered through the "Zoom Meeting" of 81.25%
Capture the subject matter stage presented with "Zoom Meeting" of 78.75%
Clarify the issues presented with "Zoom Meeting" by 76.25%

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Something else contained in the learning constraint instrument above can be observed in table 10. Valid instruments of online learning constraints through the application "Zoom Meeting"

Online learning solutions through the "Zoom Meeting" application
The results of recap and data analysis of online learning solutions through the application "Zoom Meeting" as seen in table 3. From table 3. This looks at the value and percentage of each item.

Table 3. Valid instruments of online learning solutions through the application "Zoom Meeting"

No	Statement/Question	Value	%
1	Ask again through "Zoom Meeting" during the meeting / On-line	71	88.75
2	Ask again through "Zoom Meeting" outside of the meeting / On-line	60	75
3	Discussing issues with "Zoom Meeting" friends	73	91.25
4	Discussing issues with upperclassmen	55	68.75
5	Ask other lecturers	31	38.75
6	Look back at problems that are not understood.	70	87.5
7	Looking for answers from the internet	68	85
8	Looking for answers from similar books	58	72.5
9	Search for answers in the "Zoom Meeting" group	72	90
10	Looking for answers from other sources	48	60
Average			75.75

Hasil rekap data solusi pembelajaran on-line melalui aplikasi "Zoom Meeting" di atas memiliki rerata sebesar 75.75 %. Persentase sebesar ini efektifitas pembelajaran termasuk dalam kategori baik. Itupun persentase baik yang dalam kategori tengah. Jika lebih mencermati persentase yang lain, 4 persentase yang terbesar pada butir solusi pembelajaran, secara berurutan adalah yang berkaitan dengan hal:
Membahas permasalah dengan teman segrup "Zoom Meeting" sebesar 91.25 %

Mencari jawaban di grup "Zoom Meeting" sebear 90 %
Bertanya kembali melalui "Zoom Meeting" saat pertemuan/On-line sebesar 88.75 %
Mencermati kembali permasalahan yang tidak dimengerti sebesar 87.5 %
Untuk hal yang lain yang terdapat pada instrumen solusi pembelajaran di atas dapat dicermati pada tabel 11.

Instrumen valid solusi pembelajaran on-line melalui aplikasi "Zoom Meeting
Student response to online learning through the "Zoom Meeting" application
The results of recap and data analysis about online learning responses through the application "Zoom Meeting" as seen in table 4. From table 4. This looks at the value and percentage of each item.

Table 4. Valid instruments of student response to online learning through the application "Zoom Meeting"

No	Statement/Question	Value	%
1	Stay excited to follow the teaching through the application "Zoom Meeting"	71	88.75
2	Teaching with the "Zoom Meeting" app is drab	72	90
3	Many teaching constraints through the application "Zoom Meeting"	70	87.5
4	Communication in teaching through the application "Zoom Meeting" many obstacles	69	86.25
5	Learning through the "Zoom Meeting" app is slow	58	72.5
6	Written explanation of learning through the application "Zoom Meeting" is less clear	72	90
7	Learning through the application "Zoom Meeting" is often disrupted network	60	75
8	Learning through the "Zoom Meeting" application is often disrupted by distance.	28	35
9	Learning screen view through the limited "Zoom Meeting" app	51	63.75
10	Learning through the "Zoom Meeting" application is often weather-affected	60	75
Average			76.375

The results of the online learning response data recap through the "Zoom Meeting" application above have an average of 76,375%. A percentage of this effectiveness of learning falls into the good category. That's a good percentage in the middle category.
 If you look more closely at the other percentage, the 4 percentages are the largest in the learning response item, sequentially is that the written explanation of learning through the application "Zoom Meeting" is less clear by 90%.Pengajaran dengan aplikasi "Zoom Meeting" menemukan sebesar 90%

Stay excited to follow the teaching through the application "Zoom Meeting" by 88.75%
Many teaching constraints through the application "Zoom Meeting" by 88.5%
Communication in teaching through the application "Zoom Meeting" many obstacles amounting to 86.25%.

Other things contained in the learning solution instrument above can be observed in table 4. Valid instruments of online learning response through the application "Zoom Meeting.

Conclusion
Online lectures offer a convenience and generosity.   It doesn't depend on space or time. Online lecturers and participants do not have to be face-to-face. so that the lecture can be followed anywhere as far as the internet network is available. So for how to upload or download, the lecture can be carried out as needed.

In addition, online lectures provide integration services to the international community to be affordable and easier and cheaper. Cooperation for many things, including research, institutional cooperation, guest lecturers and experts, which gives the high dynamics of the university that follows. A guest lecturer, for example, can fill out an online lecture in a predefined class. This can be a weight in itself that can increase the institution's derajad. The results of this study can briefly be presented as follows:

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The effectiveness of online learning through the "Zoom Meeting" application is 65,125%. A percentage of this effectiveness of learning falls into the category of sufficient. That's a fair percentage at the bottom. Online learning constraints through the "Zoom Meeting" application averaged 70.75%. A percentage of this effectiveness of learning falls into the good category. That's a good percentage that's within the lower limit.

Online learning solutions through the "Zoom Meeting" application above have an average of 75.75%. A percentage of this effectiveness of learning falls into the good category. Online learning response through the application "Zoom Meeting" above has an average of 76,375%. A percentage of this effectiveness of learning falls into the good category. That's a good percentage in the middle category.

In general, the results of this study give an idea that online learning using the application "Zoom Meeting" results in success. That's a success rate at a low level. Many obstacles that arise in teaching using this "Zoom Meeting" application, among others: communication is not smooth; The application "Zoom Meeting" is less convenient for learning models that give rise to many anga, such as calculations and formulas, the operation of tables, graphs or learning images.

The application "Zoom Meeting" is still relevant for teaching with material that has a subject matter of "description" and not to discuss with the subject matter of numbers.

Suggestion

In general, the application of "Zoom Meeting" is less suitable for the delivery of lecture materials online, especially in materials that are many calculations or applications of formulas. Related to that, for the delivery of material online if using the application "Zoom Meeting" is intended for materials that are described, avoid materials that are many formulas and calculations.

For future research it is necessary to pay attention to the application "Zoom Meeting" on other aspects, may it be necessary to pay attention to other applications for learning that use many applications of formulas, tables, graphs, and images.

References

Ahmad Khairul Nuzuli. (2021). Pembelajaran On Line Di Perguruan Tinggi: AnalisisHambatan Komunikasi. Angewandte Chemie International Edition, 6(11), 951–952., 16(1), 2013–2015. https://doi.org/10.24042/bu.v

Hafizhdillah, A. R., Purwaningrum, R., Kheru, A., Eksa, D. R., Mustofa, F. L., & Rafie, R. (2021). Penyuluhan Pencegahan Penularan Corona Virus dengan Mematuhi Protokol Kesehatan di Puskesmas Rawat Inap Kota Karang Bandar Lampung. Jurnal Kreativitas Pengabdian Kepada Masyarakat (Pkm), 4(1), 200–206. https://doi.org/10.33024/jkpm.v4i1.3674

Hutauruk, A., & Sidabutar, R. (2020). Kendala pembelajaran daring selama masa pandemi di kalangan mahasiswa pendidikan matematika: Kajian kualiatatif deskriptif. Journal of Mathematics Education and Applied, 02(01), 45–51. Retrieved from https://jurnal.uhn.ac.id/index.php/sepren/article/view/364

Inayah, Y. (2021). Penggunaan Aplikasi Zoom Meeting Dalam Meningkatkan Motivasi Belajar Kelas Xi Ips 3 Di Sma Negeri 1 Kusan Hilir. Seminar Nasional Pendidikan Profesi Guru Pendidikan Agama Islam, 1(1), 176–187.

Kokoh Ferdiansyah Puji Lestari1), N. R., & Utami3), A. D. (2021). EFEKTIVITAS PEMBELAJARAN DARING DENGAN MENGGUNAKAN ZOOM MEET DI KELAS VII SELAMA PANDEMI COVID-19 PADA PELAJARAN ILMU PENGETAHUAN SOSIAL (IPS) DI SMP NEGERI 1 TRUCUK, 1–9.

Kurniawati, T. (2021). Analisis Penerapan Project Based Learning Approach dalam Pembelajaran On-Line dimasa Pandemi Covid 19, 1–6.

Masyarakat, M., Dan, C., Di, S., Huta, D., Kecamatan, R., Baek, R., & Mandailing, K. (2020). Meningkatkan kesadaran masyarakat akan pentingnya ilmu tentang protokol kesehatan dalam mencegah penyebaran

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

covid-19 menuju masyarakat cerdas dan sehat di desa huta raja kecamatan ranto baek kabupaten mandailing natal. Proceeding.Stain-Madina.Ac.Id, 11–20. Retrieved from http://sehatnegeriku.kemkes.go.id

Nurhidayati, N., & Yuliastanti, T. (2021). Hubungan Pengetahuan Dengan Kepatuhan Masyarakat Menerapkan 3 M (Memakai Masker, Menjaga Jarak Dan Mencuci Tangan) Dalam Upaya Pencegahan Penularan Covid 19. Jurnal Kebidanan, 13(01), 45. https://doi.org/10.35872/jurkeb.v13i01.419

Oktavian, R., & Aldya, R. F. (2020). Efektivitas Pembelajaran Daring Terintegrasi di Era Pendidikan 4.0. Didaktis: Jurnal Pendidikan Dan Ilmu Pengetahuan, 20(2), 129–135. https://doi.org/10.30651/didaktis.v20i2.4763

Purba, A. M. (2021). WHATSAPP GRUP SEBAGAI MEDIA KOMUNIKASI KULIAH ON LINE DENGAN E-LEARNING DI MASA PANDEMI COVID 19, 1–14.

Retno Sari Dewi, SH, M. H. (2020). PERLINDUNGAN KONSUMEN DI ERA PANDEMI VIRUS CORONA Oleh, 38–47.

Sadimin, Mustar Aman, S. (2018). PENGEMBANGAN MODEL PEMBELAJARAN ON-LINE MENGGUNAKAN LEARNING MANAGEMENT SYSTEM PADA SMA NEGERI 1 SUKATANI. Advanced Optical Materials, 10(1), 1–9. Retrieved from https://doi.org/10.1103/PhysRevB.101.089902%0Ahttp://dx.doi.org/10.1016/j.nantod.2015.04.009%0Ahttp://dx.doi.org/10.1038/s41467-018-05514-9%0Ahttp://dx.doi.org/10.1038/s41467-019-13856-1%0Ahttp://dx.doi.org/10.1038/s41467-020-14365-2%0Ahttp://dx.doi.org/1

Saiful Hakim, R., Ridho Wijaya, S., & Arta Abhipraya, F. (2021). Efektivitas Pemerintah Dalam Sosialisasi Gerakan 5m Kepada Masyarakat. Warta Governare: Jurnal Pemerintahan, 2(1), 154–172.

Sambuari, I. B., Saerang, I. S., & Maramis, J. B. (2020). Reaksi Pasar Modal Terhadap Peristiwa Virus Corona (Covid-19) Pada Perusahaan Makanan Dan Minuman Yang Terdaftar Di Bursa Efek Indonesia. JMBI UNSRAT (Jurnal Ilmiah Manajemen Bisnis Dan Inovasi Universitas Sam Ratulangi)., 7(2), 407–415. https://doi.org/10.35794/jmbi.v7i3.30668

Setemen, K. (2010). Pengembangan Evaluasi Pembelajaran Online. Jurnal Pendidikan Dan Pengajaran, 43(3), 207–214.

Silmi Alfaritsi; Dewi Anggraeni; Abdul Fadhil. (2020). View of Analisis Wacana Kritis Berita 'Tentang Social Distance, Cara Pemerintah Cegah Penyebaran Virus Corona' Di Detik.

Suriadi, H. J., Firman, F., & Ahmad, R. (2021). Analisis Problema Pembelajaran Daring Terhadap Pendidikan Karakter Peserta Didik. Edukatif : Jurnal Ilmu Pendidikan, 3(1), 165–173. https://doi.org/10.31004/edukatif.v3i1.251

Syarifudin, A. S. (2020). Impelementasi Pembelajaran Daring Untuk Meningkatkan Mutu Pendidikan Sebagai Dampak Diterapkannya Social Distancing. Jurnal Pendidikan Bahasa Dan Sastra Indonesia Metalingua, 5(1), 31–34. https://doi.org/10.21107/metalingua.v5i1.7072

Yuniarti, R. D. (2010). Potensi E-learning Melalui Sistem Kuliah On-line Dalam Meningkatkan Kualitas Pembelajaran Di Prodi Tata Niaga Jurusan Pendidikan Ekonomi Fpeb-upi. Manajerial: Jurnal Manajemen Dan Sistem Informasi, 9(1), 66–77.

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Synchronous and Asynchronous Hybrid Learning Methods for Vocational High Schools in the Covid-19 Pandemic

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Abstract: The Covid-19 pandemic has had a major impact on life, including the world of education, which has been impacted by the Covid-19 pandemic. The learning process has limited implementation which can only be done online. This resulted in the learning material was not conveyed properly to students. The author's goal is to provide alternative solutions for appropriate learning methods used for Vocational High Schools during the Covid-19 Pandemic. By developing the Hybrid Synchronous and Asynchronous learning methods for Vocational High Schools. So that the learning process will be more effective because the material is not only given to students through the LMS platform but also material is delivered face-to-face virtual. For this reason, the Hybrid Synchronous and Asynchronous learning method is recommended to be applied to vocational high school students to become an alternative solution for teaching and learning methods during the COVID-19 pandemic.
Keyword: Hybrid, Synchronous, Asynchronous.

INTRODUCTION

Until now the Covid-19 pandemic is still going on around the world. The Covid-19 pandemic has had a huge impact on various sectors, including education. During the Covid-19 pandemic, many countries have decided to temporarily close schools and colleges. Each of these countries makes policies to overcome current problems, especially in the field of education. One of the efforts to overcome the Covid-19 pandemic outbreak, all countries implement a social distancing movement, namely social distancing designed to reduce the interaction of people in the wider community (Wilder-Smith & Freedman, 2020: 2). With the social distancing policy, learning in schools is hampered and cannot be done directly. So this is very influential on the implementation of educational activities.

With the Covid-19 pandemic, the Government announced Extraordinary Events (KLB) throughout Indonesia. This extraordinary incident caused chaos, especially in the field of education. Both schools and campuses were closed, resulting in disruption of teaching and learning activities at school and on campus. Learning that was originally done face-to-face is temporarily unable to be carried out. To overcome these problems, it is necessary to change the model design in teaching and learning activities to avoid face-to-face learning as an effort to reduce the spread of the covid-19 virus outbreak.

The Ministry of Education and Culture also immediately issued circular letter No. 4 of 2020 regarding the implementation of education policies in the emergency period of the spread of the corona virus disease (Covid-19) which contains an appeal to study from home with online learning activities (in the network) or distance learning (PJJ). During the pandemic, online learning has now been carried out almost all over the world (Goldschmidt, 2020:88). Thus, it requires schools to carry out teaching and learning activities using online learning methods or distance learning. Distance learning, which emerged at the end of the 20th century, entered the 21st century as one of the most effective forms of learning (Lenar et al, 2014:111). Distance Education can be defined as a learning process that does not take into account the space and time of learning, has an independent nature for the process of developing students using methods and media in learning activities (Kor et al, 2014:854). In Indonesia distance learning (PJJ) is not something new,

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because education with technology is continuous with each other. Distance learning is the most appropriate choice during the Covid-19 pandemic because education must continue.

The Vocational High School Education unit is no exception, which must implement Online Learning to carry out teaching and learning activities. Stefan Hrastinski 2008 states that online learning is divided into two types, namely synchronous learning and asynchronous learning. However, the majority of online learning teachers only use the asynchronous model with Google Classroom as a substitute platform for face-to-face learning. Asynchronous Learning (ASL), which is an online learning process that provides teaching materials and indirect assignments. Teaching materials and assignments can be in the form of powerpoint, pdf, video or other forms. MacDonald and Creanor (in Sutriyanti, 2020) explain asynchronous learning means communication activities that do not require all students to be online simultaneously, the most common example is online discussion forums that can be read and responded to at any time, such as the use of Google Forms, Google Docs, and Spreadsheet. . The advantages of Asynchronous Learning are that students are more flexible in studying the material or learning materials. And also time to reflect on learning more freely. However, in addition to these advantages, there are disadvantages if online learning only uses the Asynchronous learning method. Among them are interactions with teachers that cannot be real time, so it takes time to communicate. And students must get used to discipline, because this learning character requires the independence of students.

So teachers need to also apply the Synchronous Learning method in online learning in teaching and learning activities. Synchronous Learning is online learning directly using a teleconferencing application (can zoom meeting or google meet). With the Synchronous Learning method, teachers can replace face-to-face meetings with virtual face-to-face meetings.

In this study, researchers will provide alternative online learning solutions for Vocational High Schools in the Pandemic Period by using Asynchronous and Synchronous Hybrid Learning Methods. By applying the Hybrid Asynchronous and Synchronous Learning Method for Vocational High Schools in the Pandemic Period, it is hoped that it can help teachers and students in Teaching and Learning Activities. So that teachers can be more effective in providing material with hybrid Asynchronous Learning with a class room platform and combined with Synchronous Learning as a virtual face-to-face using a zoom meeting platform. And for students it can increase knowledge and make it easier for students to absorb learning material.

RESEARCH METHODS

In this study, researchers used the development model of Lee & Owens (2004) as the basis for conducting research. With five stages, namely; 1) Analysis 2) Design 3) Development 4) Implementation and 5) Evaluation.

The analysis stage is carried out as a first step for researchers for information that will later be used as capital in developing learning. Meanwhile, at the design stage, the researchers made preparations by making alternative learning design solutions using the Hybrid Asynchronous and Synchronous learning methods for Vocational High Schools during the Pandemic that would be implemented. The development stage is carried out by pouring the Hybrid Asynchronous and Synchronous learning methods into a Semester Learning Plan (RPS). The researcher also made a tutorial that contains guidelines for using Google class rooms and zoom meetings as learning media carried out in teaching and learning activities with the Hybrid Asynchronous and Synchronous learning methods. Then at the implementation stage the author applies the Hybrid Asynchronous and Synchronous learning method to the students of SMK Al Ishlah Pulokulon.

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The last is the evaluation stage, at this stage the researcher tests the validity of the application of the Hybrid Asynchronous and Synchronous learning methods for Vocational High Schools. This validity test involves several experts, namely learning design experts and media experts.

Meanwhile, at the trial stage, it involved students at SMK Al Ishlah Pulokulon. Data collection techniques in this development are using questionnaires and interviews. Interviews were conducted with several students regarding the difficulties they experienced with online learning using the Asynchronous Learning method only (Google Class Room). Then interviews were also conducted with several teachers to find out initial information about previous learning and also the effectiveness of previous online learning.

In the expert test stage, which involved two experts, namely 1) Learning design experts and 2) Media experts, it was carried out to get an assessment of how the level of validity of teaching and learning activities with Hybrid Asynchronous and Synchronous learning methods was carried out. While the trial was carried out to get an assessment from students as users or those involved in this learning.

The data analysis phase carried out is the analysis of validity data obtained from validity tests on design experts and media experts as well as assessment questionnaires on learning trials for students. The results are calculated by calculating the total score obtained from the questionnaire divided by the maximum score of all components of the questionnaire. Calculation of the percentage value is calculated by the formula:

$$P = \frac{F}{A} \times 100\%$$

With:
P = Percentage
F = Total score obtained
A = Total maximum score

Then the conclusions from the results of the assessment of the components contained in the questionnaire on the expert validation test are converted to the eligibility criteria of a learning product. Learning with the Hybrid Asynchronous and Synchronous learning method can be said to be valid if the calculation results are above a score of 80%. The eligibility criteria for learning products can be seen in the following table:

Table 1. Eligibility criteria for Asynchronous and Synchronous Hybrid Learning Methods

Percentage	Qualification	Equivalent
80% - 100%	Valid	Worthy
60% - 79%	Quite valid	Decent enough
30% - 59%	Not valid	Not worth it
0% - 29%	Invalid	Not feasible

RESULTS AND DISCUSSION

Description of Development Procedure

Analysis
The analysis phase carried out by the researchers resulted in a finding that online learning carried out at Vocational High Schools during the Covid-19 pandemic used online learning. However, the majority of teachers only use the asynchronous model with the Google class room as a substitute platform for face-to-face learning. Teachers and students are quite proficient in using gadgets such as laptop PCs and smartphones for teleconferencing supported by the availability of an internet network. Therefore, the

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Hybrid Asynchronous and Synchronous learning method with the google class room and zoom meeting platforms can be applied as an alternative online learning solution during this pandemic.

The information obtained from the results of interviews conducted by researchers is that students still have difficulty in capturing material from the teacher if they only use the google class room platform as a forum for providing materials and assignments. Students expect to be given face-to-face meetings even if only virtual so that students will better understand the material presented by the teacher.

Design

At this stage, the researchers made preparations by designing teaching and learning activities with Hybrid Asynchronous and Synchronous learning methods. Asynchronous Learning uses the Google Class Room Platform which is used by teachers to provide material and student assignments. Meanwhile, Synchronous Learning uses a zoom meeting platform as a substitute for face-to-face with virtual face-to-face. In Asynchronous Learning, the teacher provides an explanation regarding the material presented and also the interaction with students, both question and answer and discussion.

Development

The result of this stage is a semester learning plan (RPS) which is then outlined in a guidebook for the implementation of teaching and learning activities for the Hybrid Asynchronous and Synchronous learning methods intended for teachers. This guide also includes guidelines for using Google Class Room and Zoom Meetings which are used as platforms in conducting teaching and learning activities for Hybrid Asynchronous and Synchronous learning methods.

Implementation

After going through several previous stages, alternative learning method solutions that have been developed are then implemented in the classroom. Online learning is done using Hybrid Asynchronous and Synchronous, with 50% learning time using Asynchronous Learning and 50% using Synchronous Learning. Teaching and learning activities in the first meeting started with Asynchronous Learning using Google Class Room to provide material to students. Which is then continued at the next meeting with Synchronous Learning using a zoom meeting to explain the material and conduct a question and answer session or discussion. However, it can also be done in one meeting to combine Asynchronous and Synchronous Learning with technical teaching and learning activities, first the teacher uploads material in the Google class room then continues by explaining the material on the Zoom meeting platform.

Evaluation

The results of the implementation of the Asynchronous and Synchronous Hybrid Learning Method for Vocational High Schools during the Covid-19 Pandemic were then assessed by students. Previously, this alternative learning solution was through a validity test conducted by learning design experts and media experts. Students give their opinions about the implementation of teaching and learning activities using the Hybrid Asynchronous and Synchronous Learning Method for Vocational High Schools during the Covid-19 Pandemic which they have obtained by filling out an assessment questionnaire provided by the researcher. The results of the validity test of two experts and also field trials of teaching and learning activities using the Asynchronous and Synchronous Hybrid Learning Method for Vocational High Schools during the Covid-19 Pandemic are described in the following table:

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Table 2 Expert Validity Test Results and Field Trials

Subject	Score Gain/ Maximum Score	Percentage	Category
Design Expert	45/ 50	90%	Valid
Media Expert	70/ 75	93%	Valid
Field Trial	215/ 250	86%	Valid

Based on the results of expert validity tests and also on field trials, it can be seen that the alternative solution for teaching and learning activities using the Hybrid Asynchronous and Synchronous Learning Method for Vocational High Schools during the Covid-19 Pandemic is included in the valid category to be applied in learning. This is based on the assessment of learning design experts who get 90% so that it is included in the valid category. Likewise with the validity tests conducted on media experts regarding the use of media used in online classes, media experts considered that learning with the Asynchronous and Synchronous Hybrid Learning Method for Vocational High Schools during the Covid-19 Pandemic could be categorized into valid categories. with the acquisition of the percentage value reaching 93%. Finally, the results of the assessment of students in the field trial got an assessment percentage reaching 86% and this value was also included in the valid category.

There are several suggestions from media experts, design experts and also from students who are the subject of learning trials that can help researchers to further refine product development in the form of alternative online learning solutions. Among others; In teaching and learning activities, please ensure an adequate internet network. The learning implementer (teacher) must determine the time allocation for the implementation of the Asynchronous and Synchronous Hybrid Learning Method so that students can prepare themselves. Finally, the teacher must ensure that students are active and participate in online teaching and learning activities using the Hybrid Asynchronous and Synchronous Learning Methods.

CONCLUSION

With the results of the assessment from the expert validity test and also field trials where all of the assessments are in the valid category, alternative solutions for teaching and learning activities conducted online using the Asynchronous and Synchronous Hybrid Learning Method for Vocational High Schools during the Covid-19 Pandemic can be considered. to be applied in learning during the current covid-19 pandemic to meet the needs of students. Online teaching and learning activities using the Hybrid Asynchronous and Synchronous Learning Method can be used as a new innovation where online learning with the Asynchronous Learning method is not enough to meet the needs of students. The Synchronous method with Teleconferencing is needed by students to improve understanding of the material presented by means of face-to-face virtual with the teacher and classmates.

Suggestions for further developers are that it is hoped that teaching and learning activities carried out online using the Hybrid Asynchronous and Synchronous Learning Method for Vocational High Schools during the Covid-19 Pandemic choose a more user-friendly platform so that it is easy for teachers and students to use.

REFERENCES

A Lee, W. W. & Owens, D. L. (2004). Multimedia-based Instructional Design. California: Pfeiffer.

Goldschmidt, K. (2020). The Covid-19 Pandemic: Technology use to support the wellbeing of children. Journal of Pediatric Nursing, 88–90.

Hrastinski, Stefan. 2008. A theory of online learning as online participation. Uppsala University, Computer and Systems Science, Department of Information Science

Kor, H., Aksoy, H., & Eerbay, H. (2014). Comparison of the Proficiency Level of the Course Materials (Animations, Videos, Simulations, E-Books) Used In Distance Education. Procedia - Social and Behavioral Sciences, 141, 854–860. Retrieved from https://doi.org/10.1016/j.sbspro.2014.05.150

Lenar, S., Artur, F., Ullubi, S., & Nailya, B. (2014). Problems And Decisions In The Field Of Distance Education. Procedia - Social and Behavioral Sciences, 131, 111–117. Retrieved from https://doi.org/10.1016/j.sbspro.2014.04.088

Sutriyanti, N.K. 2020. Menyamai Benih Dharma Perspektif Multidisiplin. Yayasan Ahmad Cendekia Indonesia

Wilder-Smith, A., & Freedman, D. O. (2020). Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. Journal of Travel Medicine, 1-4.

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The Effect Of Intelligent Questions And Learning Intensity On Learning Outcomes In Mechanical Engineering Expertise Students Department Of Mechanical Engineering Education Faculty Of Engineering Unima

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Every graduate desires a job that is in accordance with their competencies, including Mechanical Engineering Education students. The learning outcomes of students' mechanical engineering expertise are the main capital for students in obtaining jobs in accordance with the study program taken. The formulation of the problem in this study is whether intelligent questions and learning intensity affect student learning outcomes in the field of mechanical engineering expertise. The purpose of this study is to analyze how much intelligent questions and learning intensity affect student learning outcomes in the field of mechanical engineering expertise.

This research uses a quantitative approach and a survey method using a questionnaire as a research instrument and documentation of the Grade Point Average as a result of studying students' mechanical engineering expertise. The variables in this study are intelligent questions, X1 and learning intensity, X2 and student learning outcomes in the field of mechanical engineering expertise, Y. The population and research sample amounted to 25 respondents.

The hypothesis of this research is that there is an influence between intelligent questions and work intensity on learning outcomes in the field of mechanical engineering expertise for students of the Department of Mechanical Engineering Education, Faculty of Engineering, UNIMA.

Keywords: intelligent questions, learning intensity, and student learning outcomes

PENDAHULUAN

Di era globalisasi ini ditandai persaingan kualitas sumber daya manusia. Maka menuntut semua pihak dalam berbagai bidang untuk meningkatkan kompetensinya termasuk bidang pendidikan.

Untuk mencapai hasil belajar yang sesuai dengan karakter pendidikan kejuruan maka tentunya hambatan-hambatan dari luar maupun dalam dunia pendidikan kejuruan sangatlah besar. Khususnya di Jurusan Pendidikan Teknik Mesin Fakultas Teknik Unima yang merupakan Pencetak "Guru Pendidikan Kejuruan" untuk bidang permesinan.

Satu hal yang sangat disayangkan yaitu kurangnya hasil belajar mahasiswa jurusan Pendidikan Teknik Mesin pada bidang keahlian teknik mesin yang sebenarnya merupakan tujuan atau sasaran dari jurusan Pendidikan Teknik Mesin. Berdasarkan Borang Akreditasi Jurusan Pendidikan Teknik Mesin (2016: 24) menjelaskan bahwa keahlian berdasarkan bidang ilmu (profesionalisme) lulusan teknik mesin berdasarkan tanggapan pihak pengguna dalam hal ini kepala Sekolah Menengah Kejuruan yaitu sebesar 70% merasa cukup, 18% merasa baik, 8% kurang dan 4% sangat baik. Dari data tersebut dapat dilihat bahwa 70% pengguna lulusan merasa cukup pada keahlian berdasarkan bidang ilmu lulusan jurusan pendidikan teknik mesin.

Berdasarkan data yang diperoleh tahun 2021 semester genap dengan jumlah rata-rata SKS yang di ambil adalah 10,99 dan capaian IP semester tersebut 1,10. Untuk angkatan tahun 2015 sampai 2018 maka diperoleh SKS rata-rata 9,98 dan IP semester 0,85 artinya mahasiswa rentang angkatan tersebut pada

semester yang berjalan masih dibawah standar kelulusan nilai mahasiswa adalah nilai C dengan IPK 2.0 berdasarkan pedoman akademik Universitas Negeri Manado tahun 2016.

Berdasarkan data pada Mata Kuliah Bidang Keahlian teknik mesin dengan pendapat ahli mengenai hasil belajar dapat dilihat bahwa daya serap mahasiswa pada mata kuliah-mata kuliah bidang keahlian Teknik Mesin masih kurang maka keberhasilan belajar pun akan kurang, itu dapat dilihat dari indikator-indikator keberhasilan hasil belajar seperti yang sudah dipaparkan oleh Djamarah dalam buku Supardi (2015: 5). Masalah hasil belajar ini pun dengan sendirinya muncul ketika mahasiswa tersebut mencapai masa studi pada semester V, dimana sudah memiliki nilai dasar/murni mata kuliah bidang keahlian Teknik Mesin.

Permasalahan hasil belajar memang tidak mucul dengan sendirinya tetapi bisa saja terjadi karena adanya faktor-faktor lain yang mempengaruhi mahasiswa dalam belajar, sehingga mengakibatkan hasil belajar yang kurang baik. Faktor yang kemungkinan dapat mempengaruhi hasil belajar seperti yang dapat dilihat dari perilaku mahasiswa itu sendiri secara kasat mata yaitu faktor intensitas belajar. Hal ini dapat dilihat dari kurangnya inisiatif mahasiswa untuk membaca buku ataupun mencari informasi mengenai mata kuliah yang sedang di pelajari. Namun semuanya juga bisa didasari oleh faktor intelligent questions atau IQ dari setiap mahasiswa itu sendiri, karena ini merupakan dasar kemampuan intelektual dari mahasiswa itu sendiri. Faktor-faktor lainnya juga dapat mempengaruhi hasil belajar, seperti media pembelajaran yang kurang atraktif dan kreatif.

Faktor IQ atau Intelligent Questions merupakan dasar untuk mengetahui seberapa jauh kemampuan seseorang dalam memahami sesuatu (Prasetyono, 2015: 10), sehingga dalam proses belajar mengajar. Mahasiswa yang memiliki IQ tinggi diharapkan dapat mencapai hasil belajar yang baik. Namum bagaimana dengan mahasiswa yang memiliki IQ dibawah rata-rata atau menengah. Tentunya akan sulit untuk menyerap mata pelajaran dari para dosen.

Kemampuan anak-anak untuk memahami suatu materi pembelajaran sangat berbeda. Ada anak-anak yang memiliki kemampuan untuk menanggapi dan yang memahami materi dengan cepat dan baik, namun dalam kenyataan pula, ada juga mereka yang berpikir lambat, yang sulit dimengerti dan dipahami, dan itu adalah hal yang wajar. Ada pepatah bahwa pisau yang sering diasah akan menjadi lebih tajam, tetapi jika jarang diasah maka lama-kelamaan akan tumpul. Makna tersebut dapat diartikan bahwa seorang yang sering berlatih dan berulang kali melakukan rutinitas belajar akan membuat otak terbiasa berpikir dan mampu menyimpan ingatan dengan baik. Ini sama dengan anak yang mencoba memahami materi melalui pembelajaran rutin di sekolah, di rumah, les dan di tempat lain sebagai tempat untuk belajar. Hal ini sangat erat kaitannya dengan masalah yang akan diteliti, yaitu rutinitas belajar atau dengan kata lain, intensitas belajar.

Menurut Sudjana (2005:28) bahwa belajar merupakan suatu proses yang ditandai dengan adanya perubahan pada diri seorang. Perubahan sebagai hasil proses belajar dapat ditunjukkan dalam berbagai bentuk seperti berubah pengetahuan, pemahamanya, sifat dan tingkah lakunya, daya penerimaanya dan aspek pada individu. Oleh sebab itu belajar adalah proses aktif. Dengan demikian bahwa intesitas belajar adalah tingkatan, ukuran atau seberapa sering usaha seseorang yang menghasilkan perubahan-perubahan dalam pengetahuan, pemahaman, keterampilan nilai dan sikap. Dapat disimpulkan pula pengertian intensitas belajar yakni tingkatan, ukuran atau seberapa sering usaha mahasiswa untuk menghasilkan perubahan-perubahan dalam pengetahuan, pemahaman, keterampilan, nilai dan sikap. Artinya, makin banyak usaha belajar itu dilakukan, makin banyak dan makin baik perubahan yang diperoleh.

Melihat faktor intelligent questions (IQ) dan intensitas belajar memiliki kecenderungan mempengaruhi hasil belajar sehingga diangkat sebagai masalah yang perlu diteliti, maka penulis membuat penelitian dengan

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judul adalah pengaruh intelligent questions dan intensitas belajar terhadap hasil belajar bidang keahlian Teknik Mesin Mahasiswa Jurusan Pendidikan Teknik Mesin Fakultas Teknik UNIMA. Adapun tujuan dari penelitian ini menganalisis pengaruh intelligent questions (IQ) dan intensitas belajar terhadap hasil belajar bidang keahlian Teknik Mesin mahasiswa Jurusan Pendidikan Teknik Mesin Fakultas Teknik UNIMA.

METODOLOGI PENELITIAN
Rancangan Penelitian

Jenis penelitian ini menggunakan metode penelitian survei dengan pendekatan penelitian kuantitatif. sekaligus menjelaskan pengujian hipotesis. Penelitian ini menggunakan deskriptif analisis data. Analisis yang digunakan analisis jalur. Analisis ini akan digunakan dalam menguji besarnya pengaruh dari 2 variabel bebas (independent variable) dan 1 variabel terikat (dependent variable) yaitu intelligent questions (IQ) (X1), intensitas belajar (X2) adalah variabel bebas dan variable terikat adalah hasil belajar bidang keahlian Teknik Mesin (X3). Hubungan antar variabel penelitian tersebut dapat digambarkan dalam konstelasi masalah pada gambar 3.1 sebagai berikut:
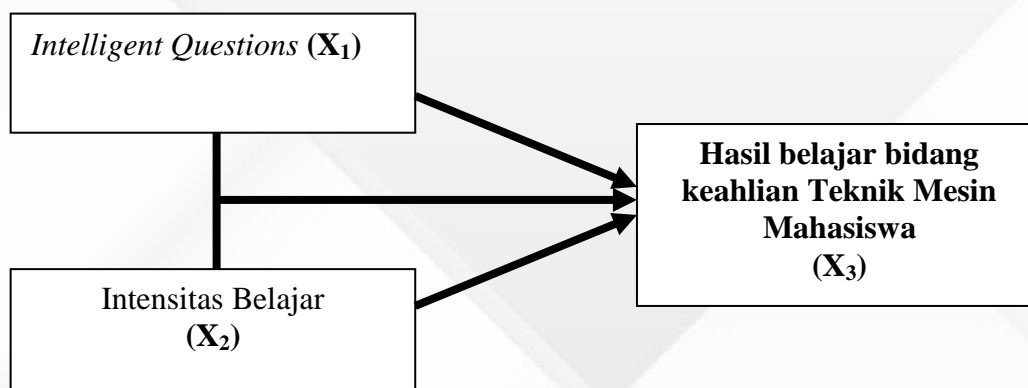
Gambar 1. Desain Konstelasi Hubungan Variabel Penelitian

Lokasi dan Waktu Penelitian
Penelitian ini dilaksanakan pada mahasiswa Jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado yang dilakukan mulai bulan Pebruari sampai dengan Juli 2021.

Teknik Pengumpulan Data
Teknik Pengumpulan data dalam penelitian ini menggunakan instrument berbentuk angket, tes dan praktikum, dokumentasi sertainstrumen penelitian mencakup:
Intelligent Questions diukur dengan tes IQ berupa tes khusus untuk mengetahui IQ seseorang.
Intensitas belajar yang diukur dengan instrument angket yang mengisi adalah mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado sebagai responden.

adalah hasil belajar bidang keahlian Teknik Mesin diukur berdasarkan kognitif, afektif, dan psikomotor sesuai dengan kurikulum termasuk didalamnnya matakuliah bidang keahlian Pendidikan Teknik Mesin yang diperoleh melalui operator PTM dan Pusat Komputer UNIMA untuk mahasiswa jurusan Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Manado tahun angkatan 2018 sebagai responden.

Teknik Analisis Data

Teknik analisis data yang digunakan adalah analisis deskriptif dan inferensial. Analisis deskriptif digunakan untuk melihat gambaran tentang data masing-masing variable penelitian yang ditujukkan melalui mean, median, daftar distribusi frekuensi dan histogram.

Analisis inferensial digunakan untuk menguji hipotesis dengan regresi berganda yang sebelumnya dilakukan pengujian normalitas. Sehubungan dengan itu, maka tahapan analisis data dilakukan adalah: (1) statistic deskriptif, (2) pengujian persyaratan analisis (3) Pengujian Hipotesis.

Pengujian Persyaratan Analisis

Untuk pemeriksaan terhadap catatan yang harus dipenuhi yaitu: (1) Uji Normalitas, (2) Uji signifikansi dan linearitas koefisien regresi. Pada bagian ini memaparkan kedua uji statistik tersebut yang dipersyaratkan:

Uji Normalitas Galat Taksiran (Residu)

Syarat utama yang harus dipenuhi dalam analisis jalur adalah sampel harus berasal dari populasi yang berdistribusi normal. Uji statistik yang dilaksanakan untuk menguji normalitas distribusi galat dalam penelitian ini adalah one sample Kolmogorov-Smirnov dilakukan dengan menggunakan bantuan software IBM SPSS versi 25. Hipotesis yang diajukan dalam uji normalitas adalah:

H0 : data galat taksiran berdistribusi normal.

H1 : data galat taksiran tidak berdistribusi normal.

Dasar pengambilan keputusan uji normalitas adalah jika nilai sig (signifikansi) > 0,05 maka terima Ho, data berdistribusi normal, sebaliknya jika nilai sig (signifikansi) < 0,05 maka tolak Ho, data berdistribusi tidak normal.

Uji Signifikansi dan Linearitas Regresi

Persyaratan kedua yang harus dipenuhi dalam melakukan analisis adalah signifikansi dan linearitas regresi variabel endogen terhadap variabel eksogen. Uji linearitas hubungan antara variabel digunakan untuk mengukur derajat kereratan hubungan memprediksi besarnya arah hubungan, serta meramalkan besarnya variabel dependen jika variabel independen diketahui dengan bantuan sofware program SPSS.

Pengujian Hipotesis

Pengujian hipotesis dilakukan setelah semua persyaratan terpenuhi dalam analisis jalur, data yang diperoleh yang diujicobakan di lapangan, maka tahapan selanjutnya adalah pengujian hipotesis. Adapun hipotesis yang akan diuji yaitu pengaruh variabel endogen terhadap variabel eksogen, model pengaruh variabel terikat yang dianalisis berdasarkan konsep teoretik. Pengujian ini di dasarkan pada perhitungan koefisien jalur dengan bantuan software SPSS Versi 25.

Target Luaran

Luaran dari penelitian ini yaitu jasa. Dalam kegiatan perencanaan pengajaran untuk pengembangan pendidikan dimulai dengan melakukan proses identifikasi masalah atau potensial masalah maka informasi dan pengembangan sektor pendidikan perlu di rekomendasikan dalam usaha pengembangan proses pembelajaran di Fakultas Teknik UNIMA.

DATA PENELITIAN

Deskripsi Penelitian

Data yang dianalisis adalah data veriabel X1 (intelligent questions), variabel X2 (intensitas belajar) dan variabel Y (hasil belajar mahasiswa). Adapun data hasil penelitian dapat dilihat pada tabel 1 yaitu sebagai berikut:

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Tabel 1 Hasil Data Penelitian menggunakan MS. Excel

	Intelligent Questions (X1)	Intensitas Belajar (X2)	Hasil belajar Mahasiswa (Y)
Mean $\bar{X}_1 \bar{X}_2 \bar{Y}$	93,24	89,44	79,64
Standard Error	3,622283	1,109174	1,284368
Median	93	89	80
Mode	93	87	85
Standard Deviation (Sdx1, Sdx2, Sdy)	18,11141	5,545869	6,421838
Sample Variance (Sdx12, Sdx22, Sdy2)	328,0233	30,75667	41,24
Kurtosis	-0,78963	-0,14722	0,634333
Skewness	0,064047	-0,32486	-0,45778
Range	59	21	29
Minimum	65	78	63
Maximum	124	99	92
Sum	2331	2236	1991
Count	25	25	25

Uji Persyaratan Analisis
- Uji Normalitas
- Tabel 2 Uji Normalitas Kolomogorov-Smirnov
-

		Unstandardized Residual
N		25
Normal Parametersa,b	Mean	,0000000
	Std. Deviation	1,98931103
Most Extreme Differences	Absolute	,155
	Positive	,075
	Negative	-,155
Test Statistic		,155
Asymp. Sig. (2-tailed)		,123c
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

Berdasarkan uji normalitas dengan Kolmogorov-Smirnov Test diperoleh nilai KSZ sebesar 0,155 dan Asymp.sig. sebesar 0,123c lebih besar dari 0,05. Karena nilai sig lebih besar dari 0,05, maka keputusannya adalah menerima Ho yang berarti bahwa data berdistribusi normal. Berarti asumsi normalitas data terpenuhi.

Uji Linearitas
Signifikansi dan Linearitas Regresi Hasil Belajar Mahasiswa (Y) atas Intelligent Questions (X1)
Dari hasil analisis terhadap persamaan regresi variabel hasil belajar mahasiswa (Y) atas intelligent questions (X1) diperoleh persamaan regresi Ŷ = 50,668 + 0,311X1 diuraikan dalam tabel 3 adalah :

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Tabel 3 Coeffisient hubungan hasil lulusan mahasiswa (Y) atas intelligent questions (X1)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	50,668	3,380		14,989	,000
	INTELLIGENT QUESTIONS (X1)	,311	,036	,876	8,724	,000
a. Dependent Variable: HASIL BELAJAR (Y)						

Berdasarkan tabel 4 Uji Linieritas diperoleh harga Fhitung = 1,103 kurang dari harga dimana F tabel = 3,912, (α = 0,05) dengan dk pembilang 17 dan penyebut = 6, maka terima H0 dan tolak H1. Maka disimpulkan bahwa bentuk regresi Ŷ atas X1 adalah "regresi linier"

Tabel 5.4 ANOVA untuk pengujian Signifikansi dan Linearitas Regresi Y atas X1 (Ŷ = 50,668 + ,311X1)

			Sum of Squares	df	Mean Square	F	Sig.
HASIL BELAJAR (Y) * INTELLIGENT QUESTIONS (X1)	Between Groups	(Combined)	934,093	18	51,894	5,593	,021
		Linearity	760,070	1	760,070	81,924	,000
		Deviation from Linearity	174,023	17	10,237	1,103	,487
	Within Groups		55,667	6	9,278		
	Total		989,760	24			

Signifikansi dan Linearitas Regresi Hasil Belajar Mahasiswa (Y) Atas Intensitas Belajar (X2)
Dari hasil dan analisis terhadap persamaan regresi variabel hasil belajar mahasiswa (Y) atas intensitas belajar (X2) diperoleh persamaan regresi Ŷ = -13,411 + 1,040X1 dapat diuraikan dalam tabel 5 adalah :

Tabel 5 Coeffisient hubungan Hasil Belajar Mahasiswa (Y) Atas Intensitas Belajar (X2)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-13,411	9,499		-1,412	,171
	INTENSITAS BELAJAR (X2)	1,040	,106	,898	9,814	,000
a. Dependent Variable: HASIL BELAJAR (Y)						

Berdasarkan tabel 6 Uji Linieritas diperoleh harga Fhitung = 1,426 kurang dari harga F tabel = 2,87 (α = 0,05) dengan dk pembilang 13 dan penyebut =10, maka terima H0 dan tolak H1. Maka disimpulkan bahwa bentuk regresi Ŷ atas X1 adalah "regresi linier"

Tabel 6 ANOVA untuk pengujian Signifikansi dan Linearitas Regresi Y atas X1 (Ŷ = 50,668 + ,311X1)

			Sum of Squares	df	Mean Square	F	Sig.
HASIL BELAJAR (Y) * INTENSITAS BELAJAR (X2)	Between Groups	(Combined)	922,893	14	65,921	9,859	,000
		Linearity	798,963	1	798,963	119,486	,000
		Deviation from Linearity	123,930	13	9,533	1,426	,291
	Within Groups		66,867	10	6,687	66,867	
	Total		989,760	24		989,760	

b. Analisis Data

Pengujian hipotesis dalam penelitian ini yaitu dengan menggunakan teknik analisis statistik yang sudah ditentukan semula, yaitu analisis korelasi dan analisis regresi ganda diuraikan sebagai berikut.

Uji Hipotesis 1 : Pengaruh Intelligent Questions (X1) terhadap Hasil Belajar Mahasiswa (Y)
Berdasarkan perhitungan diatas, dengan ketentuan α 0,05; dk = n -2 = 25 – 2 = 23 sehingga di dapat ttabel = 2.06866. ternyata thitung lebih besar dari ttabel atau 8.711 > 2.06866 artinya terdapat pengaruh signifikan antara intelligent questions (X1) terhadap hasil belajar mahasiswa (Y).

Uji Hipotesis 2 : Pengaruh Intensitas Belajar (X2) terhadap Hasil belajar Mahasiswa (Y)
Berdasarkan perhitungan di atas, dengan ketentuan α 0,05; dk = n -2 = 25 – 2 = 23 sehingga di dapat ttabel = 2.06866. ternyata thitung lebih besar dari ttabel atau 9.788 > 2.06866 artinya terdapat pengaruh yang signifikan antara intensitas belajar (X2) terhadap hasil belajar mahasiswa (Y).

Uji Hipotesis 3: Pengaruh Minat Berwirausaha dan Motivasi Kerja terhadap Kompetensi Lulusan Mahasiswa Jurusan Pendidikan Teknik Mesin FATEK UNIMA (analisis X1, dan X2 dengan Y)

Tabel 7 Hasil Analisi Regresi Linear Berganda

Coefficientsa						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	7,070	8,115		,871	,393
	INTELLIGENT QUESTIONS (X1)	,165	,035	,466	4,711	,000
	INTENSITAS BELAJAR (X2)	,639	,114	,552	5,586	,000
a. Dependent Variable: HASIL BELAJAR (Y)						

Sumber: Hasil output SPSS yang diolah, 2021
Berdasarkan hasil yang telah diperoleh dari koefisien regresi di atas, maka dapat dibuat persamaan regresi sebagai berikut :
Y = a + b1X1+ b2X2+ eY = 7,070 + 0,165 X1+ 0,639X2+ e
Dimana :   Y: Hasil belajar Mahasiswa : intercept (konstanta)
        b1: Koefisien regresi untuk X1
        b2: Koefisien regresi untuk X2
        X1: Intelligent questions
        X2: intensitas belajar
        e: Nilai residu
Dari persamaan diatas, dapat diinterpretasikan sebagai berikut:
Nilai konstanta (a) sebesar 7,070. Nilai konstanta bernilai positif artinya nilai variabel intelligent questions dan intensitas belajar dianggap konstan atau sama dengan nol, maka hasil belajar mahasiswa akan semakin tinggi.
Nilai koefisien X1 sebesar ,165. Nilai koefisien X1 bernilai positif artinya pengaruh intelligent questions terhadap hasil belajar mahasiswa adalah bersifat positif dan cukup kuat. Jika tingkat intelligent questions tinggi, maka hasil belajar mahasiswa akan semakin tinggi.
Nilai koefisien X2 sebesar ,639 Nilai koefisien X2 bernilai positif artinya pengaruh intensitas belajar terhadap hasil belajar mahasiswa adalah bersifat positif dan cukup kuat. Jika nilai intensitas belajar meningkat, maka hasil belajar mahasiswa akan semakin meningkat.

Pembahasan Hasil Penelitian.

Terdapat pengaruh yang signifikan antara intelligent questions (X1) dengan hasil belajar mahasiswa (Y)

Besarnya pengaruh antara variabel intelligent questions (X1) terhadap hasil belajar mahasiswa (Y) yang dihitung dengan koefisien korelasi adalah 0.876 tergolong kuat. Sedangkan kontribusi (sumbangan) variabel intelligent questions (X1) terhadap variabel hasil belajar mahasiswa (Y) adalah sebesar 76.8% sedangkan sisanya 23.2% ditentukan oleh variabel lain. Selanjutnya untuk mengetahui signifikansi variabel intelligent questions (X1) dengan variabel hasil belajar mahasiswa (Y) yaitu dengan menggunakan analisis statistik uji t dari hasil analisis statistik diperoleh thitung sebesar 8.711 dengan ketentuan α = 0,05; dk = n -2 = 25 − 2 = 23 sehingga di dapat ttabel = 2.06866. ternyata thitung lebih besar dari ttabel atau 8.711 > 2.06866 artinya terdapat pengaruh yang signifikan antara intelligent questions (X1) terhadap hasil belajar mahasiswa (Y).

Terdapat pengaruh yang signifikan antara intensitas belajar dengan hasil belajar mahasiswa
Besarnya pengaruh antara variabel intensitas belajar (X2) terhadap hasil belajar mahasiswa (Y) yang dihitung dengan koefisien korelasi adalah 0.898 tergolong sangat kuat. Sedangkan kontribusi (sumbangan) variabel intensitas kerja (X2) terhadap variabel hasil belajar mahasiswa (Y) adalah sebesar 80.7% sedangkan sisanya 19.3% ditentukan oleh variabel lain. Selanjutnya untuk mengetahui signifikansi variabel intensitas belajar (X2) dengan variabel hasil belajar mahasiswa (Y) yaitu dengan menggunakan analisis statistik uji t. dari hasil analisis statistik diperoleh thitung sebesar 9.788 dengan ketentuan α 0,05; dk = n -2 = 25 − 2 = 23 sehingga di dapat ttabel = 2.06866. ternyata thitung lebih besar dari ttabel atau 9.788 > 2.06866 artinya terdapat pengaruh yang signifikan antara intensitas belajar (X2) terhadap hasil belajar mahasiswa (Y).

Terdapat pengaruh yang signifikan antara intelligent questions dan motivasi kerja secara simultan terhadap hasil belajar mahasiswa

Dari hasil pengujian hipotesis penelitian dengan menggunakan analisis regresi ganda diperoleh hasil persamaan regresi ganda:

Y = a + b1X1+ b2X2+ eY = 7,070 + 0,165 X1+ 0,639X2+ e

Tabel 8 Coefficients antara intelligent questions dan motivasi kerja secara simultan terhadap hasil belajar mahasiswa

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	7,070	8,115		,871	,393
	INTELLIGENT QUESTIONS (X1)	,165	,035	,466	4,711	,000
	INTENSITAS BELAJAR (X2)	,639	,114	,552	5,586	,000
a. Dependent Variable: HASIL BELAJAR (Y)						

Kontribusi Korelasi Ganda yakni variabel intelligent questions dan intensitas belajar dengan hasil belajar mahasiswa Jurusan Pendidikan Teknik Mesin FATEK UNIMA (analisis X1, dan X2 dengan Y) yakni sebesar 90,4%, dan sisanya 9.6% dipengaruhi oleh faktor lain.

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Berdasarkan hasil pembahasan di atas ini menunjukkan bahwa intelligent questions dan intensitas belajar mahasiswa berpengaruh terhadap hasil belajar mahasiswa Jurusan Teknik Mesin. Dengan demikian kesimpulan hasil pembahasan dalam penelitian ini adalah sebagai berikut:

Terdapat pengaruh intelligent questions siswa dengan hasil belajar mahasiswa Jurusan Pendidikan Teknik Mesin FATEK UNIMA.

Terdapat pengaruh intensitas belajar dengan hasil belajar mahasiswa Jurusan Pendidikan Teknik Mesin FATEK UNIMA.

Terdapat pengaruh secara bersama-sama antara intelligent questions siswa dan intensitas belajar dengan hasil belajar mahasiswa Jurusan Pendidikan Teknik Mesin FATEK UNIMA.

KESIMPULAN

Berdasarkan hasil penelitian dan pembahasan, maka dapat ditarik kesimpulan sebagai berikut:

Variabel intelligent questions (X1) secara parsial, menunjukkan bahwa ada pengaruh yang signifikan terhadap variabel hasil belajar mahasiswa (Y).

Variabel intensitas belajar (X2) secara parsial, menunjukkan bahwa ada pengaruh yang signifikan terhadap variabel hasil belajar mahasiswa (Y).

Kedua variabel independen yaitu intelligent questions (X1) dan intensitas belajar (X2) secara bersama-sama (simultan) berpengaruh signifikan terhadap dependen yaitu variabel hasil belajar mahasiswa (Y).

DAFTAR PUSTAKA

Amiluddin Risnawati. 2016. Pengaruh IQ, CQ Dan EQ Terhadap Prestasi Belajar, Dan Motivasi Belajar Mahasiswa Pendidikan Matematika. Jurnal Riset Pendidikan Matematika. Vol. 3, No. 1. http://journal.uny.ac.id/index.php/jrpm/article/view/7303. 1 Oktober 2016

Amir Taufik. 2015. Merancang Kuesioner; konsep dan panduan untuk penelitian sikap, kepribadian, dan perilaku. Jakarta: Kencana

Arikunto, Suharsimi. 2010. Prosedur Penelitian: Suatu Pendekatan Praktik. Jakarta: Rineka Cipta.

Badan Pusat Statistik Jakarta Pusat. 2013. Statistik Indonesia Tahun 2013. Jakarta Pusat : Badan Pusat Statistik dalam https://www.bps.go.id/

Darmadi Hamid. 2014. Metode Penelitian Pendidikan dan Sosial. Bandung: Alfabeta

Djaali. 2008. Psikologi Pendidikan. Jakarta: Bumi Aksara.

Echols, J. M. (2014). Kamus Inggris Indonesia. Jakarta: Gramedia.

Fatmala. 2008. Pengaruh tingkat kecerdasan intelektual (IQ) terhadap prestasi belajar mata pelajaran ekonomi siswa kelas X SMA Laboratorium Universitas Negeri Malang tahun ajaran 2007-2008. Perpustakaan Digital Universitas Negeri Malang. Vol. 6, No. 2. http://library.um.ac.id/index.php/jpakun/article/view/35541. 1 Oktober 2016

Juliansya Noor, 2011. Metodelogi Penelitian Skripsi, Tesis, Disertasi & Karya Ilmiah. Jakarta: Kencana

Kadir. 2015. Statistika Terapan – Konsep, Contoh dan Analisis Data Dengan SPSS /Lisrell dalam Penelitian. Jakarta: Rajawali Pers.

KBBI. 2016. Kamus Besar Bahasa Indonesia (KBBI). Online. Diakses pada 27 Juni 2019 dari https://kbbi.web.id/lulus

Pedoman Akademik Universitas Negeri Manado tahun 2016. Universitas Negeri Manado Hal 53-62

Peraturan Pemerintah RI No.19 Tahun 2005 tentang Standar Nasional Pendidikan

Peraturan Presiden No 8 Tahun 2012 tentang Kerangka Kualifikasi Nasional Indonesia

Poerwadarminta. W.J.S. 2003. Kamus Umum Bahasa Indonesia. Jakarta: Balai Pustaka

Prasetyono Dwi Sunar, 2015. Yuk, Cari Tahu IQ dan Kepribadianmu. Yogyakarta: Saufa

Pusat Bahasa, 2008, Kamus Besar Bahasa Indonesia, Jakarta: PT Gramedia Pustaka Utama

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

Sardiman A. M. 2014. Interaksi & Motivasi Belajar Mengajar. Jakarta: Rajawali Pers

Slameto. 2003. Belajar dan Faktor-faktor yang Mempengaruhinya. Jakarta: Rineka Cipta.

Sudjana, Nana. 2010. Cara Belajar Siswa Aktif dalam Proses Belajar Mengajar. Bandung: Sinar Baru Algensindo

Sudjana, Nana. 2012. Penelitian Hasil Proses Belajar Mengajar. Bandung: Remaja Rosda Karya.

Sugiyono. 2014. Metode Penelitian Kuantitatif Kualitatif dan R&D. Bandung: Alfabeta

Supardi. 2015. Penilaian Autentik Pembelajaran Afektif, Kognitif, dan Psikomotor: Konsep dan Aplikasi. Jakarta: Rajawali Pers.

Trihendradi, 2013. Langkah Mudah Menguasai SPSS 21. Yogyakarta: Penerbit Andi.

UIN Jakarta. 2017. Kualitas Pendidikan di Indonesia Masih Memprihatinkan tanggal 5 November 2017 dalam https://www.uinjkt.ac.id/id/kualitas-pendidikan-di-indonesia-masih-memprihatinkan/ diakses tanggal 17 Pebruari 2019

Undang-undang No. 14 Tahun 2005 Tentang Guru dan Dosen

Undang-undang No. 20 Tahun 2003 tentang Sistem Pendidikan Nasional

Undang-undang Republik Indonesia No.13 tahun 2003 Tentang ketenagakerjaan. www.pendidikandiy.go.id/file/uu/uu_13_2003.pdf . Diakses pada tanggal 01 Juli 2019

UU RI No 12 Tahun 2012 tentang Pendidikan Tinggi

UU RI No 5 Tahun 2003 tentang Sistem Pendidikan Nasional

Yamti. 2016. Pengaruh Peran Guru dan Intelligent Questions (IQ) terhadap Hasil Belajar Kognitif, Sikap, dan Keterampilan. Pythagoras: Jurnal Pendidikan Matematika. Vol. 11, No. 1. http://journal.uny.ac.id/index.php/pythagoras/article/view/9677. 1 Oktober 2016

EDUCATION IN POST-PANDEMIC: INTERNSHIP STRATEGY AFTER THE COVID-19 PANDEMIC AT VHS N 2 KEBUMEN

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Abstract

Currently, education in Indonesia has entered the post-pandemic period. A strategy is needed to restore the condition of vocational education in the implementation of student internships in the industry. This study aims to identify strategies that VHS N 2 Kebumen has carried out in implementing internships after the covid-19 pandemic. This research is qualitative research using interview, observation, and documentation techniques in the implementation process. VHS N 2 Kebumen carries out student internships in the industry by implementing health protocols by government recommendations. Students are free to choose relatively closer industries and by VHS criteria. Before students do internships in the industry, the school first provides briefing and refreshment of materials. In addition, soft skills debriefing is also carried out to prepare students. The internship mentoring process is carried out to ensure that the field assistant teachers run the internship process well.

Key words: internship, vocational education, post-pandemic.

Introduction

Vocational High School (VHS) is a formal education equivalent to Senior High School (SHS), which organizes vocational education at the secondary education level. Vocational High School (VHS) is an educational institution that specifically aims to prepare students to be ready for work, either working independently or filling existing job vacancies[1]. Vocational Schools are schools that aim to produce graduates who are ready to enter the industrial world, whether they are working or creating jobs, but VHS graduates also do not rule out the possibility to continue their education to the University level. With the purpose of the VHS, the VHS has a different curriculum from SHS[2,3]. The SHS curriculum has learning that is more focused or emphasizes theory. In contrast, VHS has an education that emphasizes practice. VHS has several areas of expertise that will study various materials related to skills or expertise to enter the industrial world.

The VHS curriculum also has a program that must be followed or implemented by VHS students, namely Field Work Practices (FWP) or often called internships[4]. In Permendikbud 50 of 2020 concerning Field Work Practices for Students, it is stated that the PKL program is implemented for students at the VHS, SSHS (Special Senior High School), and FWP levels, which are carried out as learning media for students in the form of work practices in the world of work within a certain period[5]. By the curriculum and the needs of the world of work. The main objective of laboratory work-based practical learning is experimental confirmation and verification of significant theoretical provisions[6].

Education is an essential factor in building the strength of a nation's global perspectives, and individual views represent the primary sources of investment[7–10]. The fieldwork practice program or internship is a program of student learning activities in the field that aims to introduce, train and grow students' abilities in the real world of work and be ready when entering the world of work or the industrial world. Since the Covid-19 pandemic began to enter and spread in Indonesia in March 2020, the government has made many efforts to deal with this Covid-19 case. The internship which is a mandatory activity for vocational high school students to improve students' insights and qualities and foster good relations between a vocational

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high school and a job provider company during the Covid-19 pandemic[9,11,12]. The Indonesian government's policy is physical distancing or maintain distance between individuals in activities including in the implementation of education[13]. One of them is to regulate the learning system by issuing Circular Letter Number 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of Covid-19, which explains that learning is carried out at home through virtual/online learning (on a network). The purpose of this study was to determine the strategy for implementing an internship after the Covid 19 pandemic at VHS N 2 Kebumen.

Methods

In this study, the method used is qualitative. Poerwandari explains that qualitative research products and processes descriptive data such as interview transcripts, field notes, pictures, photos, recordings, videos, and so on[14]. This research is qualitative because it aims to collect information and find out more about the implementation of the fieldwork practice program in the post-pandemic period as it is today by using case studies.

This study carried out data collection by in-depth interviews, observations, and documentation at VHS Negeri 2 Kebumen, located at Jalan Joko Sangkrip KM 1 Sumberadi, Kebumen. Research informants are the Head of the Light Vehicle Engineering Department and the Deputy Head of Industrial Relations. The research data will be analyzed using a qualitative data analysis model, namely analyzing data from interviews, observations, and documentation, to then know the results (in this case, the implementation strategy of the Post Covid 19 Pandemic internship at VHSN 2 Kebumen).

Results and Discussion

In adjustment to the ministry of education and culture number 50 of 2020, the learning activities are carried out at the vocational level, one of which is internship activities or often referred to as Industrial Work Practices. In its implementation, the school cooperates with companies or offices by the majors or expertise programs in the VHS. The core of vocational education is to teach thinking and working habits through structured training. There are three habits taught in vocational schools: (1) adaptation to the work environment; (2) routines in the process of carrying out work, and (3) habits of thinking in the profession[12,15–17].

Mr. Drs. H. Sri Hastana provided information related to internships carried out by 11th-grade students at VHS N 2 Kebumen after the pandemic had been carried out generally like internship which was usually done in previous years. However, internships carried out post-pandemic experienced a setback in the month of implementation, which is usually carried out in May is now held in 3 months after that, namely in August.

According to the information provided by Mr. Industry Subagyo Budi W,S.Pd.,M.Pd that not all industries or companies accept students to carry out street vendors at their places post-pandemic on the grounds of worrying that the symptoms of covid will increase if students have implemented the internship. The reason for this is that there is a delay in implementing street vendors.

Industrial work practices or internships carried out by VHSN 2 Kebumen last for 3 months by adjusting the curriculum used by the VHS. The implementation of the internships is carried out outside the school environment so that students who carry out internships do not participate in teaching and learning activities at school but carry out practical activities outside the schools, namely in industries that collaborate with VHS N 2 Kebumen.

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At VHSN 2 Kebumen, there are 3 classes, so the implementation of industrial work practices is divided into two sessions. The first session is carried out by classes A and B first. If the class has carried out the first internship session, then the next session will be carried out by class C. In addition to experiencing a delay in the implementation of street vendors, there are also a few obstacles in students' readiness in terms of soft skills and hard skills.

Under normal conditions, soft skills and hard skills can be trained during the learning process, but because of this pandemic, the learning process is carried out online. Then for students' readiness and challenging skills, it decreases because they rarely practice. Therefore, by taking advantage of the setback in implementing street vendors, the school uses that time to provide briefings first, one of which is the implementation of practices to train soft skills and hard skills. The placement plan for implementing this field work practice is placed inside the city or outside the city. Students can choose their own for the street vendors industry, except for students who have not received an industry, the school will help determine an industrial partner.

Interview with Mr. Drs. H. Sri Hastana and Deputy Head of Industrial Relations Subagyo Budi W, S.Pd., M. Pd at VHS N 1 Kebumen said that post-covid-19 industrial work practice activities had been equipping on internship activity while still adhering to health protocol recommended by the government. Internship activities in vocational schools are essential activities in vocational education. The internship is one of the cores of implementing vocational education that provides students with hands-on experience in work. Without an internship, students are not ready to face the world of work. In general, supervision is not carried out properly[18], in future implementation a system will be created for monitoring apprentice students using an integrated system

Conclusion
Internship activities carried out after the pandemic went well, effectively, and followed the applicable curriculum. The VHS N 2 Kebumen also tries hard to prepare all the needed requirements for the internship to comply with the relevant curriculum. Schools use the postponement of the internship to equip their students to be ready for internships in the industry. VHS N 2 Kebumen carries out student internships in the industry by implementing health protocols by government recommendations. Students are free to choose relatively closer industries and by VHS criteria. Before students do internships in the industry, the school first provides briefing and refreshment of materials. In addition, soft skills debriefing is also carried out to prepare students. The internship mentoring process is carried out to ensure that the field assistant teachers run the internship process well

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References

[1]   Hidayah H N 2020 Precondition Model for Field Work Practices Based on Project-Based Learning to Improve Vocational School Stundentsâ€TM Competence and Readiness in Entrepreneurship, Fashion Design Expertise Program Journal of Vocational and Career Education 5

[2]   Sunyoto S and Setiyawan A 2021 Entrepreneurship Education in Vocational Schools in Indonesia Education at the Intersection of Globalization and Technology (IntechOpen)

[3]   Setiyawan A, Manggalasari L C, Prasetya T A, Towip T and Noviansyah W 2021 Development of Hydraulic Cylinder Excavator Learning Media Based on Augmented Reality with Shapr 3D Journal of Physics: Conference Series vol 2111 (IOP Publishing) p 012008

[4]   Setiyawan A 2017 Pengembangan Sistem Informasi Penugasan dan Monitoring Siswa Prakerin Berbasis SMS Gateway dengan Raspberry Pi

[5]   Setiyawan A, Priyanto, Prasetya T A and Hastawan A F 2021 Usability evaluation of assignment and monitoring information learning system of internship students based on SMS Gateway with Raspberry Pi IOP Conference Series: Earth and Environmental Science 700 012021

[6]   Abdullaeva M 2018 Laboratory Work in Education of Food Technology Professionals Vocational Teacher Education in Central Asia: Developing Skills and Facilitating Success ed J Drummer, G Hakimov, M Joldoshov, T Köhler and S Udartseva (Cham: Springer International Publishing) pp 53–63

[7]   Hadromi, Kurniawan A, Setiyawan A, Bachri A F, Nofa K and Permana C 2020 A Practicum Learning Management Model for Productive Materials Based on the Needs of Industry 4 . 0 in Vocational School 14 1294–314

[8]   Setiyawan A 2021 PEMBEKALAN MANAJEMEN ENERGI EFEKTIF PEMASANGAN SEL SURYA DI KANDANG TERNAK KELOMPOK TANI NGUPOYO UPO DUSUN SUMBER SALATIGA J-ABDI: Jurnal Pengabdian kepada Masyarakat 1 1349–60

[9]   Setiyawan A and Kurniawan A 2021 The Effect of Pandemic Covid-19 into Internship Activity of Mojokerto Vocational High Schools JOVES (Journal of Vocational Education Studies) 4 125–30

[10]   Setiyawan A and Kurniawan A 2021 The Effect of Pandemic Covid-19 into Internship Activity of Mojokerto Vocational High Schools Journal of Vocational Education Studies 4

[11]   Setiyawan A 2021 Internship Regulations in Vocational Education during the Covid-19 Pandemic VANOS Journal of Mechanical Engineering Education 6

[12]   Setiyawan A 2020 Assignment and Monitoring Information System of Prakerin Students Based On SMS Gateway with Raspberry Pi VANOS Journal of Mechanical Engineering Education 5

[13]   Prasetya T A, Harjanto C T and Setiyawan A 2020 Analysis of student satisfaction of e-learning using the end-user computing satisfaction method during the Covid-19 pandemic Journal of Physics: Conference Series 1700

[14]   Poerwandari E K 1998 Pendekatan kualitatif dalam penelitian psikologi Jakarta: LPSP3 Fakultas Psikologi Universitas Indonesia 2

[15]   Prosser C A and Quigley T H 1950 Vocational Education in a Democracy (Chicago: American Technical Society)

[16]   Setiyawan A 2016 Penggunaan Arduino Uno R3 sebagai Media Pembelajaran Mikroprosesor pada Program Keahlian Teknik Ototronik Prosiding Seminar Nasional UNS Vocational Day, 2016

[17]   Prasetya T A, Harjanto C T and Setiyawan A 2020 Analysis of student satisfaction of e-learning using the end-user computing satisfaction method during the Covid-19 pandemic Journal of Physics: Conference Series vol 1700 (IOP Publishing) p 012012

[18]   Mashudi A, Khumaedi M and Widjanarko D 2021 The Evaluation Process of Industrial Class in Light Automotive Engineering Competencies Journal of Vocational and Career Education 6

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OPTIMIZATION OF ONLINE LEARNING IN BUILDING CONSTRUCTION COURSE 1 WITH STUDENT LEARNING OUTCOMES

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Abstract The restrictions on activities set by the government to suppress the spread of COVID-19 are no exception in the world of education which is a challenge, one of which is higher education. This condition makes the learning system and lectures must be able to adapt to conditions that require Social Distancing so that online learning becomes an alternative in this Building Construction 1 course. Optimization efforts made by lecturers in order to achieve learning achievement goals, several things have been done, one of which is by applying the observation learning method. The method of observation in this study, students conduct debriefing by means of observations made in the environment where students live and observations by studying literature on books and the internet. The results of this study show good results, with evidence of student learning evaluation results achieved are very good category of 20.29%, good category of 46.38%, sufficient category of 30.43% and less than 2.90%.

Keywords: Online, Observation, Learning Outcomes.

INTRODUCTION

Online learning is one of the alternatives in the era of pandemic covid-19. Restrictions on activities set by the government to reduce the spread of covid-19 are no exception in the world of education is a challenge in itself, one of which is higher education.

This condition makes the learning system and lectures must adjust to the circumstances that require social distancing, namely giving space and time restrictions to all routine activities in the learning system at every level of education, ranging from pre-school, elementary and secondary schools to higher education. Many things are clearly visible after listening to the changes in the learning system at each level.

Learning usually takes place in a classroom with a certain schedule turns into learning in each room with an impractical time according to the learning schedule. Of course, not only space and time, but the model and delivery of lectures must also be adjusted to the current conditions so that the material can be accepted by students and learning achievements can be achieved.

Especially in building construction 1, which is a basic course in the department of Civil Engineering unnes building engineering study program that must be studied by students in the first semester. In general, first semester students are still lay about knowledge about building construction especially because not all new students come from alumni of Vocational Building Engineering, thus the delivery of materials in order to achieve learning achievements, lecturers must have a strategy or learning model that is in accordance with the material to be delivered online.

Optimization efforts made by lecturers in order to achieve the goal of learning achievement, several things have been done, one of which is to apply observation learning methods. Observation can be carried out in the environment where students live and observations with literature studies on books and the internet.

II. METHOD

This research aims to find out the learning outcomes of students by providing real learning in understanding materials about building construction 1 with observation of the environment around the student residence as well as with observation through literature studies. In keeping with these efforts, the

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study uses a quantitative research approach. Data collection by doing the learning process by applying observation learning methods. The sample in this study was 69 students participating in building construction 1 who were first semester students and then evaluated with tests. The results of the evaluation are included in the achievement criteria:

Table 1. Achievement criteria

SUCCESS RATE	CATEGORY
>85	Excellent
70-84	Good
50-69	Enough
30-49	Less
<30	very less

III. RESULTS AND DISCUSSION

The application of observation learning methods in this study aims to find out the level of understanding of materials in building construction 1 courses by looking at the learning outcomes of students after following learning with these methods.

The steps of applying this learning method are starting with lecturers providing material with visual media in the form of images and theories with online perception through zoom, then students are asked to make observations around the student residence and literature study, collect data (inventory data) by means of bail documentation in the form of real photos / videos, then in analysis, interpretation, and evaluation, withdrawal of conclusions, preparation of reports, and presentation of observation reports.

The study was conducted in September-November 2021. After the learning process is then carried out learning evaluation with test techniques, and obtained student learning results with the following criteria on average:

Table 2. Learning Outcomes

NO	SUCCESS RATE/CRITERIA	AMOUNT	PERCENTAGE
1	EXCELLENT	14	20,29
2	GOOD	32	46,38
3	ENOUGH	21	30,43
4	LESS	2	2,90
5	VERY LESS	0	0,00
	TOTAL	69	100

Diagram 1. Learning Outcomes
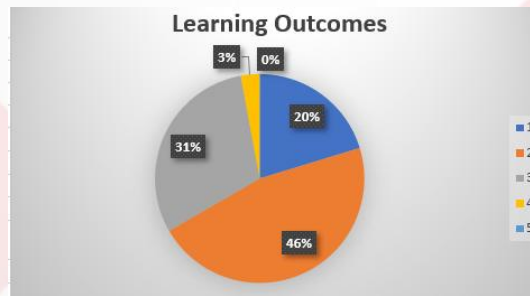
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Student study evaluation results were obtained in excellent categories 20.29%, good categories 46.38%, quite 30.43% categories and less 2.90%. This proves that the results of student learning evaluations in building construction courses with the application of observation methods, during the Covid-19 Pandemic conducted by distance learning showed good results.

References

Anas, Muhammad. 2014. Mengenal Metodologi Pembelajaran. Pasuruan: Pustaka Hulwa

Arifin, Zainal. 2013. Evaluasi Pembelajaran. Bandung: PT Remaja Rosdakarya

Arikunto, dkk. 2014. Penelitian Tindakan Kelas. Jakarta: Bumi Aksara

Eggen, Paul and Don Kauchak. 2012. Strategi dan Model Pembelajaran. Jakarta: Indeks.

Hamalik, Oemar. 2013. Proses Belajar Mengajar. Jakarta: PT Bumi Aksara

Huda, Miftahul. 2014. Model-model Pengajaran dan Pembelajaran: Isu-isu Metodis Dan Paradigmatis. Yogyakarta: Pustaka Pelajar.

Finch, & Crunkilton. (1992). Curriculum development in vocational and technical education. Planning, content and implementation. Fourth edition. Virginia: Polytechnic Institute and State University.

Mayasari, Retno, Sri Handayani, and Harijadi Gunawan Buntoro Wahjono. "Professional Competence of Vocational Teachers from the Graduates of Vocational Education Building Engineering Study Program UNNES." 1st Vocational Education International Conference (VEIC 2019). Atlantis Press, 2019

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Environmental Issues in Realizing a Smart Environment on the Manado Bay Coast; Literature Study

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Abstract. The development of tourism on the coast of the bay of Manado has brought both positive and negative impacts. The positive impacts that occur include an increase in the number of tourist visits, expansion of job opportunities and an increase in income for the surrounding community. The research method is descriptive qualitative but the data is managed quantitatively, while the determination of the sample is done by purposive sampling. The latest data/information related to activities and various environmental problems as well as tourism management efforts on the Manado bay coast were obtained through field observations and in-depth interviews with several informants. Interviews were conducted using snowball sampling technique. Meanwhile, the negative impact seen based on the results of observations and interviews is in the form of environmental damage in several locations due to increasing exploitative development and also caused by abrasion and garbage. From the results and analysis of the problem, it is known that the occurrence of environmental problems is caused by management that has not run optimally. In general, it is necessary to improve the management of the coastal border area so that it can run optimally in order to support the sustainability of tourism on the coast of the Manado bay.

Keywords: environment, coastal, tourism

Introduction

The development of national tourism is also a part of North Sulawesi. Currently, North Sulawesi is getting support from the central government to become one of the locations for tourism development with the existence of a Super Priority Area (KSP) for Likupang tourism development. Of course, the development of the KSP must not ignore the tourism area that has developed first, namely the Manado bay coastal area. This coastal area is located along the coast of Manado Bay across 2 regencies and 1 city and is directly opposite the Bunaken marine national park area .

Increasing the tourism sector requires the availability of supporting infrastructure such as access to transportation, roads, clean water, terminals, telecommunications, information and accommodation advice, airport and port restaurants. (Widyarini & Sunarta, 2019) . The availability of all these facilities is an important requirement so that it takes determination to jointly build supporting infrastructure so that they can continue to attract tourists to visit tourist objects that are being developed (Nuraeni, 2014) . The need for these facilities and infrastructure provides opportunities for investment and business. including the coastal tourism area of Manado City.

This investment opportunity presents its own challenges for investors to participate in opening businesses in this coastal area, and not only for local investors but also for national investors and even international investors. Of course, the presence of outside investors needs to follow the standards set by the local government. Investment in tourism will encourage the improvement of facilities at tourist sites (Singagerda et al., 2013) . Tourism also encourages the opening of employment opportunities in various sectors and opens job opportunities for the surrounding community and of course this is part of improving the welfare of the community around tourism development locations (Risman et al., 2016) .

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The tourism sector has been proven to be able to make a significant contribution to national economic development as a foreign exchange earning industry. Therefore, with management that does not leave local wisdom, it can indicate the construction of more adequate facilities and infrastructure with the first condition that it has the uniqueness or identity of the area, both tourist attractions provide security, comfort and safety, thirdly support from local government and local communities. There are three ways that need to be done in tourism development, namely firstly promoting, secondly accessibility and thirdly structuring the tourism area itself. (Hidayat, 2016) . These three will be the solution in developing the tourism aspect, including in the coastal area of the Manado bay.

Although the COVID-19 pandemic has hit the world, over time tourism development must be restored. For this reason, this research was carried out within the framework of analyzing environmental problems for the sake of restoring tourism on the coast of Manado City.

Method
The purpose of this study is how we then analyze environmental problems that occur in the coastal area of Manado City. Environmental problems in question are environmental problems related to tourism development on the coast of Manado City. This environmental problem is then analyzed with a sustainable tourism approach. Sustainable tourism is tourism that puts forward economic principles, social principles and environmental principles in the tourism management procedures. This tourism point invites all parties to then use their potential and resources to meet social and environmental economic needs without neglecting the sustainability of the environment itself, sustainability of local culture, natural authenticity of biodiversity. and other support systems in the tourism area to be developed (A.Yoeti & Gunadi, 2013) .

Results, Analysis, and Discussions
Identification of Environmental Problems in Manado Bay Coast.
The coast of Manado City is a stretch of coast consisting of various forms of tourism area development. Tourism on the coast of Manado bay as the capital of North Sulawesi province is growing very rapidly. The rapid development of this coastal area has resulted in a very high demand for land in coastal areas. The development of tourism-based areas is very widespread. This condition affects the conditions of the coastal and marine environment. Moreover, this area is located in the buffer zone of the marine conservation area of the Bunaken Marine National Park. Bunaken is an island in front of the bay of Manado which is rich in biodiversity (Santoso et al., 2015) .

Coastal areas are very vulnerable areas due to the need for regional development which if not managed will be easily damaged and encourage natural disasters such as floods (Patty & Manu, 2015) . The results of the researchers' observations indicate that environmental damage has occurred in several coastal locations of the Manado bay as shown in Table 1 below.

Table 1. The results of observations of environmental problems in the coastal area of the Manado bay

No	Environmental Issues	Information
1	Coastal Abrasion and Flood Rob	Occurs almost every year, especially during the westerly wind (November – February)
2.	Development of tourism infrastructure that interferes with coastal borders	Café and tourist building
3	Management of public facilities that are not optimal	Toilets, docks and roads that are still damaged
4.	Waste management is not optimal	Garbage is scattered and has not been managed optimally, still relying on disposal to the landfill

Source: Processed from primary data, 2021

Conclusion

The coastal area is an area that has an important value in tourism development, especially in Indonesia, which is an archipelagic country. The coast offers various tourism potentials such as beaches, forests, fields, marine parks and so on. The potential of the coast as a tourism area must be maintained. Management commitment should prioritize the sustainability of the coastal area. The principle of sustainability that needs to be applied is to maintain coastal conditions so that they remain natural by continuing to maintain the cleanliness and beauty of the coastal area. This concept also applies to the coastal development of Manado City. Where it is proper that the development of tourism on the coast does not forget to pay attention to the condition of the coast both in terms of the coastal border area and from its cleanliness.

Based on the description above, the conclusions of this study are described as follows; (1) The current coastal environmental problems of Manado City that have occurred and have been identified, namely abrasion, tidal flooding, violation of coastal boundaries, management of infrastructure facilities that are not yet optimal and waste management that is not based on technology need to be raised as part of improving the quality of the coast as a tourist area. . (2) The environmental problems that occur in the coastal area of Manado Bay are partly due to the lack of stakeholder understanding in understanding the importance of coastal environmental conditions as supporting tourism. Most of the development carried out tends to be profit-oriented and ignores the importance of a beautiful coastal environment. This situation will cause the sustainability of tourism will only be short-lived. Over time this area will be abandoned by tourists. (3) In order to restore the potential function of the area to support food tourism, it is necessary to develop integrated and sustainable coastal tourism management by involving all stakeholders across regions and governments. Coastal management must also be made regulations originating from the concept of sustainable tourism development.

Based on the description above, the efforts that need to be made in optimizing the management of coastal tourism in Manado City are to apply the principles of sustainable development by: (1) Determining the area of the coastal border area. (2) Prohibition of new permanent physical development if it is in the coastal border area. (3) Implement strict rules for violators of coastal border development. (4) Mandatory the management of environmental permits for business owners along the coast. (5) Promote the planting of coastal plants, especially in areas that often experience abrasion. (6) Increasing the procurement of facilities and infrastructure independently. (6) Waste management through waste bank makers and promote independent waste sorting.

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References

Agmasari. (2019). List of Most Visited International Tourists to Indonesia 2019 . https://travel.kompas.com/read/2019/11/03/164641027/List-wisatawan-mancanegara-most-   many-berkunjung-ke-indonesia-2019

Anugrah, AP, Putra, BA, & Burhanuddin. (2020). Implementation of the coral triangle initiative on coral reefs, fisheries, and food security (CTI-CFF) in Indonesia and the Philippines. IOP Conference Series: Earth and Environmental Science , 575 , 012154. https://doi.org/10.1088/1755-1315/575/1/012154

A. Yoeti, O., & Gunadi, IMA (2013). Sustainable Tourism as a Strategic Instrument in Development Planning An Analysis from the Development Side of Sustainable Tourism Destinations. Journal of Tourism Destination and Attraction , 1 (1), 37–44.

Azizah, N. (2020). Structure and Culture in the Family in the Era of IMR (Adaptation of New Habits) in the Bandung City Family Environment . 11.

Papua Province Regional Research and Development Agency, & Ismail, M. (2020). Papua Province Tourism Development Strategy. Renewal Dimensions , 4 (1), 59–69. https://doi.org/10.21787/mp.4.1.2020.59-69

Central Bureau of Statistics . (2020). https://sulut.bps.go.id/subject/16/pariwisata.html

Bank Indonesia: The Indonesian economy only grew 4.2-4.6% due to Covid-19 . (2021). https://www.aa.com.tr/id/nasional/bank-indonesia-ekonomi-indonesia-only-tumbuh-4-2-4-6-karena-covid-19/1771700

Darma, IGKIP, & Kristina, NMR (2020). Restoration of the Natural Function of Tourism Amid the Covid-19 Pandemic Khasanah Ilmu - Journal of Tourism and Culture , 11 (2), 101–108. https://doi.org/10.31294/khi.v11i2.8480

Fronteira, I., Eel, M., Magalhães, JP, de Barros, FPC, Delgado, AP, Correia, T., Daniel-Ribeiro, CT, & Ferrinho, P. (2021). The SARS-CoV-2 pandemic: A syndemic perspective. One Health , 12 , 100228. https://doi.org/10.1016/j.onehlt.2021.100228

Handayani, GL, & Sanjiwani, PK (2020). The Influence of Exclusive Beach Border Activities for Community Life at Double-Six Beach. JOURNAL OF TOURISM DESTINATIONS , 8 (2), 176–183. https://doi.org/10.24843/JDEPAR.2020.v08.i02.p02

Hidayat, M. (2016). TOURISM OBJECT PLANNING AND DEVELOPMENT STRATEGY (CASE STUDY OF PANGANDARAN BEACH, CIAMIS DISTRICT, WEST JAVA). THE Journal : Tourism and Hospitality Essentials Journal , 1 (1), 33. https://doi.org/10.17509/thej.v1i1.1879

Hudha, N., Rondonuwu, DM, & Suryono, -. (2019). THE STUDY OF MANADO BAY COASTAL DEVELOPMENT AS A BEACH CITY. SPATIAL , 6 (3), 800–809.

Karauwan, MAJ (2007). Study of coastal ecosystem management around the reclamation area of Manado Bay, North Sulawesi Province . http://repository.ipb.ac.id/handle/123456789/50736

Kharisma, B. (2019). IMPACT OF THE TOURISM SECTOR ON ECONOMIC GROWTH (TLG HYPOTHESES, CASE STUDY: 8 ASEAN COUNTRIES). E-Journal of Economics and Business, Udayana University , 1193–1208. https://doi.org/10.24843/EEB.2019.v08.i10.p04

ManadoTribunNews, M. (2021). BREAKING NEWS Megamas Manado Business District Full of Garbage This Morning—the Manado Tribune . https://manado.tribunnews.com/2021/01/18/breaking-newskawasan-bisnis-megamas-manado-full-sampah-pagi-ini

Strengthening Technology
and Vocational Competence
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Masbiran, VUK (2020). IMPACT OF THE COVID-19 PANDEMIC ON WEST SUMATERA TOURISM. Journal of Nagari Development , 5 (2), 148–164. https://doi.org/10.30559/jpn.v5i2.212

Mendler de Suarez, J., Cicin-Sain, B., Wowk, K., Payet, R., & Hoegh-Guldberg, O. (2014). Ensuring survival: Oceans, climate and security. Ocean & Coastal Management , 90 , 27–37. https://doi.org/10.1016/j.ocecoaman.2013.08.007

Nisa, DF (2020). THE EFFECTIVENESS OF SOCIALIZATION IN SANTRI PONDOK PESANTREN TOWARDS ADAPTATION OF NEW HABITS IN LUMAJANG DISTRICT. Journal of Public Services , 4 (2), 259. https://doi.org/10.20473/jlm.v4i2.2020.259-266

Nuraeni, BS (2014). 1 ANALYSIS OF FACTORS THAT INFLUENCE THE INTEREST OF TOURISTS TO VISIT THE RANGGAWARSITA MUSEUM, SEMARANG . 23 (1), 20.

Nurdin, R. (2015). Communication in Disaster Management. JOURNAL OF SIMBOLIKA: Research and Learning in Communication Study , 1 (1), Article 1. https://doi.org/10.31289/ Simbollika.v1i1.49

Parassa, Y., Pesik, M., Pairunan, T., & Pongtuluran, A. (2019). North Sulawesi Tourism Management Information System Design as a website for the Tourism Office. MIPA Journal , 8 , 86. https://doi.org/10.35799/jmuo.8.3.2019.25358

Patty, W., & Manu, G. (2015). COMMUNITY OF REEF FISHING ON BIOROCK ARTIFICIAL REEF IN SILADEN ISLAND WATERS, MANADO CITY, NORTH SULAWESI . 6.

Primadany, SR (2013). STRATEGY ANALYSIS OF REGIONAL TOURISM DEVELOPMENT . 9.

Risman, A., Wibhawa, B., & Fedryansyah, M. (2016). TOURISM CONTRIBUTION TO IMPROVING THE WELFARE OF INDONESIAN COMMUNITY. Proceedings of Research and Community Service , 3 (1). https://doi.org/10.24198/jppm.v3i1.13622

Salya, DH & Bappenas International Conference on Best Development Practices and Policies. (2015). Conference proceedings: Bapenas International conference on best development practices and policies Jakarta, 19-20 August 2015 .

Santoso, H., Muntasib, EKSH, Kartodihardjo, H., & Soekmadi, R. (2015). Implementation of Nature Tourism Use Regulations in Order to Development of Tourism Governance in Bunaken National Park. Social Sciences , 4 (3), 42. https://doi.org/10.11648/j.ss.20150403.13

Singagerda, FIS, Oktaviani, R., & Hakim, DB (2013). FLOW ANALYSIS OF INDONESIAN TOURISM INVESTMENT AND TRADE . 17 , 9.

Sugihamretha, IDG (2020). Policy Response: Mitigation of the Impact of the Covid-19 Outbreak on the Tourism Sector. Journal of Development Planning: The Indonesian Journal of Development Planning , 4 (2), 191–206. https://doi.org/10.36574/jpp.v4i2.113

Trinanda, TC (2017). Management of Indonesian Coastal Areas in the Framework of Environmental Conservation-Based Development. Renewal Dimensions , 75–84. https://doi.org/10.21787/mp.1.2.2017.75-84

Uar, ND, Murti, SH, & Hadisusanto, S. (2016). Environmental Damage Due to Human Activities on Coral Reef Ecosystems. Indonesian Geography Magazine , 30 (1), 88–96. https://doi.org/10.22146/mgi.15626

Utami, S., Soemarno, Surjono, & Bisri, M. (2014). Disaster Risk and Adaptation of Settlement along the River Brantas in the Context of Sustainable Development, Malang, Indonesia. Procedia Environmental Sciences , 20 , 602–611. https://doi.org/10.1016/j.proenv.2014.03.073

Wardhana, A., & Kharisma, B. (2019). IMPACT OF THE TOURISM SECTOR ON ECONOMIC GROWTH (TLG HYPOTHESES, CASE STUDY: 8 ASEAN COUNTRIES) . 16.

Widyarini, IGA, & Sunarta, IN (2019). Impact of Tourism Facilities Development on Increasing Number of Visitors at Angseri Hot Spring Nature Tourism, Tabanan. JOURNAL OF TOURISM DESTINATIONS , 6 (2), 217. https://doi.org/10.24843/JDEPAR.2018.v06.i02.p03

Widyastono, H. (2007). NATURAL AND NATURAL RESEARCH METHODOLOGY. Journal of Education and Culture , 13 (68), 757–775. https://doi.org/10.24832/jpnk.v13i68.398

Zone, iwan. (2001). (PDF) THE Space Use Analysis of Manado Bay Coastal Zone, North Sulawesi | iwan zone—Academia.edu .

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CONDITIONS OF SMART TOURISM IN THE LIKUPANG SEZ IN THE PANDEMIC ERA; LITERATURE REVIEW

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Likupang North Minahasa Regency has diverse tourism potential which is also included in the government's strategic program as the Likupang National Tourism Strategic Area (KSPN). Tourism is one of the pillars of sustainable tourism is a smart tourism policy approach that has made a significant contribution to tourism development. Tourism must be planned in accordance with the criteria for sustainable development with a smart tourism approach. This research is an initial effort to conduct a literature study to identify tourism development policies, especially in the Likupang Super Priority Tourism Destination. The results of the literature review become material for the development of Likupang Tourism Super Priority Destinations in the future, of course, it is related to the conditions of health protocols due to the Covid-19 pandemic. This study reviews a hundred relevant journals regarding the implementation of tourism development policies in the previous 5 years from 2016 to 2021. The selection of the last 5 years was based on the pandemic conditions that emerged in 2018. The research method is through a systematic literature review approach or called Systematic Literature Review (SLR) through the perish or publish application and then mapped with the Vos Viewer application to determine the cluster of tourism development in KSPN and at this time when the pandemic hit the world. Furthermore, the identification results are modeled through a dynamic system approach. The identification results show that there is a change in orientation regarding tourism development before the pandemic and during the pandemic. The results of the search through the application. The method used then accommodates the pandemic conditions in current research on smart tourism according to health protocol standards. This is when field observations have been implemented by tourism business actors in the Likupang National Tourism Strategic Area (KSPN) in the form of a sustainable smart tourism thinking system model.

Keywords: Policy, Smart Tourism, Likupang , Pandemic

Introduction

By significant pandemic this has cause drop total tourists and give influence on the sector supporter service tourist as sector transportation warehousing , services accommodation , culinary and giving impact on laying off workers service this . This thing naturally cause loss because decline income business service field tourist (Masbiran , 2020) .

For that facing the era of the Covid-19 pandemic so sector tourist should capable adapt with life new or called New Normal (Azizah , 2020) . New normal or adaptation habit new this done through modification of procedure work , appropriate soup protocol health , minimal touch implementation or touchless, repair sanitation , inspection and certification health for workers involved _ in sector this . At the level of accommodation nor culinary so Thing important necessary _ done is the share responsibility among stakeholders.

Bank Indonesia provides description projection growth Indonesian economy from previous 5.0 -5.4 percent Becomes to 4.2-4.6 percent consequence deployment of the corona virus . (Bank Indonesia , 2021) . In

period time before pandemic that is Among 2009 to _ with year 2019 (10 Years) tourism Becomes commodity excel and experience various increase . Presence traveler international (international tourists) increase from 892 million in 2009 to 1,461 Million People in 2019 (Sugihamretha , 2020) . Another thing that proves enhancement performance tourist is existence indicator performance enhancement mark strategic growth tourist sister sector power employment that absorbs 4% of workers increase to 9% and contribution Global exports increase from 7% to 9% (Kharisma , 2019)

Likupang Beach _ Regency North Minahasa has potency diverse tourism which also includes in strategic program government as a Strategic Area National Tourism (KSPN) Likupang . Coastal beach Likupang and its surroundings have beautiful potential , with _ expanse sand white is at right in the triangle world coral . Scenery main coast likupang no only sunrise and sunset. Sun beautiful sunrises and sunsets _ facing to direction sea Pacific Becomes appearance main coast likupang with potency beach sand white . Potency this supported by the state through Determination of Strategic Area National Tourism (KSPN). Coastal beach own potency garden sea this with collection diversity rich life of species coral is one of the most complete in the world. Condition this supported by potential fishery free a beach that is also promising for developed as part from sport fishing . Besides that public local also has variety power pull interesting culture _ including variety potency culinary . Referring to the above potential , of course development tourist coast likupang has a very prospective future .

one _ factor main in development tourist is participation society . Participation done in development process tourist that alone . Participation the community in question must character voluntary and ongoing by Keep going continuously . Participation public done done through pattern thought and pattern act of looking public as subject development . Approach participatory carried out will creating processes and rules in for create customized programs with aspirations them .

Paper this serve approach literature review for Becomes solution alternative model for implementing Smart Tourism in Indonesia (Anindra et al., 2018) . Open review concept this utilise source power and application existing technology _ for use together . Contribution from this post is give alternative solution new for the holders policies and decisions in government in make plan strategic in skeleton development tourist insightful environment (Smart Tourism) in Indonesia. If the policy can be identified, it is hoped that it will become the basis for developing community-based ecotourism in the future.

Method
Study this done with focus on two analysis . first one is dig information about how dynamics study about policy development tourism in the area coast in five years last . Second is for know information where study about theme dominant its application to tourism city coast . because of that , Literature Review is method proper research _ chosen for reach objective study this . source from study is one hundred article journal indexed _ indexer reputable . Method review References done with Systematic Literature Review (SLR) technique (Kitchenham et al., 2009) . This is terms used _ for refers to the methodology study or research certain and the development carried out for gather as well as evaluate research related to focus _ topic certain . SLR research done for various goals , including for identify , assess , evaluate , and interpret all available research _ with field topic interesting phenomenon , with _ question study certain relevant . _ SLR too often needed for setting the research agenda , as part from dissertation or thesis , as well as is complementary part _ submission grant research . SLR method is used for identify , assess , evaluate , and interpret all available research _ with field topic interesting phenomenon , with _ question study certain relevant . _ With use SLR method can review and identification journal by systematic , which at each the process follow steps or protocol that has been established (Triandini et al., 2019) .

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In analyze qualitative data , research this using very precise computer software that is The Publish or Perish app is application used _ for got reference scientific from various institution indexer (Parchomovsky , 2000 ; Arwendria , 2021) . Then map with Vos viewer for got convenience understand data encoding using selected indicators _ in accordance with objective from study this (Yu et al., 2020) .

Object study this is identification smart tourism policy in development tour city beaches in Indonesia.

Analysis and Interpretation

3.1. Identification of Likupang KSPN Tourism Locations

Super Priority Destinations or Special Economic Zones Likupang . Coastal which located appropriate at the end jasirah Sulawesi Island occupies 3 districts from those in the District North Minahasa.

Regency North Minahasa is area expansion from Regency Minahasa and flanked by two cities namely Manado City and Bitung City. by whole coast beach likupang which is area tours that include throughout the region _ if looked at from environmental region side there is in marine park scope Bunaken National . National park sea Bunaken is location world tourism and become one of the conservation areas coast and sea . Bunaken National Marine Park established in 2010 in the region center coral triangle three .

District area North Minahasa is about 1,059,244 km2 (area land area) and 1,261 km2 (area ocean) with coastline _ along 292.20 km. state partial topography _ big is land and hills at a height about 0 – 650 meters from surface sea , except for the surrounding area mountains especially Mountain The clabat that reaches height about 1,995 meters from surface sea . Character topography almost same every District , which is categorized flat , sloping and wavy .

Use land on the coast likupang development tour coast beach supported with fusion function urban as area trade with the existence of a large-scale hotel international combined use land ecotourism sea and coast . Unique view _ because offer potency tour lower sea until peak mountain . Mountain nor mountains a number of of them Mountain Mountain fiery as Mountain Klabat that can enjoy direct from coast beach Likupang . As an area located in the Ring of Fire area and became meeting circum Pacific and circum Mediterranean make coast likupang rich in diversity . Characteristics this Becomes potency for development tour coast based on smart environment management . Beaches and coasts in Likupang is heaven for reef coral and become the place famous diving in various _ part of the world proved with some famous diving spots until overseas like spot diving on the island Ganga .

Potentials and Attractions or power attraction owned , Accessibility leading to _ to object , amenity or facilities in objects and activities _ _ or activities that can done in object tour Coastal owned _ Regency North Minahasa is as The following are 1) Kinaari Beach , 2) La Merry Beach, 3) Bahoi Mangrove Ecotourism , 4) Surabaya Beach, 5) Kalinaung Beach , 6) Pulisan Beach 7) Paal Beach 8) Casabaio as well as a number of location group medium island _ growing .

Identification Type Likupang KSPN Tourism and Application Health Protocol (Prokes)

Development very rapid tourism on the coast beach Likupang consist on a number of type activity both that affect the condition social, economic nor environment beach in particular.

Observation results shown in shape table under concerning grouping tourism that occurs on the coast beach Likupang and shape application protocol health (Prokes).

Table 1.   Observation results Type Likupang KSPN Tour Application Health Protocol

No.	Tourist Area	Type Tour	Location	Application Prokes
	Beach Kinaari	Swimming , snorkeling , diving, jetski , boat , sunset, Café and lodging	West Likupang	Applied _
	La Beach Merry	Swimming , snorkeling , diving, jetski , boat , sunset, Café and lodging	West Likupang	Applied _
	Mangrove Ecotourism bahoi	Swimming , snorkeling , diving, jetski , boat , sunset, Café and lodging	West Likupang	Applied _
	Surabaya Beach	Swimming , snorkeling , diving, jetski , boat , Sunrise, Café	East Likupang	Applied _
	Beach Kalinaung	Swimming , snorkeling , diving, jetski , boat , Sunrise, Café	East Likupang	Applied _
	Pulisan Beach	Swimming , snorkeling , diving, jetski , boat , Sunrise, Café	East Likupang	Applied _
	Paal beach	Swimming , snorkeling , diving, jetski , boat , Sunrise, Café	East Likupang	Applied _
	Casabaio	Swimming , snorkeling , diving, jetski , boat , sunset, Café and lodging	East Likupang	Applied _

Source : processed from primary data 2021

Identification result researcher so there is four type tour the main one is at _ coast Manado City beach as shown in table above . Next results identification it is described activities carried out based on observation field and depicted as following :

Conclusion

Based on results research that has been done , can taken a number of conclusion as following :
Identification result location tour coast strategic area beach Priority Likupang National Tourism consist top 8 locations tour beach . Refer to the results observation field there is there is a coastal area beach likupang so show that application protocol health has done as mechanism prevention in accordance set standard _ government , even though need Keep going done supervision by active .
Based on identified results _ through Publish Or Perish material app articles that appear year 2021 Only 3 articles found _ about development tourism in likupang It means discussion Smart tourism topics linked with development area priority tourist national likupang not yet many written in article journal what again connected with development tourism in the era of the pandemic .

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Based on identified results _ through application vosviewer , year 2021 then with using the keywords Smart environment, pandemic , Indonesia Then found 31 items divided over 4 Clusters with 301 links . As for strong total record of formed _ is 2092.

Necessary Instruments _ developed in Smart tourism study based on literature review is Smart Tourism will related with virtual travel , Social Media as Smart Tourism Instruments , Tourism need managed according to available data accounted for answer , Smart Tourism still Becomes necessary study _ Keep going researched , Smart Tourism uses social media and information health area , Smart Tourism limits massive tourism , Smart Tourism Instruments through creation application , Financing in development of smart tourism.

Reference

Anindra , F., Hendric Spits Warnars , HL, & Min, DM (2018). Smart City Implementation Modeling in Indonesia with Integration Platform Approach. 2018 International Conference on Information Management and Technology (ICIMTech) , 43–48. https://doi.org/10.1109/ICIMTech.2018.8528141

Arwendria , A. (2021). PUBLISH OR PERISH: BIBLIOMETRIC ANALYSIS OF THE LITERATURE ON COVID-19 ON THE GOOGLE CENDIKIA DATA BASE FOR 2019 - 2021. Al- Ma'arif : Science Islamic Libraries and Information , 1 (1), 1–12.

Azizah , N. (2020). Culture Structure and Culture in Family in the AKB Era (Adaptation Habit New) in Neighborhood Bandung City Family . 11.

Bank Indonesia: Indonesia's economy only grew 4.2-4.6% due to Covid-19 . (2021). https://www.aa.com.tr/id/nasional/bank-indonesia-ekonomi-indonesia-only-tumbuh-4-2-4-6-karena-covid-19/1771700

Casado-Aranda, L.-A., Sánchez-Fernández, J., & Bastidas -Manzano, A.-B. (2021). Tourism research after the COVID-19 outbreak: Insights for more sustainable, local and smart cities. Sustainable Cities and Society , 73 , 103126. https://doi.org/10.1016/j.scs.2021.103126

Elistia , E. (2021). Development and Impact Tourism in Indonesia during the Covid-19 Pandemic . Proceedings National Conference on Management Economics and Accounting (KNEMA) , 1 (1), Article 1. https://jurnal.umj.ac.id/index.php/KNEMA/article/view/9066

Fronteira , I., Eel , M., Magalhães , JP, de Barros, FPC, Delgado, AP, Correia, T., Daniel-Ribeiro, CT, & Ferrinho , P. (2021). The SARS-CoV-2 pandemic: A syndemic perspective. One Health , 12 , 100228. https://doi.org/10.1016/j.onehlt.2021.100228

Khaeril , K., Muis , M., Jusni , J., & Madris , M. (2020). Power Competition Objective Tourism : Systematic Literature Review . Indonesian Journal of Tourism and Leisure , 1 (2), 103–117. https://doi.org/10.36256/ijtl.v1i2.117

Kharisma , B. (2019). IMPACT OF THE TOURISM SECTOR ON ECONOMIC GROWTH (TLG HYPOTHESES, CASE STUDY: 8 ASEAN COUNTRIES) . E- Journal of Economics and Business , Udayana University , 1193–1208. https://doi.org/10.24843/EEB.2019.v08.i10.p04

Kitchenham , B., Pearl Brereton, O., Budgen , D., Turner, M., Bailey, J., & Linkman, S. (2009). Systematic literature reviews in software engineering – A systematic literature review. Information and Software Technology , 51 (1), 7–15. https://doi.org/10.1016/j.infsof.2008.09.009

Lionardo , A., & Kurniawan, R. (2020). Local Government Income Revenue: A Brief Study of the Policy Impact of Pandemic Covid-19 on Tourism Recovery . 5.

Masbiran , VUK (2020). IMPACT OF THE COVID-19 PANDEMIC ON WEST SUMATERA TOURISM. Journal of Nagari Development , 5 (2), 148–164. https://doi.org/10.30559/jpn.v5i2.212

Nisa , DF (2020). THE EFFECTIVENESS OF SOCIALIZATION IN SANTRI PONDOK PESANTREN TOWARDS ADAPTATION OF NEW HABITS IN LUMAJANG DISTRICT. Journal Community Service (Journal of Public Services) , 4 (2), 259. https://doi.org/10.20473/jlm.v4i2.2020.259-266

Parchomovsky , G. (2000). Publish or Perish . Michigan Law Review , 98 (4), 926–952. https://doi.org/10.2307/1290335

Pramana , S., Paramartha , DY, Ermawan , GY, Deli, NF, & Srimulyani , W. (2021). Impact of the COVID-19 pandemic on tourism in Indonesia. Current Issues in Tourism , 1–21. https://doi.org/10.1080/13683500.2021.1968803

Pribadi , TI, Tahir, R., & Yuliawati , AK (2021). The Challenges in Developing Smart Tourism: A Literature Review. InfoTekJar : National Journal of Informatics and Technology Network , 5 (2), 254–258. https://doi.org/10.30743/infotekjar.v5i2.3462

Stephenson, ML, & Dobson, G. (2020). Deciphering the Development of Smart and Sustainable Tourism Cities in Southeast Asia: A Call for Research. Austrian Journal of South-East Asian Studies , 13 (1), 143–153. https://doi.org/10.14764/10.ASEAS-0033

Sugihamretha , IDG (2020). Response Policy : Mitigation Impact The Covid-19 Outbreak in the Sector Tourism . Journal Development Planning : The Indonesian Journal of Development Planning , 4 (2), 191–206. https://doi.org/10.36574/jpp.v4i2.113

Sujarwo , S., Suganda , D., & Hadian , MSD (2021). TOURISM RECOVERY OF THE KARANGSONG TOURISM AREA IN THE NEW NORMAL ERA (COVID-19 PANDEMIC) THROUGH THE CONCEPT OF SMART TOURISM. SCIENTIFIC DEVELOPMENT MEDIA , 15 (2), 4067–4072. https://doi.org/10.33758/mbi.v15i2.840

Triandini , E., Jayanatha , S., Indrawan , A., Putra, GW, & Iswara , B. (2019). Systematic Literature Review Method for Identification of Platforms and Methods Development System Information in Indonesia. Indonesian Journal of Information Systems , 1 (2), 63–77. https://doi.org/10.24002/ijis.v1i2.1916

Wardhana , A., & Kharisma , B. (2019). IMPACT OF THE TOURISM SECTOR ON ECONOMIC GROWTH (TLG HYPOTHESES, CASE STUDY : 8 ASEAN COUNTRIES) . 16.

Wen, J., Kozak, M., Yang, S., & Liu, F. (2020). COVID-19: Potential effects on Chinese citizens' lifestyle and travel. Tourism Reviews . https://doi.org/10.1108/TR-03-2020-0110

Wulung , SRP, Yuniawati , Y., & Andari , R. (2021). Covid-19 and Indonesian super-priority tourism destinations. In Promoting Creative Tourism: Current Issues in Tourism Research . Routledge.

Xie , L., Chen, Z., Wang, H., Zheng, C., & Jiang, J. (2020). Bibliometric and Visualized Analysis of Scientific Publications on Atlantoaxial Spine Surgery Based on Web of Science and VOSviewer . World Neurosurgery , 137 , 435-442.e4. https://doi.org/10.1016/j.wneu.2020.01.171

Yu, Y., Li, Y., Zhang, Z., Gu, Z., Zhong, H., Zha , Q., Yang, L., Zhu, C., & Chen, E. (2020). A bibliometric analysis using VOSviewer of publications on COVID-19. Annals of Translational Medicine , 8 (13), 816. https://doi.org/10.21037/atm-20-4235

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SYSTEM DINAMICS MODEL OF COASTAL TOURISM POLICY IN MANADO CITY POST THE ESTABLISHMENT OF THE COVID PERDA IN NORTH SULAWESI

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Abstract

This research is an initial effort to identify the type of tourism and the model of tourism policy structure on the coast of Manado City in the current Covid-19 Pandemic Era. The development of coastal areas that are directed through a sustainable tourism approach needs to prioritize Health protocols. The research method is descriptive qualitative, preceded by identification of the type of coastal tourism in Manado City and then inhabited. The latest data related to activities and tourism on the coast of Manado City were obtained through field observations and interviews with several informants. Interviews were conducted using snowball sampling technique. The results of observations are described through a dynamic model approach that describes a causal relationship qualitatively in order to make it easier for stakeholders to understand and conclude that it concerns sustainable tourism on the coast of Manado City, also adjusted to the Covid-19 protocol policy . The identification results show four types of areas that develop on the coast, namely coastal tourism, culinary tourism, historical tourism, and trade tourism. For this reason, it is necessary to direct a development pattern that involves the participation of all stakeholders related to the development of tourism in Manado City and the coastal government is to be the main facilitator. in relation to the standard Covid-19 protocol policy. North Sulawesi has formulated a protocol for handling COVID-19 through Regional Regulation No. 1 of 2021, it is known that the regulation does not describe in detail the health protocol in tourist areas, and tourism actors have not yet known. For this reason, socialization of this policy is needed and the responsibility for this socialization is handed over to the government with a humanist approach.

Keywords: Model, Coastal, Tourism, Covid, Manado

Introduction

Covid-19 pandemic was present at the beginning of 2019 along with the development of the earth facing the digitalization era without limit . The news of the Covid -19 virus which was first reported in Wuhan, China finally Becomes global pandemic . which later became a global pandemic. The COVID -19 pandemic has an impact not only on developed countries but also on all nations in the world. This pandemic also has an impact on the countries that are members of the G20 where these countries then experience a recession . It is predicted that most of these countries will experience negative economic growth , only 3 G20 countries are predicted to still show positive economic growth in 2020, namely Indonesia, India and China. Recession this impact on the world of tourism cause drop visit tour various part of the world. Tourism that relies on mobility public With this pandemic, people's mobility in doing tourism is hampered. (Muhyiddin & Wardhana, 2020) . In 2019, the world experienced a shock with the SARS-Covid virus and became a global pandemic. President Jokowi in dealing with the Covid-19 pandemic and analyzing the causes of the ineffectiveness of policies taken with an applied communication approach in the policy sector (Sirait, 2021) . The current condition of the COVID-19 pandemic requires tourism to adapt to new habits or what is often referred to as the New Normal. This modification applies to work events, the implementation of which has a reduced service touch which then affects the improvement of sanitation improvements that must follow health protocol standards. at the same time tourists visiting tourism need to be checked according to health certification standards for both those who visit field trips and those who organize

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tourist areas and this will connect all tourism stakeholders. Although in its development since the covid pandemic has caused a decline in tourist visits in North Sulawesi, at the end of 2021, along with the outbreak of the covid case, tourism is reviving. For this reason, tourism development needs to readjust to current global conditions. The tourism development model should prioritize health protocols so that the integration between the current tourism development model and health protocol policies is worth reviewing.

The coastal area of Manado City is an area that will face directly with the Pacific Region and will face foreign tourist arrivals through the cooperation of overseas countries in Asia. Not only tourists from Asia are actually visitors to the coast of Manado City, but almost from all over the world. The coastal area of Manado City is one of the coastal areas that are directly facing foreign countries, especially Asia, such as the Philippines, Taiwan, Hong Kong and South Korea. Due to its strategic position, the coast of Manado City which is experiencing rapid city development and has become one of the tourist destinations, one of which is the opening of direct flights from China to the city of Manado before the pandemic. To be sustainable, of course, the coastal tourism model of Manado City needs to continue to pay attention to the principles of sustainable tourism principles and integrate them with healthy tourism policies according to the current protocol standards. This means that the coastal tourism model of the city of Manado and at the same time needs to be integrated with the principles of healthy tourism. Referring to this condition, the research wants to structure the coastal tourism model of Manado City to be carried out in harmony with the current conditions in handling the pandemic through existing regional regulations in North Sulawesi.

2. Method

The purpose of this study is to model the interrelationships between elements involved in the development of tourism on the coast of Manado City through a sustainable tourism approach. In addition to the sustainable tourism approach, healthy tourism is also integrated in accordance with the Covid-19 protocol policy. In addition to the sustainable tourism approach in pandemic conditions, the sustainable tourism approach is seen from three main sides, namely social, economic and environmental in order to realize sustainable tourism governance. The research was carried out in coastal tourism locations in Manado City, North Sulawesi, and the focus of the observations was carried out on tourist areas on the coast of Manado City. The results of the observations were then structured in the form of a model and then examined using a regional regulation policy approach regarding the handling of the COVID-19 pandemic in North Sulawesi. The time of conducting the research in May - August 2021.

The method used in this research is descriptive qualitative by making direct observations in coastal areas in order to find the phenomenon of coastal tourism. Furthermore, the phenomenon is made into concepts and variables that are connected with a causal basis into a model. After being modeled, the framework is described through economic, social and environmental approaches. In order to strengthen the observations, the researchers also conducted interviews with selected stakeholders in order to get input about the condition of tourism on the coast of Manado City. Information regarding tourism activities in the coastal area of Manado City is carried out by direct field observations both in the floating area to Tuminting the observation point is carried out by direct field visits and meeting several basic informants who are individuals who understand tourism development in the coastal city of the entrusting city. Furthermore, the results of interviews with informants were transcribed and analyzed descriptively according to the results of the systems thinking model.

Results and Discussion

Identification of Types of Tourism on the Coast of Manado City

The very rapid development of tourism on the coast of Manado City consists of several types of activities that both affect the social, economic and coastal environment in particular . Observation results shown in shape table under concerning grouping tourism that occurs on the coast Manado City beach .

Table 1.   Observations of the Types of Coastal Tourism in Manado City

No.	Tourist Area	Type of Tour	Location	Application Protocol
1.	Beach Tourism Area	Swimming, snorkeling, diving, jetski, boat, sunset.	malayalam	Applied _
2.	Culinary Tourism Area	Food Cafe, Coffee Cafe, Restaurant	Reclamation and Tuminting Area	Applied _
3.	Historical Tourism Area	Harbor warehouses, factories and shops.	Manado Harbor Area	Applied _
4.	Trade Tourism Area (Crafts and MSMEs)	Mantos, Megamall, Bahu Mall	All Reclamation Area	Applied _

Source: processed from primary data

Model of Tourism Structure in the Coastal City of Manado and Application of Health Protocols.

The results of the identification of types of tourism on the coast of Manado City show four main types of tourism. Four types of areas that develop on the coast are coastal tourism, culinary tourism, historical tourism, and trade tourism. Associated with sustainable tourism, this area has the social potential to create conflicts of interest, economically it creates income inequality and causes environmental damage. For this reason, it is necessary to direct a development pattern that involves the participation of all stakeholders related to the development of coastal tourism in Manado City and the government is obliged to be the main facilitator. in relation to the standard Covid-19 protocol policy.

In order to get outlined connection because consequence development tourism on the coast of Manado City , Maka make a structural model tour coast Manado City beach .

From this structure, it is described then healthy Becomes part important in development tourist moment this . Without protocol health so tour no could run . In structure .
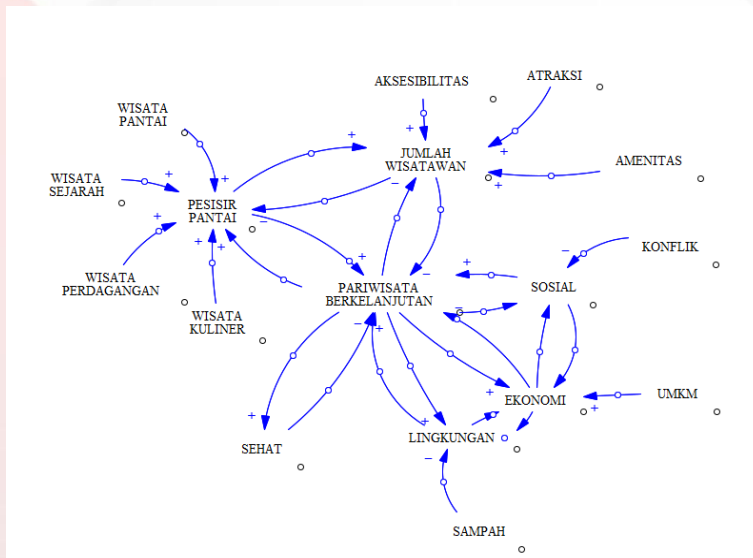
Systemic Model Tourist Coastal Insight _ Environment

Conclusions

Coastal Manado City beach is the main area development tourism in the city of Manado. Society can To do activity all 24 hours a day throughout coast Manado City beach . morning _ public could exercise during the day they could enjoy culinary or shopping and evening they could enjoy the beautiful sunset as well as night day they could enjoy restaurant and cafe until the morning . Condition this of course is with existence COVID-19 pandemic . However along with the more a lot vaccines administered by the government so with depend on protocol health so of course tourism on the coast this could permanent continued .

For that beautiful beach conditions and facility support In order for tourism conditions on the coast to be sustainable and contribute to improving community welfare, especially during the current pandemic, the application of health protocols is absolute. In order to understand the implementation, it is necessary to identify phenomena that occur on the coast of Manado City, consisting of coastal tourism, culinary tourism, historical tourism, and trade tourism. Determination of the type of area followed by identification of tourism potential and the challenges of implementing health protocols are a priority in the development of coastal tourism in Manado City.

Achieving sustainable tourism in accordance with health protocols, of course, requires a comprehensive and integrated synergy collaboration between stakeholders in the coastal tourism area of Manado City. contribute to improving the welfare and sustainability of coastal tourism itself and encourage the environmental sustainability of Manado City.

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As written in rule In this case , this Regional Regulation aims to (a) provide protection for the community from the spread of COVID-19; (b) improve the compliance of the community, the person in charge/owner of/or the manager of public facilities to the implementation of the Health Protocol in the prevention and control of COVID-19, (c) C. strengthen efforts to handle health due to COVID-19; and d. provide a deterrent effect for everyone who violates the Health Protocol in preventing and controlling COVID-19 .

Acknowledgments

References

Dredge, D. (2010). Place change and tourism development conflict: Evaluating public interest. Tourism Management , 31 (1), 104–112.

Eichelberger, S., Peters, M., Pikkemaat, B., & Chan, C.-S. (2020). Entrepreneurial ecosystems in smart cities for tourism development: From stakeholder perceptions to regional tourism policy implications. Journal of Hospitality and Tourism Management , 45 , 319–329. https://doi.org/10.1016/j.jhtm.2020.06.011

Jiricka-Pürrer, A., Brandenburg, C., & Pröbstl-Haider, U. (2020). City tourism pre- and post-covid-19 pandemic – Messages to take home for climate change adaptation and mitigation? Journal of Outdoor Recreation and Tourism , 31 , 100329. https://doi.org/10.1016/j.jort.2020.100329

Lee, TH, & Hsieh, H.-P. (2016). Indicators of sustainable tourism: A case study from a Taiwan's wetland. Ecological Indicators , 67 , 779–787. https://doi.org/10.1016/j.ecolind.2016.03.023

Muhyiddin, M., & Wardhana, D. (2020). Covid-19 Outbreak and Development Planning in Indonesia. Journal of Development Planning: The Indonesian Journal of Development Planning , 4 (1).

Risman, A., Wibhawa, B., & Fedryansyah, M. (2016). TOURISM CONTRIBUTION TO IMPROVING THE WELFARE OF INDONESIAN COMMUNITY. Proceedings of Research and Community Service , 3 (1). https://doi.org/10.24198/jppm.v3i1.13622

Ross, S., & Wall, G. (1999). Evaluating ecotourism: The case of North Sulawesi, Indonesia. Tourism Management , 20 (6), 673–682. https://doi.org/10.1016/S0261-5177(99)00040-0

Roy, J., Hadjaat, M., Darma, DC, Za, SZ, & Kasuma, J. (2021). EXPLORATION OF RURAL TOURISM IN THE FOREST OF MERABU VILLAGE, BERAU (INDONESIA). Journal of Enchantment Tourism , 6 (1), 36–48. https://doi.org/10.26905/jpp.v6i1.5641

Saksono, H. (2012). Creative Economy: New Talent Triggers Regional Competitiveness. Journal of Bina Praja: Journal of Home Affairs Governance , 4 (2), 93–104. https://doi.org/10.21787/jbp.04.2012.93-104

Saksono, H. (2013). Blue Economy: Regional Development Solutions Characterized by Islands Case Study of Anambas Islands Regency. Journal of Bina Praja: Journal of Home Affairs Governance , 5 (1), 1–12.

Sirait, F. (2021). Policy Communication and Solidity of the Jokowi Government Coalition Volume 2 in Handling Covid-19. Journal of Bina Praja: Journal of Home Affairs Governance , 13 (2), 257–268. https://doi.org/10.21787/jbp.13.2021.257-268

Siswahto, E., & Muryani, M. (2020). THE IMPACT OF TOURISM ON ECONOMIC IN NORTH SULAWESI: INPUT-OUTPUT ANALYSIS PERSPECTIVE. JDE (Journal of Developing Economies) , 5 (1), 41–56. https://doi.org/10.20473/jde.v5i1.17924

Tirayoh, V., Latjandu, Lady, Sabijono, H., & Mintardjo, C. (2021). Public Sector Asset Management in the Government of Indonesia: A Case Study in Minahasa Regency. Journal of Bina Praja: Journal of Home Affairs Governance , 13 (2), 195–205. https://doi.org/10.21787/jbp.13.2021.195-205

Wulandari, R., & Rahman, AZ (2020). STUDY OF PLACE BRANDING MEASUREMENTS ON INCREASING GRAND MAERAKACA TOURISM VISITS IN CENTRAL JAVA. Journal of Public Policy and Management Review , 9 (4), 109–124.

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Analisis Kualitas Bahan Bangunan Batu Bata Dan Batako Di Kota Manado

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ABSTRAK

Penelitian ini adalah penelitian eksperimental yang dilaksanakan di laboratotium pengujian tanah dan bahan bangunan STM Negeri manado. Tujuan Penelitian ini adalah untuk mengetahui berapa kuat tekan dari bata merah dan batako (%), berapa penyerapan awal dan akhir dari bata merah dan berapa % pengkristalan garam pada permukaan bata merah. Metode penelitian adalah metode eksperimen dengan menggunakan analisa pengujian kekuatan tekan< pengujian/analisa kadar air yang terkandung, analisa penyerapan awal/akhir, analisa/pengujian pengkristalan garam. Berdasarkan hasil analisis/pengujian mutu maka diperoleh: a) Kuat tekan antara 11-36 kg/cm2 atau termasuk pada kelas kuat tekan 25-50 kg/cm2, b) Kadar air cukup rendah dan penyerapan akhir <15% pada batra merah batako. Pengkristalan garam tidak membahayakan karena hasil pengujian <50% permukaan bata merah tertutup lapisan bunga putih. Dalam pembangunan fisik infrastruktur tiap daerah cenderung memanfaatkan sumber alam yang digunakan sebagai bahan bangunan yang merupakan salah satu dampak dari Otonomi Daerah (otoda). Sehingga penggunaan material bahan bangunan akan berdampak pada pada kualitas maupun umur bangunan. Bahan bangunan yang menggunakan material batu bata dan batako di Kota Manado sebagai bahan bangunan. Oleh sebab itu, mutu bahan batu bata dan batako dapat ditentukan antara lain dengan dengan beberapa pengujian yang memenuhi standart kualitas antara lain: standart ASTM, SNI dan lain sebagainya.
Kata kunci: bahan bangunan batu bata, bahan batako

PENDAHULUAN

Baik masyarakat pedesaan maupun masyarakat perkotaan memerlukan bahan bangunan untuk membuat/mendirikan bangunan yaitu untuk membangun gedung perkantoran, gedung asrama, gedung pendidikan, rumah tinggal, dan lain-lain. Bahan bangunan terdiri dari bahan alami dan bahan buatan (bata merah dan batako). Penggunaan bahan bangunanbuatan sudah dikenal dan banyak digunakan baik di desa maupun di kota. Persyaratan yang harus dipenuhi pada prosesnya ialah pembakarannya, kekuatan tekan, penggunaanya dan sebagainya. Setelah di ketahui tentang persyaratan tersebut maka, para konsumen bahan bangunan buatan tersebut akan berhati-hati untuk memilih bahan bangunan buatan yang sesuai untuk membangun suatu bangunan yang sudahh direncanakan secara teliti Khususnya di kota madya Manado pentingnya mutu yang baik untuk bata merah dan batako perlu diperhaytikan/ditingkatkan guna menunjang bangunan yang bermutu/ memenuhi syarat. Masyarakat dalam membangun suatu bangunan perlu mengetahui akan persyaratan-persyaratan kwalitas bahan bangunan yang berlaku. Kwalitas adalah baik buruk sesuatu benda, keadaan sesuatu benda (Kamus Besar Bahasa Indonesia Modern, Muhamad Ali).

Bata merah (batu bata) harus memenuhi syarat mutu sebagi berikut: a) Tampak luar; b) ukuran; c) Garam yang dapat larut dan membahayakan; d) kuat tekanan (kg/cm2); e) syarat penandaan; f) cara pengambilan contoh; g) jumlah contoh yang harus diambil; dan h) pembungkusan dan pengambilan contoh. Adapun syarat- syarat tersebut harus juga memenuhi pada batako. Dan dari uraian tersebut dapat dinyatakan bahwa pemeriksaan laboratorium dilakukan terhadap: a) pemeriksaan/pengujian tampak luar/ukuran; b) pemeriksaan kadar garam; d) pemeriksaan berat/bobot isi; e) penentuan kuat tekan bahan; dan f) pemeriksaan/ pengujian daya serap bahan. Tanah liat yang meruapakan bahan pokoknya dalam pembuatan bata berasal dari pelapukan batu batuan yang banyak mengandung senyawa seperti slikat-kalium-aluminium. Silikat natrium aluminium dan silikat kalsium aluminium dalam pelaukannya, karena disebabkan

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oleh air yang mengandung asam arang, maka unsure unsur kalium, natrium dan kalsium larut dalam air dan unsure silikat aluminiumnya berubah menjadi silikat aluminium basa, $((OH)4 A1 2 S1 2 0 5$.

Tanah liat yang bisa dipergunakan untuk pembuatan bata, bahan asalnya dari tanah porselin yang dalam alamnya telah tercampur dengan tepung pasir kwarts dan tepung oxid besi ($Fe 2 o 3$) dan tepung kapur ($CaCo 3$). Ciri cirri dari banyaknya kadar oxid besi atau kapur dapat diketahui setelah tanah liat dibakar. Jika setelah dibakar warnanya menjadi merah cokelat berarti kadar oxid besi lebih banyak dari pada kapurnya. Sebaliknya bila kadar kapurnya lebih banyak warna tanahnya setelah dibakar menjadi kuning agak merah. Tanah liat yang tidak banyak mengandung pasir kwarts bila diberi air dan dilumatkan dengan tangan akan terasa lekat lekat pada tangan, dan bila maka tanah liat semacam ini gemuk. Tanah kiat disebut kurus bila digelung gelungksn menjadi silinder mudah putus-putus. (Sutopo Ediwijoyo,1997).

Menurut Sutopo Ediwijoyo (1997) tanah liat di Indonesia kebanyakan tinggal mengambil dari permukaan tanah. Rendapan tanah liat di Indonesia jarang terdapat dalam lapisan tanah lain, sehinga pengambilannya harus dengan membuat sumur sumur. Warnanya macam-macam, tergantung dari oxid oxid logam yang dikandungannya selain aluminium, besi dan kalsium. Jadi yang ditemukan warnanya ada yang merah cokelat, coklat, abu-abu, dan ada yang kebiruan gelap.
Tanah liat hasil penggalian digundukkan dilapangan sampai setinggi +/- 2 m, dan dibiarkan kehujanan dan kepanasan.ada juga yang disimpan didalam ruangan lembab sampai sebulan lebih. Semuanya ini dimaksudkan untuk membusukkan organism yang ada di dalam tanah liat. Setelah kurang lebih satu minggu tanah liat dibalik. Pekerjaan membolak balik gundukan dalam periode pembusukan merupakan juga pekerjaan mencampur tanah liat secara tidak langsung. Tanah liat yang akan dikerjakan, campurannya harus merata artinya kadar pasir dalam adonan tanah liat harus tercampur merata. Pekerjaan mencmpur ini apabila tidak dikerjakan dengan mesin, biasanya secara di injak injak oleh orang atau kerbau dan tanah liatnyapun dalam keadaan basah. Kadar pasir tiap tiap kali diperiksa apakah telah memenuhi syarat syarat untuk membuat bata, bila tanah litany gemuk mudah ditambahkan dengan pasir sedikit demi sedikit, tetapi apabila tanah litany kurus dan tidak ada tanah liat yang gemuk untuk campuran maka sebelum pekerjaan pelumatan dilaksanakn harus diadakan pengendapan lebih dahulu untuk dapat mengurangi kadar pasir.

Tanah liat itu harus diaduk dalam bak besar dengan air banyak, jadi merupakan massa yang sangat cair, sehingga dalam pengadukan itu pasir yang mempunyai berat jenis lebih besar akan dengan sendirinya turun ke bawah. Dari bak aduk ini cairan tanah tanah liat dialirkan ke bak-bak panjang yang mempunyai dasar tidak kedap air, untuk memudahkan airnya meresap ke bawah dan tinggal tanah liatnya. Pekerjaan pengendapan ini meskipun menambah waktu maupun tenaga, ada baiknya untuk pembersihan dari kotoran-kotoran lain, sehinga mutu batu bata dapat menjadi lebih baik. Tanah liat setelah diolah barulah dicetak. Menurut Sutopo Ediwidjojo (1997), pemanfaaan bata kebanyakan di Indonesia dilakukan dengan tangan.

Menurut Sutopo Ediwidjojo (1997), bila tanah liat dibakar sampai titik leleh akan berubah sifat sifatnya yang semula dan akan menjadi keras dan tahan lama terhadap pengaruh udara dan cuaca. Jadi tanah liat yang dicetak akan berubah menjadi batu batu yang mempunyai bentuk sama, sehingga mudah disusun untuk menjadi dinding atau bangunan lain, yang saling dilekatkan dengan zat lekat atau adukan.

Menurut penyelidikan laborato-rium bata klingker mempunyai desak antara 300-400 kg/cm2 penyerapan air antara 20% - 25%. Bata bata ini baik dipergunakan pada pasangan yang kedap air atau pada pasangan yang harus menerima beban tinggi, misalnya pada pekerjaan bangunan air atau jembatan (batu kali sukar didapat atau harganya terlalu tinggi, dibandingkan dengan harga bata), untuk pasangan dinding bawah tanah (ruangan bawah tanah), dinding sumur, bagian dinding ''trasraam'' dari bangunan gedung, dinding bak air, dan pondasi bangunan gedung atau rumah tempat tinggal.

Macam bata merah biasa mempunyai kuat desak kurang dari 100 kg/cm2. Dan yang kuat desaknya 60 – 100 kg/cm2 dapat digunakan untuk pasangan dinding yang tidak perlu menerima atau mendukung beban atau dinding dinding bagian dalam "macam bata merah atau setengah matang tidak baik untuk digunakan sebagai bahan bangunan dan harus dibakar kembali" (Sutopo Ediwidjadja, 1997)

Menurut I ketut supribadi (1986) mengemukakan bahwa batako dapat dikatakan semacam batu cetak yang terbuat dari campuran tras+kapur dan air atau dapat juga dibuat dengan campuran semen+kapur+ pasir dan ditambah air, yang dalam keadaan pulon (lekat) dicetak menjadi balok- balok dengan ukuran tertentu, dimana proses pengerasannya tanpa melalui proses pembakaran. Tras berasal dari nama latin (terra = tanah) yaitu sejenis tanah pozolan yang bila dicampur dengan bahan lain seperti kapur/ semen akan dapat mengeras atau membatu.

Di Indonesia tras banyak terdapat di sekitar lereng- lereng gunung berapi, misalnya digunung murya dekat Surabaya, cimahi, lembong dan negrak (jawa barat). Tras yang terdapat di Indonesia umumnya berwarna agak kuning, merah muda dan abu abu. Batako termasuk batu batuan yang tidak dibakar, kekerasannya tergantung dari kwalitas bahan susun, perbandingan campuran dan proses kemampatannya pada proses pencetakannya. Batako hanya dapat dipergunakan sebagai dinding yang tidak memikul beban berat, dan apabila di tempat- tempat tertentu terdapat beban yang cukup berat maka ditempat itu sebaiknya dipasang kolom beton bertulang untuk memikul bebannya. Produksi batako biasanya diusahakan oleh rakyat Indonesia secara perorsngsn stsu kelompok kecil dengan alat cetak seerhana yang terbuat dari kayu atau besi dengan ukuran sesuai kebutuhan.

Selanjutnya I Ketut Supribadi mengemukakan tentang ukuran dan jenis batako bahwa, ukuran batako ini bermacam-macam sesuai dengan kebutuhan. Untuk daerah bandung dikenal dengan berbagai jenis type dan ukuran sebagai seperti pada Tabel 2.1

Tabel 2.1 Ukuran Dan Jenis Batako

type	Ukuran (cm3)	Jenis dan pemakaiannya
A	20x 20x 40	Berlobang dapat diapakai pemikul
B	20x 20x 40	Berlobang dipakai sebagai bata penutup pada sudut dan penutup tembok
C	10X20X40	Berlobang, dapat digunakan sebagai jendela
D	10 X 20 X40	Berlobsng, dapat digunakan sebagai dinding pemisah
E	10 X 20 X 40	Tidak berlobang, dipakai sebagai dinding pemisah dan pemikul untuk muatan muatan tertentu saja

	8 X 20 X 40	Tidak berlobang, dapat dipakai sebagai dinding pemisah
F		

(sumber: I Ketut Supribadi, 1986)

Syarat-sayarat untuk pemakaian batako anatara lain (I ketut supribadi, 1986: 52-54), sebagi berikut: a) batako/batu cetak harus dalam keadaan kuat dan cukup kering; b) usahakan menggunakan bantako yang sejenis dan seukuran; c) saat pemasangan tidak perlu dibasahi terlebih dahulu dan tak boleh direndam air; d) bila diinginkan tembok batako itu diplester maka tembok harus sedikit dibasahi/diperciki dengan air agar adukan plester dapat melekat dengan baik; dan e) persediaan batako yang akan dipasang hendaknya selalu terlindung dari penyinaran matahari langsung dan hujan

METODE PENELITIAN

Metode Penelitian Dan Disain Penelitian

Metode penelitian yang digunakan dalam penelitisn ini adalah metode eksperimen yang dilakukan di laboratorium STM Negeri manado jln. Pomorow Teling Manado.

Disain penelitian adalah disain atau model penelitian dapat digambarkan seperti pada Tabel 3.1 dan Tabel 3.2

Tabel 3.1 Pengujian Bata merah

Bahan Yang Diuji	Sampel									
	1	2	3	4	5	6	-	-	-	30
Kuat Tekan (Kg/Cm2										
Kadar Air (%)										
Penyerapan Awal										
Penyerapan Akhir										
Pengkristalan Garam										

Keterangan: Jumlah sampel kuat tekan = 30 bh; Jumlah sampel untuk kadar air = 3 bh; Jumlah sampel untuk pengkristaklan garam = 3 bh

Tabel 3. 2 Pengujian Batako

Bahan Yang Diuji	Sampel									
	1	2	3	4	5	6	7	8	9	10
Kuat Tekan (Kg/Cm2)										
Keadaan Air (%)										

Keterangan: Jumlah sampel untuk kuat tekan =- 10 bh; Jumlah sampel untuk kadar air = 3bh

Teknik Penelitian

Untuk bata merah
Persiapan pengujian kwalitas bahan (sampel) dilakukan sebagai berikut:
Memeriksa bentuk bata yaitu kesikuan, kerataan, keretakan

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Mengatur panjang, lebar, dan tebal (cm2)
Menghitung bobot isi: rumus berat/volume (gr/cm3)
Menghitung kadar air A-B/BX100%
Menguji penyerapan awal yaitu: berat air yang diserap/luas permukaan bata (gr/dm2/men.
Menguji penyerapan akhir dengan rumus: A-B/BX100%
Memeriksa pengkristalan garam.

Ketentuan SII:
Tidak membahayakan bila kurang dari 50 % dari permukaan bata tertutup oleh lapisan tipis berwarna putih akibat Kristal garam. Ada kemungkinan membahayakan: bila 50 % dari permukaan bata tertutup oleh lapisan putih yang agak tebal. Membahayakan bila lebih dari 50 % permukaan bata tertutup oleh lapisan putih yang tebal dan permukaan bata menjadi bubuk atau terlepas.

Menguji kekuatan tekan bata (kg/cm2)
Untuk batako
Persiapan pengujian kwalitas bahan (sampel) dilakukan sebagai berikut:
Memeriksa bentuk batako yaitu kesikuan, kerataan, keretakan.
Mengukur panjang, lebar, dan tebal (cm)
Memeriksa kekerasan tepibatako
Mengukur berat batako
Menghitung/menguji kadar air (umur batako 3 minggu)
Menguji kekuatan tekan batako dengan rumus: T= P/F

Alat Dan Bahan Untuk Pengujian
Alat yang digunakan untuk pengujian bata merah adalah:
Mesin tekan (universal testing machine) kapasitasn 10 ton
Mesin tekan beton (cube tester) kapasitas/kekuatan 120 ton
Bejana perendaman bata merah (15 x 15 x 65) cm3
Oven pengering temperature maksimum 300 derajat celcius
Gergaji potong bata
Bejana lebar untuk penyerapan awal dan akhir ukuran (15 x 70 x 70) cm3
Mistar ingsut, spesifikasi 15 cm
Timbangan/ balans kapasitas 2610 gr (trple beam)
Timbangan besar kapasitas 30 kg
Mistar baja 40 cm
Cetok/ trovel
Cetok/ragum/penjepit
Bahan pembantu
Semen Portland
Pasir halus
Air suling
Air leding
Bahan/ benda uji
Bata merah
Batako
Prosedur Kerja Di Laboratorium
Prosedur kerja pengujian/analisis bahan bangunan:
Untuk bata merah
contoh asal pakowa lingkungan IV

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Bentuk bata (jumlah diperiksa 30 bh)

Tabel. 3.3 Bentuk Batu Bata

Bata yang tidak siku	0 %
Bata yang tidak rata	3,3 %
Bata yang retak	3,2 %
Bata yang rapuh	0%

Ukuran

Tabel. 3.4 Ukuran Batu Bata

Panjang rata-rata	21 cm
Lebar rata- rata	10,4 cm
Tebal rata- rata	5,34 cm

Berat

Tabel 3.5 Berat Baru Bata

Ditimbang rata rata	1,698 kg/bh kering udara

Bobot isi:
Cara kerja diambil 3 buah contoh bata kemudian dioven hingga berat tetap lalu ditimbang masing masing misalnya A gram lalu direndam selama 1 x 24 jam kemudian bata diangkat dimasukkan kedalam bejana yang berisi air untuk menghitung volume bata tersebut. Volume bata misalnya B cm3. Bobot isi dihitung dengan rumus: A/B (gr/cm3). Hasilnya dirata ratakan

Kadar air:
Contoh bata diambil 3 buah kemudian ditimbang beratnya masing masing misalnya A gram lalu dioven hingga berat tetap misalnya B gram.
Kadar air dihitung dengan rumus A-B/B X100%

Penyerapan awal:
Cara kerjanya ialah contoh batu bata diukur permukaannya yang lebar dihitung luasnya dalam satuan dm2, kemudian permukaan bata tadi direndam dengan kedalaman 1cm selama satu menit.

Penyerapan awal adalah jumlah air yang diserap bata selama satu menit, yakni diperoleh dari selisih penimbangan bata sebelum dan sesudah direndam. Ketentuan DPMB.
Bila penyeraoan < 10 gr/dm2/ menit, bata baik dan adukan agak kental.
Bila penyerapan antara 10-20 gr/dm2/menit bata tak perlu direndam main
Bila penyerapan > 20 gr gr/dm2/menit bata harus direndam hingga jenuh sebelum digunakan

Penyerapan akhir:
Cara kerjanya ialah contoh bata diambil 3 buah kemudian direndam hingga jenuh selama 1x 24 jam lalu diangkat kemudian ditimbang masing masing misalnya A gram. Kemudian bata dikeringkan dalam oven hingga berat tetap misalnya B gram. Penyerapan akhir dihitung dengan rumus: A-B/B X 100 %

Pengkristalan garam:

Caranya kerjanya ialah 3 buah bata diletakkan berdiri pada bejana yang berisi air suling setinggi lebih kurrang 5 cm, tiap hari airnya ditambah bila airnya berkurang, kemudian dibiarkan hingga 2 minggu apakah pada permukaan bata timbul bunga- bunga putih akibat pengkristalan garam yang dapat larut.

Kekuatan tekan:

Bata yang diuji berjumlah 3 buah diamana masing-masing bata dipotong sama panjang lalu keduanya disusun dengan dilapisi spesi 1 pc: 3 ps. Pasir yang digunakan adalah pasir kwarsa yang lolos ayakan 0.3 mm dan tertahan ayakan 0.15 mm dan air sebanyak 60-70 % dari berat semen

Penjelasan Benda Uji:

Setelah benda uji dibuat seperti gambar diatas kemudian dibiarkan mengeras selama 1 x 24 jam, setelah itu benda uji direndam dalam air selama 1 x 24 jam. Setelah itu benda uji diangkat dan dijemur selama kurang lebih 15 menit lalu diukur luas bidang tekan, dilanjutkan dengan pengujian kuat tekan hingga hancur. Kecepatan pembebanan adalah 2kg/cm2/ detik. Kekuatan tekan diperoleh dari beban hancur dibagi dengan luas di bidang tekan.

Untuk batako
contoh batako asal pineleng

Tabel 3.6 Pemeriksaan secara visual

Bentuk	Baik
Kerataan	Baik
kesikuan	Baik

Tabel 3.7 Ukuran (rata rata)

Panjang	28 cm
Lebar	13,5 cm
tebal	7 cm

Berat 1 buah batako dalam keadaan kering udara ditimbang rata rata 3.654 gram.

Kekerasan tepi batako:

Mudah ditepiskan dengan tangan (rata rata bagian tepi lemah). Hal ini disebabkan oleh perbandingan campuran bahan perekat terlalu besar dan butiran tras besar. Batako yang baik tepinya keras dan tidak mudah ditepiskan dengan tangan.

Kadar air:

Umur batako ketika diambil sebagai sampel 2 minggu. Cara uji sesuai syarat SII yaitu diambil 3 buah batako ditimbang beratnya masing-masing misalnya: A gram, kemudian batako dioven dengan dengan suhu kurang lebih 100 derajat hingga berat tetap (kering mutlak). Berat tetap dimisalkan B gram. Kadar air dihitung dengan rumus: A-B/B X 100 %
Kadar air batako standard maksimum 15 % (SII).
Kesimpulan: batako kadar airnya baik kalau < 15 %
Syarat SII bahwa batako yang akan digunakan pada konstruksi harus sudah berumur minimum 1 (satu) bulan

Kekuatan tekan batako

Benda uji ditekan pada sisi tipis batako dan kedua sisi batako dilapisi spesi tebal 1 cm dengan perbandingan spesi 1 pc: 3 ps halus dan air antara 60-70 % dari berat semen

HASIL PENELITIAN DAN PEMBAHASAN

Hasil Penelitian

Hasil pengujian/pemeriksaan bata merah

Bata asal lingkungan IV

Hasil pengujian

Pengkristalan garam:

Dari 3 buah bata yang diuji rata-rata kurang dari 50 % permukaan bata tertutup oleh lapisan tipis bunga putih akibat Kristal garam. Dengan demikian bata tersebut tidak membahayakan

Bata merah tikala baru

Hasil pengujian pengkristalan garam. Dari 4 buah bata yang diuji ternyata masing-masing kurang dari 50 % permukaan bata tertutup lapisan bunga putih. Berarti bata tersebut tidak membahayakan

Hasil Pengujian/ Pemeriksaan Batako

Tabel 15. Hasil Pemeriksaan Kadar Air Batako Asal Pineleng

No	Berat Basah (Gr)	Berat Kering (Gr)	Kadar Air (%)	Rata Rata
1	3585	3154	13,66	40.79/3
2	3671	3192	15.00	13.60
3	35.2	3132	12.13	

D=40.79

Tabel 16. Hasil Pemeriksaan/Pengujian Ukuran Dan Kuat Tekan Batako Asal Pineleng

No	Ukuran Penampang (Cm)	Luas Penampang (Cm2)	Beban Hancur (Kg)	Kuat Tekan (Kg/Cm2)	Rata Rata
1	6.5 x 20	130	9200	70.77	913.64/10
2	6.5 x2 20	130	9000	69.23	=71.36
3	6.5 x2 20	130	9200	70.77	
4	6.5 x2 20	130	9400	72.31	
5	6.5 x2 20	130	8800	67.70	
6	13.5 x 14	189	13400	70.90	
7	13 x 14	182	13200	72.53	
8	13.5 x 19.5	175.5	12800	72.93	
9	13.5 x 13	175.5	13000	74.07	
10	13.5 x 13.5	182.5	13200	72.43	
	= 713.64				

Tabel 4.17. Hasil Pemeriksaan Kadar Air Batako Asal Pineleng

No	Berat Basah (Gr)	Berat Kering (Gr)	Kadar Air (%)	Kadar Air Rata Rata
1	3738	3486	7.23	8.06
2	3672	3278	11.71	
3	3780	3592	5.23	

Tabel 4.18. Hasil Pemeriksaan/ Pengujian Ukuran Dan Kekuatan Tekan Batako Asal Winagun

No	Ukuran Penampang (Cm)	Luas Penampang (Cm2)	Beban Hancur (Kg)	Kuat Tekan (Kg/Cm2)	Rata Rata
1	13.5 X 13.5	182.25	8200	45.00	54.57
2	13.5 X 14	189	9400	49.74	
3	13.5 X 13. 5	182.25	9000	49.38	
4	13. 5 X 14	189	9200	48.68	
5	13.5 X 13.5	182.5	8600	47.19	
6	7.0 X 20	140	9200	65.71	
7	7.0 X 20	140	8000	57.14	
8	7.0 X 20	140	8200	58.57	
9	7.0 X 20	140	9000	64.29	
10	7.0 X 20	140	8400	60.00	
	= 545.70				

Tabel 4.19.Hasil Pemeriksaan Kadar Air Batako Asal Kairagi

No	Berat Basah (Gr)	Berat Kering (Gr)	Kadar Air (%)	Rata Rata
1	3648	3579	1.93	
2	3588	3423	4.82	
3	3753	3688	1.76	

Tabel 4.20. Hasil Pemeriksaan / Pengujian Ukuran Dan Kuat Tekan Batako Asal Kairagi

No	Ukuran Penampang (Cm)	Luas Penampang (Cm2)	Beban Hancur (Kg)	Kuat Tekan (Kg/Cm2)	Rata Rata
1	13.5 X 14	189	17.200	91.00	88.35
2	14.0 X 13	182	16.800	92.31	
3	13.5 X 14	189	16.600	87.83	
4	13.5 X 13. 5	182. 25	16.600	94.38	
5	13. 5 X 14	189	17.000	89.95	
6	7.0 X 20. 5	143.5	12.400	86.41	
7	7.0 X 20	140	11.600	82.86	
8	7.0 X 20.5	143.5	12.200	85.02	
9	7.0 X 20	140	11.400	81.43	
10	6.5 X 20	130	12.000	92.31	
	= 883.50				

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Pembahasan

Bata merah

Bahan asal yang digunakan haruslah yang dipilih bahan yang memenuhi syarat supaya dapat menghasilkan bata merah yang bermutu tinggi/ baik. Bahan asal yang baik adalah tanah liat yang tidak banyak mengandung tepung pasir kwarts juga tidak banyka mengandung kapur setelah (bahan asal) diambil kemudian diadakan pengolahan. Pengolahan tersebut yaitu pembusukan dan pelumatan. Pembusukan yang dimaksud adalah untuk mebusukkan prganisme yang ada di tanah liat. Sesudah pembusukkan diadakan pelumatan. Pelumatan bermaksud supaya bahan akan tercampur dengan merata. Pekerjaan selanjutnya adalah pencetakan. Pencetakan tanah liat pada alat cetak (kerangka kayu yang mempunyai ukuran dalam sesuai dengan ukuran bata yang dikehendaki ditambah 10% untuk penyusutan. Pencetakan bata merah ada 2 cara yaitu: a) cara sederhana (tanpa press), dan b) cara dengan mengepres

Sesudah bata dicetak kemudian dikering anginkan selama 3 hari. Sesudah 3 hari bata tersebut disusun dengan menyilang dan dibiarkan mengering secara perlahan lahan selama lebih kurang 2 minggu. Setelah bata merah (mentah) ini dikering anginkan barulah dibakar. Pembakaran diadakan pada dapur pembakaran yang telah disediakan. Pembakaran diadakan siang malam secara kontinu selama 3 hari. Bahan bakarnya kayu dan jerami. Untuk manado bahan bakarnya dari batang kelapa.

Setelah pembakaran selesai kemudian dibongkar/dikeluarkan dari dapur pembakaran. Bila ada bata yang belum matang harus dibakar kembali. Bata yang sudah memenuhi syarat diambil kemudian didinginkan kemudian siap untuk dipasarkan. Bata hasil pembakaran sebelum diproduksi sebaiknya diperiksa laboratorium supaya konsumen tidak ragu ragu dalam menggunakan bata tersebut. Berdasarkan hasil pengujian di laboratorium kadar air cukup rendah dan penyerapan akhir <15%. Pengujian yang lain adalah pengkristalan garam. Pengkristalan garam akan membahayakan bila > 50 % permukaan bata yang tertutup lapisan bunga putih. Selain dari pengujian tersebut masih ada pengujian yang terutama adalah pengujian kuat tekan (kg/cm2) Untuk menguji kuat tekan pertama-tama diadakan pembuatan benda uji. Disiapkan alat alat dan bahan pembantu kemudian diambil sample sebanyak 30 buah. Hasil pengujian kuat tekan adalah 11-36 kg/cm 2 jadi kuat tekan yang ada di manado termasuk pada kelas 25 kg/cm2 dan 50 kg/cm2

Batako

Bahan asal yang digunakan haruslah bahan yang memenuhi syarat agar menghasilkan batako yang bermutu tinggi. Bahan asal yang baik adalah pc (semen), tras, dan air. Khusus digunakan di kota madya Manado. Bahan setelah diayak kemudian dicampurkering lalu dicampur dengan air secara merata, kemudian dimasukan ke dalam cetakan yang sudah disiapkan dimana ukurannya disesuaikan dengan ukuran batako yang diinginkan. Sesudah dicetak batako diangkat dan dikering anginkan. Pengeringan selama 3-5 hari. Proses pengeringan dan pengerasan hanya melalui udara dan tidak dibakar seperti bata merah.

Pada umumnya batako yang diperdagangkan di kota madya Manado hanya dikeringkan beberapa hari saja, kecuali belum terjual batako tersebut mengeras sesuai ketentuan yakni selama 30 hari. Campuran yang dipakai yaitu Pc:16 tras dan air. Sebaiknya campurannya lebih kecil dari itu. Batako sebelum diperdagangkan/diproduksi sebaiknya diperiksa laboratorium. Berdasarkan hasil pengujian di laboratorium, kadar ini cukup rendah s15% itu berarti memenuhi syarat. Hasil pengujian kekuatan tekan (kuat tekan) batako di kota madya Manado yaitu 54-88 kg/cm2

SIMPULAN, DAN SARAN

Simpulan

Berdasarkan hasil penelitian yang dilaksanakan dapat dismpulkan bahwa bata merah dan batako di kota madya Manado mempunyai kualitas yang cukup sehingga dapat dimanfaatkan sebagai bahan bangunan, karena ternyata kadar air, daya serap air, pengkristalan garam dan kekuatan tekan semuanya memenuhi syarat

Saran

Penelitian ini perlu dilanjutkan dengan mengambil jumlah sampel yang lebih banyak pada setiap kelurahan yang ada pabrik bata merah dan batako. Pengujian untuk batako dapat diambil dari sampel yang dibuat sendiri dengan mencoba beberapa jenis campuran.

Perlu adanya penyuluhan kepada para produsen agar tetap mempertahankan dan meningkatkan kualitas serta kuantitas apabila syarat kualitas terpenuhi maka para konsumen tidak akan ragu ragu dalam memanfaatkannya serta dapat terpenuhi kebutuhan untuk bahan bangunan. Perlu asanya penyuluhan kepada masyarakat cara pemanfaatan dari bata merah dan batako yang baik dan memenuhi syarat bangunan dan konstruksi.

Daftar Pustaka

[1] Arikunto suharmisi.1992. Prosedur suatu pendekatan praktik. Jakarta: penerbit PT bina aksara

[2] Guildfor dan benyamin. 1978. Fundamental statistics in pshycology and education. New York

[3] I.K. Supribadi,1986. Ilmu bahan bangunan. Bandung: Penerbit Armics

[4] Sutopo Edi. W & Bhakti P. 1997. Ilmu Bahan Bangunan

[5] Turang J. 1982. Sistim perencanaan di daerah dan management proyek

[6] Y. gunawan, A. yulizar yakop, 1987. Penuntun praktis pratikum pada laboratorium teknik sipil

[7] Zulkarnaen Aksa, Penggunaan Bata, Genteng Dan Kapur Sebagai Bahan Bangunan

[8] Laya K.C. Yuliana cs,1984/1985, Pengawasan Mutu Produksi Industry Kecil Batu Bata Dan Ubin Dalam Rangka Penerapan Standarisasi.

[9] Standarisasi, Syarat Mutu Proses Pembuatan Batu Bata Dan Produksi. 1985. Penerbit Proyeksi BPIK Propinsi Sulawesi Utara.

Analisis Material Struktur Bangunan (Pasir Dan Kerikil) Di Kota Manado

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ABSTRACT

This study aims to determine what percentage of rock wear comes from the location using a Los Angeles machine tool. To determine the extent of the quality of coarse aggregate by referring to the ASTM C33-86, PBI-1971, PBI-1989 and SKSNI standards. Knowing the quality of building materials (materials) originating from the Tomohon city area meet the SKKNI standards. The method used in this study is a test method carried out on sand and gravel located and used in buildings in the city of Manado. In general, it can be said that the examination of the feasibility of coarse aggregate (gravel) originating from the city of Manado meets the requirements, through the Los Angeles Machine the average compressive strength of concrete bk is 212,362 kg/cm2. If it is seen from the classification of the quality of concrete in table No. 21 (PBI-1971: 34), then these results are included in the quality of class 2 concrete. Thus, it can be concluded that the material originating from Manado City can be used in structural works. In this study, it was found that the gradation of coarse aggregate originating from Manado City, the average grain size or gradation did not meet the requirements of ASTM C33-86 and PBI-1971, therefore the pores were large, in other words, the compressibility was low. For the fineness modulus of coarse aggregate, the average result is 6.8. the requirements for the fineness modulus of gravel, according to PBr 1989, must meet the requirements with the quality requirements of SSI 0052-80 between 6.00-7.00, so the gradation of gravel studied for its fineness modulus is on average 6.8 according to the SSI-0052-80 regulations (PBr 89) and PBI 71 meet the requirements.

Keywords: building structure material

PENDAHULUAN

Seiring dengan perkembangan zaman dan kemajuan teknologi perkembangan pembangunan di Indonesia berkembang dengan pesat. Tidak di pungkiri bahwa saat ini kebutuhan masyarakat terhadap bahan material terus meningkat seiring dengan pertumbuhan Ekonomi, dan kebutuhan pembangunan di bidang sarana dan prasarana fisik yang maju dengan pesat. Kota Manado sekarang ini sedang berusaha memacu pembangunan di segala bidang, berbenah diri serta berlomba mengejar keterbelakangan Sebagai Kota yang tentu menuntut adanya pembangunan baik fisik dalam hal ini sarana-sarana yang menunjang dan sangat diharapkan, seperti pembangunan-pembangunan jembatan, gedung-gedung, perkerasan jalan dan lainnya yang semuanya itu sangat membutuhkan bahan material seperti agregat kasar (kerikil). Kota Manado memiliki bahan material berupa agregat kasar (kerikil) yang melimpah. Namun bahan material tersebut masih banyak digunakan oleh masyarakat untuk pembangunan non struktural. Pada hakekatnya pembangunan merupakan proses perubahan yang terus menerus yang merupakan kemajuan dan perbaikan menuju kearah yang ingin dicapai. Salah satu sasaran yang ingin dicapai adalah pengembangan ilmu pengetahuan dan teknologi, lebih khusus lagi pada dunia pendidikan. Dewasa ini yang sedang dipacu oleh pemerintah dengan tujuan untuk meningkatkan sumber daya manusia untuk mempercepat terwujudnya ketangguhan dan keunggulan bangsa Indonesia.Dengan makin meningkatnya penggunaan material dalam pembangunan yang strukturil, seperti bangunan-bangunan gedung baik milik pemerintah, suasta rumah- rumah penduduk, belum berani menggunakan material yang ada. Yang sebenarnya jika dilihat dari segi ekonomisnya muda dijangkau. Hal ini dikarenakan material tersebut belum pernah diuji karakteristiknya seperti (gradasi, berat jenis, penyerapan, kadar air dan lain-lain). Sehingga kualitas/atau kondisi material tersebut belum diketahui.

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Di dalam Peranan Beton Bertulang Indonesia (1971), dikemukakan antara lain bahwa untuk beton mutu K-175 dan mutu-mutu lainnya yang lebih tinggi, harus dipakai campuran beton yang direncanakan. Untuk mencapai mutu beton yang direncanakan, maka campuran dalam hal ini perbandingan jumlah agregat kasar (kerikil/kericak), semen dan air.

Untuk menjamin hal tersebut harus memenuhi syarat antara lain. Agregat kasar harus terdiri dari butir-butir yang keras dan tidak berpori, tidak boleh mengandung lumpur lebih dari 1 %, tidak boleh mengandung zat-zat yang dapat merusak beton, seperti zat-zat yang reaktif alkali dan Agregat halus terdiri dari butir-butir yang tajam dan keras, butir-butir agregat halus harus bersifat kekal. Artinya tidak pecah atau hancur, oleh pengaruh cuaca, seperti terik matahari dan hujan disamping itu tidak boleh mengandung lumpur lebih dari 5%. Salah satu hal yang menarik bagi penulis dengan adanya material di Kota Manado khususnya yang berada dan digunakan dalam bangunan di Wilayah Paal Dua Manado tersebut, yang selama ini dimanfaatkan oleh masyarakat dan sebagai dasar bangunan dalam pencampuran beton. Namun karakteristik dari material tersebut belum pernah diuji sehingga kualitasnya belum diketahui.Berdasarkan SNI 2847:2013 agregat merupakan bahan berbutir, seperti pasir, kerikil, batu pecah, dan slag tanur (blast-fumace slag), yang digunakan dengan media perangkat untuk menghasilkan beton atau mortar semen hidarulis. Agregat menempati 70 – 75% dari total volume beton maka kualitas agregat sangat berpengaruh terhadap kualitas beton. Dengan agregat yang baik, beton dapat dikerjakan (workable), kuat, tahan lama, dan ekonomis. Terdapat pengaruh sifat agregat terhadap sifat beton dapat dilihat pada Tabel 2.1 (Nugraha & Antoni, 2017).Agregat kasar adalah agregat dengan ukuran butir yang tertahan di atas saringan NO.4 yang dapat berupa kerikil atau batu pecah (ukuran butir >5 mm). Persyaratan agregat kasar berdasarkan PBI 1971 adaiah sebagai berikut: 1) agregat kasar untuk beton dapat berupa kerikil sebagai hasil desintegrasi alami dari batu-batuan atau berupa batu pecah yang diperoleh dari pemecahan batu. Pada umumnya dimaksudkan dengan agregat kasar adalah agregat dengan besar butir lebih dari 5 mm, 2) agregat kasar harus terdiri dari butir-butir yang keras dan tidak berpori. Agregat kasar yang mengandung butir-butir pipih hanya dapat dipakai, apabila jumlah butir-butir pipih tersebut tidak melampaui 20% dal berat agregat seluruhnya. Butir-butir agregat kasar harus bersifat kekal, artinya tidak pecah atau hancur oleh pengaruh-pengaruh cuaca seperti terik matahari dan hujan, 3) agregat kasar tidak boleh mengandung lumpur lebih dari 1% (ditentukan terhadap berat kering) yang artinya dengan lumpur adalah bagian-bagian kelayakan 0,063 mm. apabila kadar lumpur melampaui 1% maka agregat kasar harus dicuci, 4) Agregat kasar tidak boleh mengandung zat-zat yang dapat merusak beton, seperti zat-zat yang reaktif terhadap alkali, 5) Kekerasan dari butir-butir agregat kasar diperiksa dengan mana harus dipenuhi bejana penguji dari Rudeloff dengan beban penguji 20 ton, 6) Agregat kasar harus terdiri dari butir-butir yang beraneka ragam besarnya dan apabila diayak dengan susunan ayakan: 31,5 mm - 16mm - 8mm - 4mm - 2mm - 1mm - 0,5mm - 0,25mm (Ayakan 150) harus memenuhi syarat berikut: a) Sisa di atas ayakan 31,5 mm, harus 0% berat; b) Sisa di atas ayakan 4 mm, harus berkisar antara 90% dan 98 % berat; dan c) Selisih antara sisa-sisa komulatif di atas dua ayakan yang berurutan, adalah maksimum 60 % dan minimum 0 % berat, 7) Besar butir agregat maksimum tidak boleli lebili dari pada seperlima jarak terkecil antara bidang-bidang dari cetakan, seperti dari tebal plat atau tiga per empat dari jarak bersih minimum di antara batang-batang atau bekas-bekas tulangan.Menurut Kardiyono Tjokrodimulyo (1996:15) bahwa agregat adalah butiran mineral yang berfungsi sebagai bahan pengisi, yang apabila dicampur dengan air akan menghasilkan beton. Agregat dalam SKSNI T-15-1991-2003, diartikan sebagai material glanural misalnya pasir, batu pecah dan kerikil yang diaduk dengan semen. Secara umum agregat dapat dibedakan berdasarkan ukuramrya yaitu agregat kasar dan agregat halus. Agregat kasar adalah batuan yang ukuran butirnya lebih besar dari 4,80 mm, dan agregat halus adalah butiran yang lebih kecil dari 4,80 mm, (Trimulyono, M, 2003: 65). Menurut Murdock Lj dan Brook (1971:24) bahwa kerikil adalah bahan yang terjadi sebagai hasil desintegrasi alami dari batu-batuan dan berbentuk agak bulat serta permukaannya agak licin. Didalam Peraturan Beton Bertulang Indonesia (1971:24) di kemukakan bahwa agregat kasar untuk beton dapat berupa kerikil sebagai hasil disentegrasi alami dari batu-batuan atau berupa batu pecah.Berdasarkan SNI 1969:2008 agregat kasar yaitu kerikil sebagai hasil disintegrasi alami dari batuan atau berupa batu pecah yang diperoleh dari industri

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pemecah batu dan mempunyai ukuran butir antara 4,75 mm (No. 4) sampai 40 mm (No. 1 1 /2 inci). Agregat kasar yang baik harus memenuhi syarat yang tercantum dalam SNI 03-1750-1990 tentang Agregat Beton, Mutu, dan Cara Uji. Sebagian besar batu kerikil ditemukan di daerah pegunungan, di tanah aluvial, seperti endapan fluvial dekat sungai atau sebagai endapan sungai. Kesesuaian kerikil untuk digunakan sebagai agregat tergantung pada beberapa sifat diantaranya distribusi ukuran butiran, bentuk partikel, tekstur permukaan, dan pelapukan. Bentuk kerikil yang cenderung bulat dikarenakan gesekan oleh air sepenuhnya, sehingga memiliki permukaan yang halus dan licin.

Berdasarkan karakteristik fisik dan struktural bebatuan, pada permukaan batuan kerikil alami memiliki lapisan lumut kerak atau dinamakan lapisan lignit. Tekstur permukaan partikel terutama mempengaruhi ikatan antara agregat dan pasta semen pada pengerasan beton (Langer W.H & Knepper D.H, 2015).

Menurut Tri Mulyono (2014) agregat kasar tak dipecahkan merupakan agregat alami berupa kerikil alami yang banyak didapatkan di sungai-sungai maupun pesisir pantai. Bentuk agregat dipengaruhi oleh beberapa faktor, secara alamiah bentuk agregat jenis ini dipengaruhi oleh proses geologi batuan. Menurut Paul Nugraha & Antoni (2007) agregat kasar tak dipecah (kerikil) cenderung memiliki bentuk bulat dan kadang agak pipih. Bentuk dari agregat tersebut akan mempengaruhi kelecakan (workability) dan kekuatan beton. Klasifikasi bentuk pada agregat kasar dapat dilihat pada Gambar 2.1. Agregat kasar dengan bentuk butiran bulat adalah yang terbaik untuk kelecakan beton. Bentuk yang pipih dan memanjang kurang baik karena sulit untuk dipadatkan. Bentuk yang dikehendaki adalah bentuk yang tidak pipih seperti ditunjukan pada Gambar 2.2. Sedangkan Tri Mulyono (2014) menambahkan dalam klasifikasi agregat berdasarkan bentuk, bahwa agregat kasar yang memiliki bentuk bulat, bulat sebagian atau tidak teratur, panjang, dan pipih kurang cocok untuk digunakan sebagai beton yang menekankan kepada kekuatan karena ikatan yang dihasilkan antar agregat tersebut kurang kuat (belum cukup baik).

Agregat kasar jenis ini merupakan agregat butiran yang berasal dari stone crusher, hasil residu terak tanur tinggi, pecahan genteng, pecahan beton, extended shale, expanded slag, dan lainnya. Bentuk agregat kasar dipecahkan dipengaruhi oleh mesin pemecah batu dan teknik yang digunakan (Mulyono, 2014). Menurut Paul Nugraha & Antoni (2017) bentuk agregat kasar jenis ini cenderung berbentuk angular dan bersudut, contohnya seperti batu pecah atau split. Dengan bentuk seperti itu, maka permukaannya lebih besar dan akan menghasilkan kekuatan yang tinggi. Tri Mulyono (2004) berpendapat bahwa agregat kasar dengan bentuk bersudut cocok digunakan untuk beton yang menekankan pada kekuatan karena ikatan yang dihasilkan antar agregatnya baik (kuat). Agregat kasar dengan bentuk tersebut juga dapat digunakan untuk bahan lapis perkerasan (rigid pavement). Berdasarkan SNI 1970:2008, agregat halus adalah pasir alam sebagai hasil disintegrasi 'alami' batuan atau pasir yang dihasilkan oleh industri pemecah batu dan mempunyai ukuran butir terbesar 4,75 mm (No.4).

Gradasi agregat adalah distribusi dari variasi ukuran butir agregat Gradasi agregat berpengaruh pada besarnya rongga dalam campuran dan menentukan workabilitas (kemu-dahan dalam pekerjaan serta stabilitas campuran). Gradasi agregat ditentukan dengan cara analisa saringan, dimana sampel agregat harus melalui satu set saringan, dimana saringan yang paling besar diletakkan paling atas dan yang paling halus dibawah. Gradasi yang ideal itu ada yang semakin padat karena menghasilkan beton yang lebih baik dan yang lebih ekonomis. Rongga udara akan minimal bila diameter butirkecil, tapi bila terlalu kecil akan tidak praktis. Selain itu tegangan permukaan dan tegangan masing-masing butir tidak memungkinkan butir dipasang secara berpasangan/berdempetan itu agar mudah dipadatkan. Gradasi senjang (gap graded) adalah suatu komposisi agregat yang grafik pembagian butirnya menggunakan di antara ukuran-ukuran tertentu berbentuk senjang, mempunyai rongga diantara agregat lebih besar sehingga dapat mengakomodasi aspallebih banyak.

Gradasi harus membutuhkan berbagai variasi ukuran butir agregat dalam campuran beton untuk mendapatkan pori yang kecil dan kemampuan yang tinggi agar interblocking yang terjadi menjadi baik,

Selain itu untuk mendapatkan penyebarangradasi yang baik dapat dilakukan dengan cara mencampurkan agragat bergradasiseragam pada ukuran butir yang agregatnyatidak memiliki gradasi senjang sehinggadiperoleh campuran gradasi yang menerus baikGradasi senjang dapat dilakukan apabila kondisi pengecoran dapat diatasi sebaikmungkin. Pemisahan atau segresi dapat diminimalisir dengan memakia slump terendahdan campuran beton yang cukup keras/kuat.

Beton pada dasarnya adalah campuran yang terdiri dari agregat kasar dan agregat halus yang dicampur dengan air dan semen sebagai pengikat dan pengisi antara agregat kasar dan agregat halus serta kadang-kadang ditambahkan additive (Tjokrodimuljo, 2007). Menurut SNI 2847:2013, beton (concrete) didefinisikan campuran semen Portland atau semen hidrolis lainnya, agregat halus, agregat kasar, dan air, dengan atau tanpa bahan campuran tambahan (admixture). Kelebihan utama beton adalah harganya relatif murah karena menggunakan bahan-bahan dasar yang umumnya tersedia di dekat lokasi pembangunan, kecuali semen Portland.
Selain itu beton termasuk bahan yang awet, tahan aus, tahan kebakaran, dan tahan terhadap pengkaratan atau pembusukan oleh kondisi lingkungan, sehingga biaya perawatan murah. Secara struktural, kuat tekan beton cukup tinggi sehingga jika dikombinasikan dengan baja tulangan (yang kuat tariknya tinggi) dapat dikatakan mampu dibuat untuk struktur berat. Pada beton segar dapat dengan mudah diangkut maupun dicetak dalam bentuk dan ukuran sesuai keinginan. Cetakan dapat pula dipakai beberapa kali sehingga secara ekonomi menjadi murah.

Penggunaan bahan dasar penyusun beton (agregat halus maupun agregat kasar) bermacam-macam sesuai dengan lokasi pengambilannya, sehingga dalam perencanan dan cara pembuatannya bermacam-macam pula. Pada beton keras mempunyai beberapa kelas kekuatan sehingga harus disesuaikan dengan bagian bangunan yang dibuat, sehingga bermacam-macam pula perencanaan dan cara pelaksanaannya. Kekurangan yang paling tama dari beton yaitu kuat tarik rendah, sehingga getas atau rapuh dan mudah retak.

METODE PENELITIAN
Metode dan Waktu Penelitian
Metode yang digunakan dalam penelitian ini adalah metode pengujian yang dilakukan pada pasir dan kerikil yang berada dan digunakan dalam bangunan di Kota Manado. Penelitian ini dilaksanakan selama 3 (Tiga) bulan yaitu dari bulan September 2021 sampai dengan bulan November 2021. Tempat pelaksanaan di laboratorium Teknik Sipil Fakultas Teknik Universitas Negeri Manado.

Teknik Pengambilan Sampel
Sampel dalam pengujian ini diambil dari lokasi dengan cara tidak menentu yaitu diambil bukan dari satu titik tempat saja, sampel Agregat pasir yang didatangkan tersebut cukup baik dan belum ada perlakuan sebelumnya, dimana pasir masih dalam keadaan basah dan kotor contoh sampel yang didatangkan sebanyak 1 karung pasir kemudian diletakan di tempat yang tidak mudah dikenai oleh sinar matahari.

Desain dan Prosedur Pengujian
Desain Penelitian ini material yang digunakan berupa agregat kasar (Kericak) Dalam penelitian dari Kota Manado perlu diketahui kondisi karakteristiknya melalui beberapa pengujian sebagai berikut: 1) Pengujian Agregat Kasar (Kerikil): a) Analisa saringan, b) Pengujian kadar air, c) Pengujian berat jenis dan penyerapan air agregat, d) Pengujian berat isi agregat, e) Pengujian keausan agregat dengan mesin Los Angeles; 2 Prosedur penelitian; 3) Menggunakan Riffle Sampler.

Pengujian Kualitas Agregat Kasar (Kerikil)

Desaian pengujian kualitas agregat kasar terdiri dari: 1) Analisa Saringan (gradasi); 2) Pengujian Berat Jenis Dan Penyerapan; 3) Pengujian Kadar Air Agregat; 4) Pengujian Berat Isi Agregat Kasar (Kcrikil); dan 5) Pengujian Keausan Dengan Menggunakan Mesin Los Angeles.

HASIL PENELITIAN DAN PEMBAHASAN
Hasil Yang Diperoleh
Setelah melalui percobaan didapat hasil dari percobaan gradasi agregat kasar, yang berasal dari Kota Manado angka kehalusan didapat sebesar 6.8. Angka kehalusan yang diisyaratkan menurt ASTM C33-86 dan (PBI 1989) adalah 6.0-7.1 dengan demikian agregat kasar yang berasal dari Kota Manado tersebut memenuhi syarat baik.

Melalui pemeriksaan diperoleh berat isi agregat kasar rata-rata sebesar 1.852 Pemeriksaan Keausan Agregat Kasar melalui (Los Angeles Machine) hasil pemeriksaan abrasi untuk mengetahui ketahanan kerikil terhadap keausan dengan menggunakan mesin Los Angeles, dapat diketahui bahwa prosentase kerikil yang hilang adalah sebesar 42.99 %. Menurut PBI (1971) kehilangan berat tidak boleh lebih dari 50 % dengan demikian agregat tersebut memenuhi syarat. Pemeriksaan kelayakan agregat kasar (kerikil) yang berasal dari Kota Manado memenuhi syarat, melalui Mesin Los Angeles didapat hasil rata-rata kuat tekan beton τ bk sebesar 212.362 kg/cm2.

Jika dilihat dari kalsifikasi mutu beton pada tabel No.21 (PBI-1971: 34) terlampir, maka hasil tersebut masuk pada mutu beton kelas 2. Dengan demikian dapat disimpulkan material yang berasal Kota Manado tersebut dapat digunakan dalam pekerjaan struktural. Untuk modulus kehalusan agregat kasar didapatkan hasil rata-rata sebesar 6,8. syarat modulus kehalusan butir kerikil, menurut PBr 1989 harus memenuhi syarat dengan ketentuan mutu SSI 0052 - 80 antara 6,00 - 7,00 jadi gradasi kerikil yang diteliti untuk modulus kehalusannya rata - rata 6,8 menurut peraturan SSI - 0052 - 80 (PB 89) dan PBI 71 memenuhi syarat.

Pembahasan Hasil Penelitian

Hasil Agregat Kasar
Analisa saringan: Bahwa kerikil tidak seluruhnya berada pada daerah yang diisyaratkan oleh ASTM C33 - 86, dimana jumlah persen yang lolos diatas ayakan $\emptyset$ 9,25 mm dan ayakan $\emptyset$ 4,75 mm masih kurang jadi perlu ditambahkan dengan cara, berat material yang tertahan diatas ayakan tersebut harus dikurangi. Sedangkan menurut PBI 1971 kerikil harus memenuhi pasal 34 ayat 6 yaitu: 1) Sisa diatas ayakan 31,5 mm, harus 0 % berat, 2) Sisa diatas ayakan 4 mm harus harus berkisar diantara 90 % berat, 3) Selisih antara sisa - sisa akumulatif diatas dua ayakan yang berurutan adalah maksimum 60 % dan minimum 10 % berat.

FM (Finnes Modulus) kerikil yang diisyaratkan menurut ASTM C33- 86 adalah 6.0-7.1 dan menurut PBI 1989 harus memenuhi syarat mutu SII 0,0052 - 80 antara 6,0-7,1 sedangkan Finnes Modulus kerikil dari pemeriksaanan yang diperoleh hasil rata-rata sebesar 6,8 jadi Finnes Modulus (FM) kerikil tersebut memenuhi syarat.

Berat Jenis dan Penyerapan: Kardiyono Tjokrodimuljo (1996), menjelaskan bahwa agregat dapat dibedakan berdasarkan berat jenisnya. Agregat normal berberat jenis antara 2,5 - 2,7: Penyerapan agregat Normal umumnya berkisar 1-2%. Setelah melalui pemeriksaan berat jenis didapat sebesar 2.47 dan penyerapan sebesar 1.75 %. Dengan demikian agregat yang berasal dari Kota Manado tersebut sangat baik digunakan sebagai bahan pengisi untuk pembuatan beton.

Berat isi: Menurut PBI 1989 kepadatan agregat >880 kg/m3, dan Dari hasil pemeriksaan diperoleh hasil rata-rata sebesar 1852 kg/m3 Dengan demikian kepadatan agregat kasar memenuhi syarat yang diijinkan.

Abrasi: Hasil pemeriksaan abrasi untuk menguji ketahanan kerikil terhadap keausan dengan menggunakan mesin Los Angeles, dapat diketahui bahwa prosentase kerikil yang hilang adalah sebesar 42.99 % Menurut PBI (1971), kehilangan berat tidak boleh lebih dari 50 %. Dengan demikian ditinjau dari segi abrasi maka kerikil tersebut berada pada daerah yang diijinkan dapat digunakan sebagai bahan pengisi untuk pembuatan beton.

Berat Jenis dan Penyerapan: Kardiyono tjokrodimuljo (996), agregat dibedakan berdasarkan berat jenisnya antara 2,5 - 2,7 agregat berat berat jenisnya kurang dari 2,0 dan penyerapan agregat berkisar antara 1 - 2 % dari hasil percobaan diatas diperoleh berat jenis pasir adalah 2,69 dengan demikian agregat halus berasal dari Kota Manado khususnya yang berada dan digunakan dalam bangunan di Kota Manado tersebut menenuhi syarat dan bisa digunakan sebagai bahan pengisi untuk pembuatan beton.

Berat isi: Menurut PBI1989, bahwa kepadatan agregat halus < 1120 kg/m3, dan Hasil rata-rata yang diperoleh dari pemeriksaan sebesar 1124 kg/m3, Dengan demikian berat isi agregat halus melebihi yang diijinkan. Hal ini dapat mempengaruhi kepadatan beton.

Kadar Organik: 1) Kadar organik didalam agregat adalah besar sekali pengaruhnya pada proses pengikatan pasta beton juga dalam pengerasannya. Kadar organik ini mengurangi kekuatan, mempengaruhi kekuatan terhadap serangan karat, mempengaruhi kualitas dari material dalam hal ini adalah pasir; 2) NaOH 3 % akan bereaksi atau mengikat zat-zat organik yang terkandung didalam pasir sehingga NaOH 3 % tersbut akan akan menjadi berwarna - warna tergantung pada jumlah zat organiknya.
Semakin banyak organiknya warna larutan akan bertambah tua, dan 3) Namun agregat yang tidak memenuhi percobaan tetap digunakan, asal kekuatan tekan adukan tersebut pada umur 7 dan 28 hari tidak kurang dari 95 % dari kekuatan agregat yang sama tetapi diam dalam larutan 3 % NaOH yang kemudian dicuci bersih dengan air, pada umur yang sama (PBI 1971: 23). Dengan demikian agregat halus tersebut dapat digunakan sebagai bahan pengisi campuran beton dan tidak perlu dicuci karena hasil pemeriksaan diperoleh sebesar 3.23 % tidak melebihi yang di isyaratkan sebesar 5 %.

Hasil Kelas A
Kerikil pecah (kricak) terdiri dari 4 macarn struklur yaitu:
Diameter 1" - 7,49" dengan berat 1250 gram
Diameter 0,75" - 0,99" dengan berat 1250 gram
Diameter 0,50" - 0,74" dengan berat 1250 gram
Diameter 0,37" - 0,49" dengan berat 1250 gram
Hasil pengujian keausan adalah 48,70% ini menunjukkan bahwa batuan tersebut diatas cukup baik (48,70 % $\leqq$ 50%). Nilai keausan ini cukup besar karena bahan yang digiling berdiameter kecil, disamping itu pula batuan ini ditumbuk oleh manusia dengan martil sehingga bahan tersebut masih utuh dan runcing-runcingnya masih ada belum hancur atau patah.

Hasil Kelas B
Kerikil pecah (kricak) terdiri dart 2 macam struktur yaitu:
Diameter 0,5" - 0,74" dengan berat 2500 gram
Diameter 0,37" - 0,99" dengan bcrat 2500 gram
Hasil pengujian keausan adalah 58,40 % ini menunjukkan bahwa batuan tersebut diatas tidak baik (58,40 % > 50 %). Nilai keausan ini sangat besar karena bahan yang digiling berdiameter kecil, disamping itu pula

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batuan ini ditumbuk oleh manusia dengan martil sehingga bahan tersebut masih utuh dan runcing-runcingnya masih ada belum hancur atau patah.

Hasil Kelas C

Kerikil pecah (kricak) terdiri dari 3 macam struktur yaitu:

Diameter2,5"-2,99" dengan berat 2500 gram

Diameter 2"-2,49- dengan berat 2500 gram

Diameter 1,50" - 1,99" dengal berat 5000 gram

Hasil pengujian keausan adatah 72,41% ini menunjukkan bahwa batuan tersebut diatas sangat balk (22,41% < 50 %). Nilai keausan ini cukup baik, karena bahan yang digiling berdiameter agak besar. Untuk mendapatkan hasil yang baik batuan ini jangan ditumbuk oleh manusia dengan martil sebab batuan tersebut dimana runcing-runcingnya masih ada belum hancur atau patah.

Hasil Kelas D

Kerikil pecah (kricak) terdiri dari 4 macam struktur yaitu:

Diameter 1,5" - 1,99" dengan berat 5000 gram

Diameter 1" -- 1,49" dengan berat 5000 gram

Hasil pengujian keausan adalah 24,27 o/o ini menunjukkan bahwa batuan tersebut diatas sangat baik (24,27% < 50 %). Nilai keausan ini sangat baik karena bahan yang digiling berdiameter besar. Salah satu faktor masih adanya pengerusan karena batuan ditumbuk oleh manusia dengan martil, kalau batuan ini dipecahkan dengan mesin pemecah batu hasilnya akan lebih baik sebab runcing-runcingnya sudah hancur atau patah. Terjadinya debu yang banyak atau agregat halus akibat dari penghancuran runcing-runcing batuan tersebut.

SIMPULAN DAN SARAN

Simpulan

Berdasarkan hasil dan pembahasan, maka dapat diberikan beberapa kesimpulan, yaitu sebagai berikut:

Secara umum dapat dikatakan bahwa pemeriksaan kelayakan agregat kasar (kerikil) yang berasal dari Kota Manado memenuhi syarat, melalui Mesin Los Angeles didapat hasil rata-rata kuat tekan beton τ bk sebesar 212.362 kg/cm2. Jika dilihat dari kalsifikasi mutu beton pada tabel No.21 (PBl-1971: 34) terlampir, maka hasil tersebut masuk pada mutu beton kelas 2. Dengan demikian dapat disimpulkan material yang berasal Kota Manado tersebut dapat digunakan dalam pekerjaan struktural.

Di dalam penelitian ini didapat bahwa gradasi agregat kasar yang berasal Kota Manado, rata-rata ukuran butir atau gradasinya tidak memenuhi syarat ASTM C33-86 dan PBI-1971 oleh karena itu porinya besar dengan kata lain kemampatannya rendah.

Untuk modulus kehalusan agregat kasar didapatkan hasil rata-rata sebesar 6,8. syarat modulus kehalusan butir kerikil, menurut PBr 1989 harus memenuhi syarat dengan ketentuan mutu SSI 0052 - 80 antara 6,00 - 7,00 jadi gradasi kerikil yang diteliti untuk modulus kehalusannya rata - rata 6,8 menurut peraturan SSI - 0052 - 80 (PB 89) dan PBI 71 memenuhi syarat.

Saran

Berdasarkan kesimpulan penelitian, dikemukakan beberapa saran sebagai berikut: Hasil rata-rata melalui Mesin Los Angeles diperoleh kuat tekan beton karakteristik (τbk) sebesar 212.362 kg/cm2, kuat tekan rata-rata yang direncanakan mutu beton K-225. Secara umum dapat dikatakan bahwa pemeriksaan kualitas material berupa agregat kasar (kerikil) yang berasal Kota Manado tersebut, memenuhi syarat. Maka dapat digunakan sebagai bahan pengisi untuk campuran beton. Namun hasil rata-rata kuat tekan beton karakteristik dari material tersebut tidak mencapai mutu beton yang direncanakan yaitu K-225.

Dengan demikian material tersebut tidak dapat digunakan pada mutu beton K-225, tetapi berada diatas mutu beton K-175, sehingga material yang berasal Kota Manado, dapat digunakan pada pekerjaan struktural untuk mutu beton K-175.

Daftar Pustaka

Annonimous, 1988. Panduan Praktikum Laboratorium. Jurusan Pendidikan Teknik Bangunan Fakultas Pendidikan Teknologi Dan Kejuruan, IKIP Manado.

Wangsadinata dkk, 1971 NI-2. Peraturan Beton Bertularg Indonesia. Direktorat Penyelidikan Masalah Bangunan, Direktorat Jenderal Cipta Karya. Departemen Pekerjaan Umum Dan Tenaga Listrik. Bandung

Annonimous, 1991. Standar Tata Cara Perhitungan Struktur Beton Untuk Bangunan Gedung-SKSNI T -15-1991-03. Departemen Pekerjaan Umum, Lembaga Pendididikan Masalah Bangunan, Bandung.

Arikunto Suharsimi, 1993 Prosedur Penelitian. Reneka cipta.

Kusuma Gideon,1994. Pendoman Pengerjaan Beton Berdasarkan SK SNI T-15- 1991-03. Erlangga Jakarta.

Murdok, L. J dan Brook K.M.1991. Bahan dan Praktek Beton, Erlangga Jakarta.

Samekto Wuryati dan Rahmadiyanto Candra, 2001. Teknologi Beton Canisius Yogyakarta.

Tjokrodimuljo Kardiyono, 1996. Teknologi Beton. Nafiri Yogyakarta.

Yunaefi dkk, 1996. Petunjuk Praktikum Bahan Bangunan I Direktorat Pendidikan Tinggi Departemen Pendidikan Dan Kebudayarn Bandung.

 Dipohusodo, Istimawan. 1996. Struktur Beton Bertulang Berdasarkan SK SNI T-15-1991-03 Departemen Pekerjaan Umum RI. Jakarta : PT Gramedia Pustaka Utama.

Handoko, Widiyo. 2002. Pengaruh Penggunaan Agregat Kasar Batu Putih Terhadap Kuat Tekan Beton. Bandar Lampung : Universitas Malahayati.

Junianto, Iwan. 2002. Pengaruh Perubahan Temperatur Terhadap Kuat Tarik Lentur Beton Mutu Tinggi. Bandar Lampung : Fakultas Teknik Jurusan Teknik Sipil Universitas Lampung.

Nugraha, Paul dan Antoni. 2007. Teknologi Beton Dari Material, Pembuatan, ke Beton Kinerja Tinggi. Yogyakarta : Penerbit ANDI.

Satyarno, Imam. 2004. Panel Beton Styrofoam Ringan Untuk Dinding. Yogyakarta : Jurusan Teknik Sipil FT UGM.

Sebayang, Surya dan Sahat Josua Silalahi. 2000. Buku Penuntun Praktikum di Laboratorium Bahan dan Konstruksi. Bandar Lampung : Fakultas Teknik Jurusan Teknik Sipil Universitas Lampung.

Tjokrodimulyo, Kardiyono. 1996. Teknologi Beton. Yogyakarta : Nafiri Edisi Pertama.

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Laboratory-Based Learning Application For Vocational Technology Education

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Abstract. Students in vocational technology education will be effective if individuals are trained directly in the laboratory by directing them to work and think regularly. Learning patterns in vocational education laboratories are considered relevant and systematic because the work is carried out in accordance with work procedures. The laboratory work carried out is to make unreinforced concrete columns and reinforced concrete columns, which is preceded by systematic work on compiling a concrete composition consisting of cement, water, fine aggregate, and coarse aggregate then compiling the desired concrete column model and given internal reinforcement. The size of the specimen selected in the strength test on a concrete column is 600 mm for the column height and the diameter selected is 140 mm. The experimental results in the laboratory using the concentric loading model are for unreinforced concrete column specimens that have a load capacity of 120 kN, while concrete column specimens with reinforced steel provide a high strength value with a load capacity of 220 kN. This test provides important information that the combination of concrete and reinforcing steel provides significant strength. This happens because concrete has a high compressive strength and reinforcing steel has a high tensile strength.

Keywords: **Laboratory, Vocational technology, Column capacity**

i. Introduction

Background of the Study

VOCATIONAL technology education applied two methods in the learning process is a method with conceptual explanatory approach and laboratory-based methods. Lecturer briefing based on the explanation of scientific theory to students has a shortage of students only as an object to be given science without opening a sharper mind about the rapidly evolving technology. This method is very damaging to a student's intelligence because it only accepts knowledge based on memorizing and memorizing, not based on solving a problem, not open, and not a systematic learning process. Models like these are based solely on lectures and transferring knowledge with a given power point slide.

It is well known that in formal education at the University plays an important role in teaching and learning process. Teaching and learning process is an integral activity between students with lecturers so that there is mutual interaction in instructional situations. To create a good learning condition for students to be more fun, then in the process of learning, a lecturer should organize, select and apply learning strategies that match the conditions of students and the environment taught, for the learning objectives that have been set can be achieved.

In achieving the purpose of learning vocational technology education, then in this paper applied the concept of laboratory-based learning. This concept is designed to create a learning situation that is really fun and supportive for the smoothness of teaching and learning process and the achievement of satisfactory student learning achievement. This concept is based on testing experiments in the laboratory against a column element of the building based on systematic work until reaching the final goal of learning.

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Laboratory activities is a learning activity conducted in the laboratory in order to provide opportunities for students to test and implement in real circumstances based on work procedures designed. Koray & Koskal (2009) states that Laboratories are the most important areas for applications in science education, inquiry and other activities related to the processes of science including the science of logic as a logical form of thinking. Therefore, the laboratory may also provide a rich context for using logical thinking along with creative and critical thinking skills.

Laboratory-based learning is learning by using laboratory equipment as a strategy for students in identifying problems, formulating problems, designing the best way to solve problems, engaging directly in analyzing test results and evaluating laboratory work. Laboratory learning provides an opportunity for students to experiment with experience to prove themselves, follow the process, observe an object, analyze, prove and draw their own conclusions about a particular object, state or process. So with the laboratory-based learning is expected to train the independence of students in understanding an object and directly understand the results of testing in the laboratory.

What will be tested in the laboratory is a concrete column element. Columns are selected because they are the most critical column elements in building construction. The column continues the loads from the upper elevation to the lower elevation until it reaches the ground through the foundation. Since the column is a compressed component, the collapse of a column is a critical site that can cause the collapse of the floor in question and also total collapse altogether. (Nawy, 1990) Failure of the column can have direct consequences on the collapse of other structural components even the failure of the column may undermine the overall structure of the building. In general the collapse of the compression component does not start with a clear warning sign, it is sudden. Therefore, in plotting the structure of the column must calculate carefully by providing a higher reserve of power than for other structural components. Furthermore, since the usage in general practice the column not only serves to withstand axial loads vertically, but the column can also withstand axial load combinations and bending moments. Columns must be taken into account to support axial load press with a certain eccentricity. (Dipohusodo, 1994).

Pure concrete columns can support very small loads, but their load carrying capacity will increase considerably if added longitudinal bars. Larger binding forces can be made by providing lateral restraints in this longitudinal reinforcement. Due to axial compressive loads, the columns tend not only to shorten in the longitudinal direction but also expand in the lateral direction. The capacity of such columns can be increased by providing lateral constraints in the form of square stirrups with adjacent distances encasing longitudinal bars (McCormac, 2004)

Based on the basis of the study that the column is a structural component element that has a very important role in holding the stability of a structure as a whole, then tested in the laboratory by following the rules of testing procedures. The purpose of this exercise is to test the laboratory-based learning model chosen by concrete column testing.

Purposes of the Research

The laboratory learning process applied in vocational technology education has a role in improving the success of the teaching and learning process. Some reasons for the application of this method are (1) can generate student motivation because not focused on the theory but based on direct observation, (2) can generate basic motivation to conduct experiment, (3) laboratory based become student learning vehicle with scientific approach, (4)) based on the laboratory to support the subject matter because it is done with the stage of the theory.

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In the laboratory activities, the testing stage of the concrete column for the construction of the building is preceded by the calculation of mix design for the concrete composition consisting of coarse aggregate, fine aggregate, cement, and water. The composition of this material will be made for concrete and added with reinforcing steel inside the concrete. The design results are then treated up to 28 days to achieve the quality of previously planned concrete. Then tested the press test until the concrete column collapsed. The purpose of the test is to determine the maximum load capacity of each specimen planned.

METHOD
The Based on the objectives of the above research, will be carried out analytical and experimental studies. An analysis study was undertaken, beginning with an inventory of recent progress or information on studies of pressed concrete columns to achieve maximum load and concrete collapse mechanisms to obtain an in-depth picture of the concrete behavior occurring after testing. The method applied in this study is a direct test method in the laboratory of several specimens designed. The test model is a monotonic concentric loading test model until the specimen is completely destroyed.

Research Design
Research design begins with the manufacture of specimens that are round columns with spiral steel reinforcement design. The design is shown in Figure 1 below.

Figure 1. The design of the Specimen

The determination scenario of the type and number of the main test object is based on the objectives and the parameters of the study, therefore the type and number of specimens is planned in 2 (two) models are the specimen model with the plain concrete columns and the reinforced concrete columns. The reinforced concrete columns are 3 designed according to the minimum reinforcement requirements on SNI 03-2847-2002.

Research Procedure
The research procedure begins with the calculation of mix design to know the composition of concrete. Broadly speaking, the process of making concrete in this research is
   (1) Provision of materials. Materials to be provided in this research are cement, sand, coarse aggregate, fine aggregate, and water.

Mixture of materials
The composition which has been calculated previously stirred until evenly distributed by using mixer machine. It is intended that the cement paste can spread and envelop the whole aggregate and facilitate the mixing process because the FAS used is only 0.3. (3) Printing and compacting. The homogeneous concrete materials are then incorporated into the molds by three layers, each compacted with 25 layers

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each layer. The next stage, after the concrete hardens, the concrete is removed from the mold. then the concrete is measured in height, diameter and weight and marked. Then the concrete is kept in a room protected against direct influence from the sun.

Maintenance of Concrete
During the hardening process, the concrete is immersed in a water bath that has been filled with water for 28 days. It is intended that the process of hardening on the concrete runs perfectly to prevent the occurrence of cracks in the concrete. (4) Tests on concrete columns. Concrete testing is intended to determine the characteristics and quality of the resulting concrete. The test was performed after the test object was 28 days old. This test aims to determine the amount of strength received by the specimen until it collapses. Flow chart research can be seen in Figure 2.
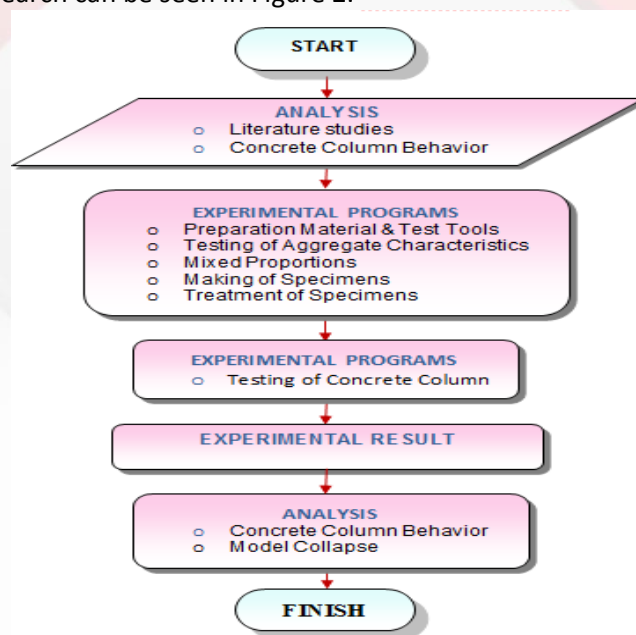

Figure 2. Research Framework.

RESULT
Test results in this paper aims to determine the capacity of strength that occurs in concrete columns without reinforcement and with the use of reinforcing steel in concrete columns. In this experimental program presented matters relating to the implementation of research which includes: concrete properties and experimental programs with concentric loading.

Material Testing
Material testing is performed to find out the characteristics of the coarse aggregate and the fine aggregate to be used to create a concrete column. The cement used is Portland Composite Cement Tonasa cement. The cement is a cement equivalent to type I cement and refers to ASTM C150 Type I Portland Cement standard. From the aggregate examination results obtained aggregate characteristics as in table 1. The results of examination of aggregate coarse and fine aggregate can be concluded that the aggregate is qualified SNI 03-6861.1-2002.

Table 1. Results of examination of aggregate characteristics

No	Type of Testing	Unit	Test Result		SNI Specification	
			Sand	Gravel	Sand	Gravel
1	Sludge levels	%	2.8	0.3	Max.5	Max.1
2	Specific gravity of SSD	-	1.7	2.54	1.6 - 3.3	1.6 - 3.3
3	Water Absorption	%	2.88	3.08	2	4
4	Organic Content	No	1	-	< 3	-
5	Modulus Subtlety	%	2.817	6	1.5 - 3.8	6 - 7.1
6	Volume Weight Free	Kg/ltr	1.43	2	1.4 - 1.9	1.6 - 1.9
7	Volume Weight Solid	Kg/ltr	1.47	2	1.4 - 1.9	1.6 - 1.6

Source: Processed Data Results

Planning Concrete Composite

The concrete strength of the planned concrete is 20.75 MPa. Concrete mix design using DOE method. From the calculation result and the concrete mix design trial yield the proportion of mixture which can be seen in table 2.

Table 2. Composition of concrete mixture material for 1 m3

KOMPOSISI CAMPURAN BETON				
	Water	Cement	Sand	Gravel
Weight (m³)	195	355	485	1136

Source: Processed Data Results

Testing of Compressive Strength

The concrete compressive strength test refers to the ASTM C39 test standard. The compressive strength of the concrete is determined by testing of a concrete cylinder measuring 150 cm x 300 cm. Tests were performed at ages 3, 7, and 28 days with a total of 3 specimens each with an average compressive strength gain of 21.70 MPa. The test results of the compressive strength of the cylindrical test object are shown in table 3.

Table 3. Data of test results of compressive strength of cylindrical concrete

No	Age (Day)	Large (mm²)	Weight of Specimens (kg)	Load (P_{max}) (kN)	Compressive Strength (MPa)	Average compressive strength (MPa)
1	3	17662.5	12.27	170	9.62	9.81
	3	17662.5	12.42	170	9.62	
	3	17662.5	12.40	180	10.19	
2	7	17662.5	12.25	260	14.72	15.29
	7	17662.5	12.40	270	15.29	
	7	17662.5	12.31	280	15.85	
3	28	17662.5	12.55	370	20.95	21.70
	28	17662.5	12.59	380	21.51	
	28	17662.5	12.43	400	22.65	

Source: Processed Data Results

Concrete Column Test Result

Based on the results of laboratory tests obtained the maximum load of each variation of the tested concrete column, as shown in table 4 on the concrete column without reinforcing steel (WRC) and concrete columns using spiral steel reinforcement (RC).

Table 4. Concrete Column Test Results

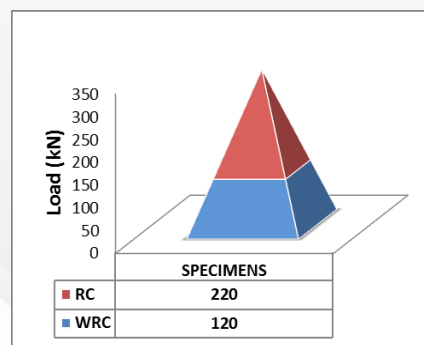| No	Specimen Code	Maximum Load (kN)	Average Maximum Load (kN)	Enhancement of Maximum Load (%)
1	WRC-01	130		
2	WRC-02	120	120	-
3	WRC-03	110		
4	RC-01	210		
5	RC-02	230	220	57.14
6	RC-03	220		

Source: Research Results

Figure 3. Experimental Maximum Load

At the time of testing in the non-steel reinforced concrete column (WRC) the model of its collapse begins with the occurrence of fine cracks on the surface of the specimen. This crack increases in length and width when this load is increased. After reaching the peak load, the collapse occurred quickly. The model of collapse of such a specimen is categorized as collapse of splitting, where the pattern of crack is parallel to the longitudinal axis of the specimen. This test piece is the same as a test specimen for testing the compressive strength of the concrete cylinder. From the results of tests conducted using UTM machines summarized in Table 1 shows that concrete columns with non-steel reinforced test objects (WRC) are capable of holding 120 kN loads. Meanwhile, the model of collapse in this WRC test specimen can be seen in figure 4 below.

Figure 4. The collapse model of the WRC specimen Meanwhile, the collapse of specimens in concrete columns using reinforcing steel (RC) is marked by the release of concrete blankets when the load is near the maximum load, and after passing the maximum load the specimen is still able to give a large enough stretch until finally the local buckling occurs on the longitudinal reinforcement. This collapse behavior is almost the

same as a column with uniaxial loading. Load capacity that occurs in test specimens using reinforcing steel (RC) is able to withstand a load of 220 kN. This shows that there is an [80] 5

increase in the strength of the RC colon of RC specimen by 57.14% when compared to the concrete column that does not have WRC steel. This indicates that the more effective the use of reinforcing steel in the concrete column. While the model of collapse on test specimens using reinforcing steel (RC) is shown in Fig. 5.

Figure 5. Model of RC Specimen Collapse

Based on the results of tests conducted on concrete columns with laboratory-based methods proved able to guide students in achieving learning outcomes is to know directly the concrete composition process, testing by using UTM tools, and know the model collapse of concrete columns that occur on each test object received. Very different from the theory-based learning only tells about the events that will occur and only based on the theory of literature review. This laboratory-based method is very suitable applied to the major of technology education. Majors in this college is very required to understand the concept of testing the test object through testing directly

4. DISCUSSION

Laboratory-based learning method can be applied to the major of technology education with the consideration that observation, theory, and direct test in the field can be felt so that the level of student achievement can be more increased. This paper is not oriented to know the improvement of teaching and learning process by using laboratory-based concept. However, it is focused on a direct test process in the laboratory with a test sample on a concrete column consisting of concrete columns without reinforcing steel and concrete columns using reinforcing steel. In this process, the load capacity of concrete column without reinforcing steel is equal to 120 kN and the load capacity in the concrete column using reinforcing steel can reach 220 kN. This shows that there is a change of force in the concrete column. The change of forces occurring from concrete column without reinforcing steel with concrete columns using reinforcing steel is 100 kN. Increased strength that occurs in the concrete column by using reinforcement steel due to the functioning of the spiral steel reinforcement placement.

With the use of reinforcing steel in the column increased by 57.14% of concrete columns that do not use reinforcing steel..

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References

Ayuddin, "GFRP Material as external Reinforcement for RC Column," Journal of Engineering and Applied Science, 13: 5699- 5704, 2018.

BRE, "Design of normal concrete mixes, 2nd edition," Building Research Establishment, Watford. 1997.

Dipohusodo. I, "Struktur Beton Bertulang.," Jakarta: Gramedia pustaka utama, 1994.

Koray, Ö. & Köksal, M. S, "The effect of creative and critical thinking based laboratory applications on creative and logical thinking abilities of prospective teachers," Asia-Pacific Forum on Science Learning and Teaching, 10(1), 1-13, 2009.

McCormac, Jack C, "Desain Beton Bertulang Edisi Kelima," Jakarta
: Erlangga, 2004.

Nawy, E. G.. (1990). Beton Bertulang Suatu Pendekatan Dasar. Jakarta: Erlangga.

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Strategi Small Medium Enterprises (Ukm) Di Indonesia Menghadapi Revolusi Industri 4.0 Dalam Implementasi Tujuan Pembangunan Berkelanjutan 2030

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Abstrak

Indonesia merupakan satu dari 193 negara di dunia yang konsen terhadap Tujuan Pembangunan Berkelanjutan 2030 atau *Sustainable Development Goals* (SDGs) yang dicanangkan oleh PBB (Perserikatan Bangsa-Bangsa) pada tahun 2015. Dalam implementasinya, Agenda Tujuan Pembangunan Berkelanjutan 2030 di Indonesia dapat menjadi peluang sekaligus tantangan bagi Indonesia. Sejalan dengan hal tersebut, fokus Indonesia pada tujuan kesembilan, yaitu Industri, Inovasi, dan Infrastruktur yang sejalan dengan Agenda Nawacita Pemerintahan Jokowi-JK ketujuh. Dalam kaitan ini, UKM merupakan salah satu sektor ekonomi sentral Indonesia yang memiliki peran penting dalam perekonomian Indonesia. Namun, dalam perkembangannya, munculnya Tren Revolusi Industri 4.0 menuntut UKM di Indonesia agar terus *survive* untuk meningkatkan kemampuan inovasinya dengan memanfaatkan kemajuan Teknologi Informasi dan Komunikasi melalui platform *e-Commerce*.

Kata Kunci: Agenda Tujuan Pembangunan Berkelanjutan 2030, UKM Indonesia, Revolusi Industri 4.0.

1. Pendahuluan

Indonesia merupakan satu dari 193 negara di dunia yang konsen terhadap Tujuan Pembangunan Berkelanjutan 2030 atau *Sustainable Development Goals* (SDGs) yang dicanangkan oleh PBB (Perserikatan Bangsa-Bangsa) pada tahun 2015, tepatnya pada 25 September 2015 bertempat di Markas Besar PBB, New York, Amerika Serikat, Agenda Tujuan Pembangunan Berkelanjutan 2030 telah resmi disahkan oleh para pemimpin dunia sebagai kesepakatan pembangunan global. Dengan mengusung tema "Mengubah Dunia Kita: Agenda 2030 untuk Pembangunan Berkelanjutan", Tujuan Pembangunan Berkelanjutan 2030 yang memuat 17 tujuan dan 169 target merupakan rencana aksi global untuk 15 tahun ke depan (berlaku sejak 2016 hingga 2030), guna mengakhiri kemiskinan, mengurangi kesenjangan, dan melindungi lingkungan. Tujuan Pembangunan Berkelanjutan 2030 berlaku bagi seluruh negara secara universal, sehingga seluruh negara tanpa kecuali negara maju memiliki kewajiban moral untuk mencapai tujuan dan target Tujuan Pembangunan Berkelanjutan 2030 (SDG 2030 Indonesia Team, 2017).Tujuan Pembangunan Berkelanjutan 2030 dapat menjadi peluang sekaligus tantangan bagi Indonesia dimana peluang yang dimaksud berkaitan dengan keselarasan dalam pelaksanaan Agenda Tujuan Pembangunan Berkelanjutan 2030 dengan Agenda Nawacita Pemerintahan Jokowi-JK sehingga menguatkan komitmen Indonesia untuk turut andil dalam pembangunan global. Selain itu, dalam pelaksanaanya, juga memunculkan tantangan bagi Indonesia karena Indonesia hanya memiliki waktu 15 tahun untuk mencapai tujuan-tujuan dan target-target Tujuan Pembangunan Berkelanjutan 2030 ini. Oleh karena itu, Indonesia perlu memiliki strategi dalam pelaksanaan agenda ini sehingga selain berpartipasi dalam pembangunan global, juga melaksanakan tujuan pembangunan nasional dan kesejahteraan masyarakat secara berkesinambungan. Partisipasi Indonesia dalam pembangunan global ini berkesinambungan dengan pembangunan nasional Indonesia, mengerucutk pada tujuan kesembilan, yaitu Industri, Inovasi, dan Infrastruktur. Berkaitan dengan hal tersebut, Indonesia memiliki UKM (Usaha Kecil Menengah) yang bahkan setelah krisis moneter pun masih berperan dan

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dijadikan tulang punggung perekonomian Indonesia karena secara alamiah lebih dinamis dibandingkan perusahaan besar (Merina, *n.d.*). Tidak dipungkiri bahwa UKM berkontribusi pada pembangunan ekonomi Indonesia yang dapat diselaraskan dengan fokus Indonesia dalam pembangunan berkelanjutan global di era baru Revolusi Industri 4.0 ini. UKM Indonesia juga terus dituntut untuk melakukan berbagai inovasi agar dapat *survive* dan menyeimbangi adanya tren Revolusi Industri 4.0 saat ini.

2.   Metode Penelitian

Tujuan umum penelitian ini adalah untuk Mengetahui Strategi *Small Medium Enterprises* (UKM) di Indonesia Menghadapi Revolusi Industri 4.0 dalam Implementasi Tujuan Pembangunan Berkelanjutan 2030 dengan tujuan khususnya adalah Untuk Mengetahui Pelaksanaan Tujuan Pembangunan Berkelanjutan 2030 di Indonesia; Untuk Mengetahui Inovasi *Small Medium Enterprises* (UKM) di Indonesia, dengan Kehadiran Tren Revolusi Industri 4.0, sebagai salah satu Sektor Ekonomi Pembangunan.

Data sekunder merupakan sumber data dalam mendukung penelitian ini. Disebut dengan data sekunder karena data, yang digunakan berasal dari data yang sudah ada, tercantum pada literatur-literatur atau biasa berada dalam bentuk dokumen (buku, jurnal, artikel, surat kabar, majalah popular, dan sebagainya) (Silalahi, 2012:291). Kemudian, adapun teknik pengumpulan data yang digunakan berupa Studi Kepustakaan (*Library Research*).

3.   Hasil dan Pembahasan

3.1.   Tujuan Pembangunan Berkelajutan 2030 di Indonesia dan Nawacita Pemerintahan Jokowi-JK

Pada 2015 lalu, Indonesia yang diwakili oleh Wakil Presiden Jusuf Kalla turut hadir pada pengesehan secara resmi Agenda Tujuan Pembangunan Berkelanjutan 2030 sebagai acuan pembangunan global untuk 15 tahun ke depan. Pada tingkat nasional, pembangunan berkelanjutan merupakan salah satu prioritas utama pembangunan nasional Indonesia saat ini (Tim Kedeputian Bidang Kemaritiman dan SDA Bappenas, 2020). dalam pelaksanaannya, diperlukan kesinambungan antara tujuan dan target agenda ini dengan pembangunan nasional Indonesia itu sendiri. Oleh karena itu, perlu adanya kemitraan yang partisipatif dan inklusif, yang melibatkan seluruh pemangku kepentingan.

Mengenai Tujuan Pembangunan Berkelanjutan 2030, salah satu fokus Indonesia adalah pada tujuan kesembilan yang selaras dengan Agenda Nawacita Pemerintahan Jokowi-JK tepatnya pada Nawacita 7, yaitu "Mewujudkan Kemandirian Ekonomi dengan Menggerakkan Sektor-Sektor Strategis Ekonomi Domestik" yang pada intinya keselarasan ini dapat memudahkan Indonesia dalam melaksanakan Agenda Tujuan Pembangunan Berkelanjutan yang dapat menjadi peluang pembangunan nasional ekonomi Indonesia. Berkaitan dengan hal tersebut, Indonesia bergantung pada sektor UKM sebagai sumber penghidupan.

Data dari Kementerian Koperasi dan Usaha Kecil dan Menengah (KemenkopUKM) menunjukkan bahwa hingga akhir 2013 ada lebih 57 juta unit UKM di Indonesia. UKM Indonesia tercatat mampu memberikan kontribusi sekitar 57% terhadap PDB Indonesia. Data tersebut menunjukkan bahwa peranan UKM dalam mendorong pertumbuhan perekonomian Indonesia adalah sentral, terutama dalam menyediakan lapangan pekerjaan dan menghasilkan produk bernilai ekonomis (Cahyadi, 2015).

3.2.   Peluang dan Tantangan UKM di Indonesia dan Tren Revolusi Industri 4.0

Tantangan baru berbagai sektor ekonomi khususnya UKM sebagai salah satu sektor ekonomi Indonesia adalah kemunculan tren Revolusi Industri 4.0. Kemunculan Revolusi Industri 4.0 yang didorong oleh kemajuan Teknologi Informasi dan Komunikasi (TIK) membawa angin segar bagi para pelaku bisnis atau pengusaha dalam mengembangkan model bisnis pada zaman yang serba digital ini sebagai kontribusinya dalam perekonomian nasional, bahkan dunia. Bagi UKM di Indonesia sendiri, adanya kemajuan TIK dapat menjadi peluang dan juga tantangan tersendiri karena di satu sisi laju pergerakan perekonomian berjalan cepat dan di sisi lain, UKM di Indonesia yang tidak dapat *survive* bisa mengalami ketertinggalan karena tidak dapat memaksimalkan pemanfaatan kemajuan TIK.

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Pada era ini model bisnis mengalami perubahan besar, tidak hanya dalam proses produksi, melainkan juga di seluruh rantai nilai industri (Satya, 2018). Kemunculan Industri 4.0, membuat negara-negara di dunia agar dapat mepersiapkan diri dalam menghadapi kekuatan daya saing dunia. Dengan adanya tren Revolusi Industri 4.0, banyak sekali inovasi yang melahirkan perubahan dalam perekonomian, sehingga muncul istilah ekonomi digital (Tapscott, 1997). Pada era Revolusi Industri 4.0 saat ini, keterbatasan teknologi dan inovasi merupakan salah satu masalah yang dihadapi oleh UKM di Indonesia. UKM memiliki akses yang terbatas untuk mengadopsi teknologi yang sesuai. Oleh karena itu, UKM tidak mampu berada di arus utama pembangunan industri berbasis teknologi. Kalaupun ada, pelaksanaan teknologi informasi di kalangan UKM Indonesia masih pada tingkat dasar dimana komputer hanya digunakan untuk pengolah kata dan perhitungan sederhana atau akses sosial media (Cahyadi, 2015:131).

3.3. Strategi UKM di Indonesia Menghadapi Revolusi Industri 4.0 dalam Implementasi Tujuan Pembangunan Berkelanjutan 2030

Semenjak diadopsinya Tujuan Pembangunan Berkelanjutan 2030 di Indonesia, selaras dengan tujuan kesembilan, Indonesia terus berupaya mengembangkan UKM sebagai salah satu sektor ekonomi sentral Indonesia. Posisi UKM di Indonesia memang tidak dapat dipungkiri memiliki peran penting yang cukup signifikan pada pembangunan ekonomi Indonesia. Namun, memang tidak dapat dipungkiri juga kurangnya kesadaran pemanfaatan kemajuan TIK yang dapat menjadi peluang dan juga tantangan bagi UKM di Indonesia untuk terus berupaya dalam inovasi di era Revolusi Industri 4.0 saat ini.

Ada pun strategi UKM di Indonesia dalam menghadapi Revolusi Industri 4.0 dalam implementasi Tujuan Pembangunan Berkelanjutan 2030, yaitu meningkatkan kemampuan inovatif dan pemanfaatan kemajuan TIK, inovasi memerlukan pencarian kesempatan baru. Hal tersebut berarti perbaikan barang dan jasa yang ada, menciptakan barang dan jasa baru, atau mengkombinasikan unsur-unsur produksi yang ada dengan cara baru dan lebih baik (Wahyuningsih, 2009:2-7). Maksudnya adalah UKM di Indonesia perlu melakukan inovasi yang dapat mendorong UKM di Indonesia untuk terus *survive* dalam tren ekonomi digital pada saat ini. Inovasi ini bisa dilaksanakan dalam berbagai agenda, salah satunya dengan memanfaatkan penggunaan kemajuan TIK melalui *platform e-Commerce*.

4. Kesimpulan

Indonesia merupakan 1 dari 193 negara yang berkomitmen dalam pelaksanaan Agenda Tujuan Pembangunan Berkelanjutan 2030 selama 15 tahun ke depan. Dalam pekaksanaannya selaras dengan tujuan pembangunan nasional Indonesia, mengerecut pada tujuan kesembilan, Tujuan Pembangunan Berkelanjutan 2030 ini selaras dengan Agenda Nawacita Pemerintahan Jokowi-JK ketujuh.

Sebagai salah satu sektor penting ekonomi Indonesia, UKM memerankan peran penting pada pembangunan ekonomi nasional Indonesia. Pada era baru Revolusi Industri 4.0 ini, UKM Indonesia dituntut untuk terus *survive* dengan memanfaatkan kemajuan TIK berkaitan dengan ekonomi digital. Strategi UKM Indonesia sebagai upaya berinovasi pada era Revolusi Industri ini adalah dengan memanfaatkan kehadiran *e-Comerce*.

5. Ucapan Terima Kasih

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6.   Daftar Pustaka

Cahyadi, I. (2015). Tantangan Internasionalisasi Ukm di Indonesia dalam Menghadapi Masyarakat Ekonomi ASEAN. *Kajian, 20*(2).

Merina, N. (n.d.). *Pengertian UKM & UMKM? Bagaimana Menjadi Usaha Kecil Menengah di Indonesia*. Retrieved from GoUKM.ID: https://goukm.id/apa-itu-ukm-umkm-startup/

Satya, V. E. (2018). Strategi Indonesia Menghadapi Industri 4,0. *Majalah Info Singkat Bidang Ekonomi dan Kebijakan Publik, X*(9).

SDG 2030 Indonesia Team. (2017). *Apa itu SDGs*. Retrieved from SDG 2030 Indonesia: https://www.sdg2030indonesia.org/page/8-apa-itu

Silalahi, U. (2012). *Metode Penelitian Sosial.* Bandung: Refika Aditama.

Tapscott, D. (1997). *The Digital Economy: Promise and Peril in the Age of Networked Intelligence.* New York: McGraw Hill.

Tim Kedeputian Bidang Kemaritiman dan SDA Bappenas. (2020). *Pedoman Teknis Penyusunan Rencana Aksi - Edisi II Tujuan Pembangunan Berkelanjutan/Sustainable Development Goals (TPB/SDGs).* Jakarta: Kedeputian Bidang Kemaritiman dan SDA Kementerian PPN/Bappenas.

Wahyuningsih, S. (2009). Peranan Ukm dalam Perekonomian Indonesia. *Jurnal Ilmu-Ilmu Pertanian, 5*(1).

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The Effect of Module Utilization To Learning Outcomes of Mechanical Drawing

Nurdin H., Purwantono, Waskito, Refdinal

Abstract. The achievement of learning outcomes in Technical Drawing training shows that the results are not optimal. This is because teachers still use the lecture method in learning. This condition causes students to become passive and less responsive in learning and not all students listen well, causing the information conveyed by the teacher cannot be accepted by students optimally. The purpose of this study was to describe the effect of the use of learning modules on the learning outcomes of the Mechanical Drawing training subject in class X students of the Machining Engineering Department of SMKN 1 West Sumatra. The research method used in this study is Quasi-Experimental Research, with the research design of Nonequivalent Control Group Design. This research was conducted at SMKN 1 West Sumatra in class X students of the Machining Engineering Department. In this study, it was found that student learning outcomes using the learning module in the Technical Drawing training course had a pre-test mean score of 50.77 and a post-test mean score of 78.40 so that this indicates that students' graduation rates reached 87%. From the cognitive learning outcomes of students who use the Mechanical Drawing learning module with conventional learning methods have a significant difference in learning outcomes scores from the post-test score of 0.245. Based on the results of this study, it can be concluded that the use of learning modules affects the learning outcomes of class X students majoring in Machining Engineering Department at SMKN 1 West Sumatra.

Keywords: Modules, Learning Outcomes, Mechanical Drawing,

INTRODUCTION

Education is an effort to develop individual abilities so that it becomes a factor that can determine the progress of a nation. Human Resource Development (HRD) quality can be improved through formal and informal education. Education is universal, accessible and owned by all children of the nation. In improving the quality of learning, it can be done by updating the relevance of teaching method approaches by using learning media in the form of modules. The selection of the right learning methods and media can support the material well conveyed to students [1]. SMKN 1 West Sumatra as a place of education in human resource development that has succeeded in producing skilled graduates in the field of Mechanical Engineering. Facilities and infrastructure that support the teaching and learning process consist of various facilities such as multimedia rooms, machining workshops, bench workshops, fabrication workshops. Teachers at SMKN 1 West Sumatra take various efforts to improve the quality of education with the aim of being able to balance science and technology. Advances in industrial technology require educational institutions to be able to compete in order to create graduates who are ready to work.

The success of students to achieve the basic competencies taught by the teacher is influenced by one of the sources of learning. Students present urgent instructional and behavioral problems to teachers but desperately need quality teaching to become successful learners and rise above their situation [2]. To

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achieve learning objectives and produce graduates who can have high competitiveness, improvements in the learning process are very necessary to be implemented [3]. The learning media used by teachers of technical drawing subjects at SMKN 1 West Sumatra are in the form of appropriate reference books, laptops and infocus to display electronic teaching materials. During the Technical Drawing learning process, in explaining the material the teacher uses a very short lecture method before the Engineering Drawing lesson begins. This causes students to become passive and less responsive in learning and not all students listen well, causing the information conveyed by the teacher cannot be received by students optimally. Teachers are required to provide summary notes for students to be able to study independently at home. The expected impact is in the form of better student learning outcomes. The learning outcomes of class X students in the Engineering Drawing subject, there are still many who have not reached the Minimum Completeness Criteria (MCC). Of the total students, only 65% passed the MCC. From this condition, it can be seen that there are still many students who do not understand and do not understand in completing Technical Drawings. What's more, it turns out that the AutoCAD application in technical drawing can also improve learning activities and student learning outcomes [4]. Learning achievement in mechanical drawing subjects using E-books and APP is significantly correlated with students' learning styles so that they are more compatible [5]. The effectiveness of learning media in Engineering Drawing subjects can be seen from the effect of using learning media on student competence. Learning activities using learning media make students have better competencies [6]. Implementation of Project-based learning (PBL) intervention significantly improved higher-order cognitive skills, self-efficacy, teamwork, and communication skills [7]. Project Based Learning (PBL) is applied in learning in engineering, showing this method helps in increasing students' understanding of basic concepts.

In an effort to improve the understanding of classroom learning based on the 2013 curriculum by applying learning modules so as to train students to think critically [8]. Students are expected to be able to learn independently through this module in their environment. By using this learning module, it is hoped that students can learn from the experiences around them, be active, critical, enthusiastic, and have the opportunity to learn independently. Knowledge Based Tutoring System (KBTS) of in Engineering Drawing is approach which model a student in the teaching learning use modules to enhance the effectiveness of learning process [9].

Based on the above background the author tries to use the Mechanical Drawing module which is quoted from the internet and related subject books as an effort to improve student learning outcomes. The purpose of the study was to examine the effect of using the module on learning outcomes in engineering drawing subjects. By learning with the use of modules independently at home, the teacher hopes that students will master the material provided.

Research Method

*This research is a kind of experiment. An experimental research methods research methods used to find a treatment effect against the other under conditions of control [10]. Experimental research in this case to see whether there is a causal relationship. The type of research that I use is experimental pseudo (Quasi-Experimental Research). Quasi-experimental research Sugiyono added "this study is used to overcome the difficulties in determining the control group in the study".*The design used in this study is a quasi-experimental design and use models nonequivalent control group design or class. Before being given treatment, both the experimental group and the control group were given test are pretest, with a view to treatment, knowing the state of the group prior to treatment. Then, after being given an experimental group and a control group given a test that post test, for know the state of the group after the treatment.

In this study, the experimental group using instructional media in the form of modules Drafting made by researcher and has been validated by an instructor with overflow subjects Drafting while the control group was not given treatment in other words, using the conventional method which is the method used by teachers in teaching and learning in a way delivery or lecture.Population use Class X Machining Engineering Department of SMKN 1 West Sumatra amounted to 39 people. Samples use Class X TP 2 as the experimental class was 22 people. Class X TP 1 as the control class amounted to 17 people. States that the quality of research instruments that will produce quality data [10]. The research instruments used in the form of an objective test to determine the cognitive aspects of learning outcomes in a sample class. There are also tests that are used in the form of objective test that has been collated based on the syllabus and lesson plans that number because 30 items will be on an analysis.

1. **Validity Tests**

Validity is an essential requirement in the evaluation instrument / test. A test is said to be valid if it can measure what should be measured. States that "the validity is a measure that indicates the level validity or validity of something instruments" [11]. Validity can be obtained and acknowledged by the parties outside the research team so that accountability is guaranteed researcher. Calculation of the validity of the items on the test using the formula Biserial Correlation Coefficient (γ_{pbi}) [11]:

$$\gamma_{pbi} = \frac{M_{pi} - M_t}{S_t} \sqrt{\frac{p_i}{q_i}}$$

Information :

γ_{pbi} = Correlation Coefficient biserial
M_{pi} = The mean scores of subjects who responded well to the validity of the items sought
M_t = Mean total scores
S_t = Standard deviation of the total score
p_i = The proportion of students who answered correctly

$$p_i = \frac{\text{many students answered correctly}}{\text{total number of students}}$$

q_i = The proportion of students who answered incorrectly *(Q = 1 - p)*

The test questions that have been carried out by the number of trial participants, N = 39, and the level of 5% segnifikan obtained r_{table} = 0.301, so the item about as valid if r_{count} > 0.301 (r count larger than 0.301). From 30 test items, 24 valid items and 6 invalid items were obtained.

2. **Reliability Tests**

Reliability is the precision of a test when tested to the same subject [11]. In determining the reliability of the question, the Kuder and Richardson (KR-20) formulas are used [10].

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{M(k-M)}{kV_t}\right)$$

Information:

r_{11} = Reliability instruments
k = The number of items or the questions
M = Average scores
V_t = Variance Total

Analysis of the details about this research is all about having a test reliabelitas 0.40 < r_{11} ≤ 1.00 with sufficient criteria, high, and very high. Calculation of the reliability coefficient obtained r_{11} = 0.81 of 30 items. So it can be stated that this mechanical drawing subject matter is reliable, because it has a correlation coefficient value at intervals of 0.8 - 1.0 which includes very high criteria.

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3. The Difficulty Index Problem

The difficulty index is a number that indicates the ease or difficulty of a question.[21] Good questions are questions that are not too easy and not too difficult. The formula for the difficulty index is as follows [12]:

$$P = \frac{B}{Js}$$

Information :
- P = Difficulty index
- B = The number of students who answered correctly
- Js = The total number of student participants test

Calculation of the difficulty index of the test items, which amounted to 30 questions, obtained 5 difficult questions, 15 moderate questions and 10 easy questions.

4. Power of Different Questions

Power of Different Questions of the questions is the ability of the questions to distinguish students' abilities. The number that shows the magnitude of the difference is called the discrimination index (D). The formula for calculating the power of different questions is as follows [12]:

$$D = \frac{Ba}{Ja} - \frac{Bb}{Jb}$$

Information :
- D = The discrimination index
- B = The number of the upper group who answered correctly
- bb = The number of the lower group who answered correctly
- Ja = Number of participants in the upper group
- Jb = Number of lower group participants

To calculate the Power of Different Questions, the steps that must be taken first are the data is sorted from the highest value to the lowest value. Then take 27% of the high-scoring group and 27% of the low-scoring group. Calculation of difficulty index of grains the test questions which amounted to 30 questions obtained 6 very good questions, 11 good questions and 13 easy questions.

5. Function Distractors

The distractor function is the distribution of students in terms of making choices on multiple choice questions. The distractor function is also known as the answer pattern or the distractor function. This distractor function is obtained by counting the number of students who choose answers a, b, c, d, who do not have any choice. In terms of evaluation the distractor is called omit (O). From the pattern of answer questions, it can be determined whether the distractor is functioning properly or not. Distractors who are not chosen at all by students mean the distractors are not good. On the other hand, a distractor can be said to function well if it has a great appeal for students who do not understand the concept or master the material. Writing about a difficulty, so that the distractors still be said to be good if at least chosen by 5% of students [11]. A distractor can be treated in three ways, namely:
a. Because it has been well received
b. Rejected because it is not good
c. Written back because of poor

Data analysis showed that of the 30 items, the ones that functioned well were 25 items and the ones that didn't function well were 5 items.

Analysis Technique of Data

The data analysis technique in this study was to compare the learning outcomes between the experimental class and the control class in the Mechanical Drawing class X Machining Engineering Department of SMKN 1 West Sumatra. Data analysis is an activity after data from all respondents or other sources has been collected [10].

Normality Test

Normality Test aim is to see whether the data of the sample are normally distributed. The Kolmogorov–Smirnov statistic for testing normality belongs to the subclass of goodness-of-fit statistics, so-called EDF (Empirical Distribution Function) statistics [13]. Normality test calculations in this study using the test of Kolmogorov-Smirnov normality were calculated with SPSS version 24 [14].

Homogeneity Tests

Homogeneity test aims to determine or see the two groups of samples having a homogeneous variance, then the homogeneity test. Homogeneity test used in this study is the ANOVA test with SPSS version 24. The assumptions used in these tests if the quantitative type of data, either interval or ratio, normal distribution of data, and the data are few. Homogeneity tests involve finding, for each site, an estimate of a quantity that measures some aspects of the (at site) frequency distributions, and verifying if the dispersion values around their regional counterpart is consistent with the hypothesis of homogeneity [15].

Test the Hypothesis

Test the hypothesis in the study need to be tested to prove the truth of a hypothesis that has been formulated previously. In testing this hypothesis the researchers used a test independent sample t test with SPSS version 24. Independent sample t test is a hypothesis test that is used to compare the mean of two groups that are not related to each other [16]. It aims to determine whether the two groups have the same average or not.

Results and Discussion

Data Description

The research was conducted at SMKN 1 West Sumatra. The results of the research conducted in the experimental class and control class were used to test the research hypothesis. In this study, the learning outcomes of students who used module media in Mechanical Drawing subjects were taken in the experimental class and data from research results in the control class who did not use module learning media.

1. **Experiment Classroom Learning Outcomes Data**

Learning outcomes carried out in the experimental class X TP 2 using the mechanical drawing module are shown in Figure 1.

Learning Outcomes of Experimental Class Mechanical Drawing

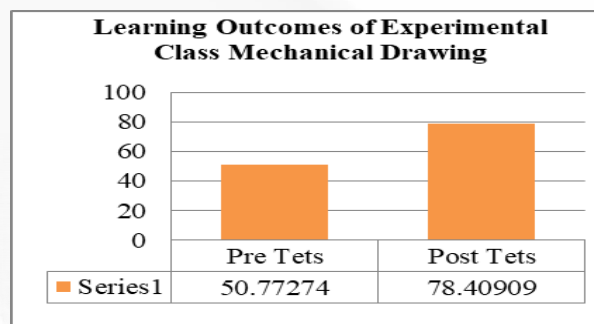|	Pre Tets	Post Tets
Series1	50.77274	78.40909

Figure 1. Graph of Experiment Class Learning Outcomes Grades

The implementation of learning in the experimental class was initially carried out with a pre-test with a total of 30 questions items, the average value of learning outcomes was 50.77. The question was carried out to determine the initial knowledge of each student and after doing the treatment, a test was given, namely the Post-test with an average number of learning outcomes of 78.41. This condition shows a significant increase in the value of student learning outcomes above the Minimum Completeness Criteria (MCC).

1. **Control Classroom Learning Outcomes Data**

Learning outcome is carried out in the control class, namely class X TP 1 using the lecture method and question and answer (conventional method) are shown in Figure 2. The implementation of learning in the control class was initially carried out with a pre-test with a total of 30 questions. The value of the Pre-test learning outcomes obtained an average of 43.64. Next students received repeated treatment and were given a post-test where the average value of learning outcomes obtained was 55.16.
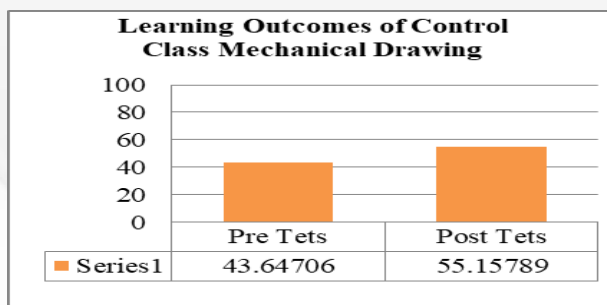

Figure 2. Graph of Control Class Learning Outcomes Grades

A. **The difference data Learning Outcomes Class Experiments (X TP 2) by Class Control (X TP 1)**
1. **Prerequisites Testing Analysis**

Prerequisite analysis testing is carried out before conducting data analysis. Prerequisites of analysis used in this study were normality test and homogeneity test between the subjects of the experimental class and the control class. The results of the analysis prerequisite test are presented in the following steps.

Normality test

Normality test is done to test whether all the variables normal distribution or not. Test for normality using the Kolmogorov-Smirnov formula in the calculation using SPSS version 24. To determine whether or not normal is if sig > 0.05, normal and if sig < 0.05 can be said to be normal. The calculation obtained are shown in Table 1.

Table 1. Normality Test Result

Group	Sig	Conclusion
Pre test experimental class	0.085	Normal
Post test experimental class	0.134	Normal
Pre test control class	0.074	Normal
Post test control class	0.091	Normal

Based on Table 1, it can be seen that the data pre-test and post-test results to learn whether the experimental class and the control class has a sig > 0.05, it can be concluded that the data were normally distributed groups.

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Homogeneity Test

After knowing the level of normality of the data, then the homogeneity test is then carried out. The homogeneity test used the ANOVA test formula in calculations using the SPSS version 24. The homogeneity test was used to determine the level of similarity of variance between the experimental group and the control group. To accept or reject the hypothesis by comparing the price sig > 0.05. Homogeneity test was conducted to see whether the experimental class (X TP 2) and the control class (X TP1) were homogeneous or not. The results of the homogeneity test are shown in Table 2.

Table 2. Homogeneity Test Result

Class	F_{count}	*Sig*	Information
Pre test	0.373	0.858	Homogeneous
Post test	2.085	0.137	Homogeneous

The results of the homogeneity test of the variables obtained that the F_{count} value in the Pre-test was 0.373 with a significant value of 0.858. While the post-test F_{count} 2.085 with a significant value of 0.137. From the calculation results, it is obtained that the significant value of Pre-test or Post-test data is greater than 0.05 (sig > 0.05). This shows that the results in Table 3 have a homogeneous variance.

Hypothesis Test

This study aimed to determine the effect of the use of modules on learning outcomes Pictures subjects in Mechanical Engineering class X Machining Engineering Department of SMKN 1 West Sumatra. The analysis used the t test with SPSS version 24.

Hypothesis Testing Pre Test

The t-test pre test and post test experimental class control class. Analysis Independent-Sample t-test of the pre-test experimental class and control class aims to determine whether there is a significant difference in the value of the pre-test experimental class and control class. The conclusion was significant when $t > t_{table}$ at significant level 5% and the value of $p < 0.05$. The pre-test summary t test experimental class and control class is shown in the following Table 3.

Table 3. Summary of Test Results t Pre Test Class   Experiment and Control Classes

Class	Average	t_{count}	t_{table}	P
class Experiment	3.040			
classroom Control	3.010	15.439	5.079	0,000

Summary of the t test in Table 3 is known pre-test average results of experimental class learning of 3.040 and an average of learning outcomes control class is 3.010 so it can be concluded that the average yield of 0.03 experimental class learning is greater than the control class. From the table it is known t_{count} amounted to 15.439 with 0.000 significant in the can t_{table} of df 39 at the 5% significance level was 5.079. So $t_{count} > t_{table}$ (15.439 > 5.079) and the significance value less than 0.05 (p = 0.000 < 0.05). It can be concluded that there are no significant differences in scores of student learning outcomes significantly in the experimental class and control class.

Hypothesis Testing Post Test

The t-test post-test and post-test experimental class control class. Analysis Independent-Sample t-test to post-test and post-test experimental class control class aims to determine whether there is a significant difference in the value of post-test and post-test experimental class control class. The conclusion was significant when $t > t_{table}$ at significant level 5% and the value of $p < 0.05$. The summary of the t-test post-test and post-test experimental class control class is shown in the following Table 4.

Table 4. Test Results Summary t Post Test Class Experiment and Class Control

Class	Average	t_{count}	t_{table}	P
Class Experiment	14.122	23.251	1,646	0,000
Classroom Control	13.877			

Summary of the t test in Table 4 is known post-test average results of experimental class learning at 14.122 and an average of learning outcomes control class is 13.877, so it can be concluded that the average results of experimental class learning is 0.245 higher than the control class. Based on the above table are known t_{count} amounted to 23.251 with 0,000 significant in the can t_{table} of df 39 at the 5% significance level is 1.646. So the value of $t_{count} > t_{table}$ (23.251 > 1.646) and the significance value less than 0.05 (p = 0.000 < 0.05). It can be concluded that there are differences in scores of student learning outcomes significantly in the experimental class and control class.

Discussion of Results

This study set out on the test results before treatment (pre-test) either the experimental class and control class. Further studies were conducted using a quasi-experimental studies that provide different treatment between the experimental class and control class. Grades given experimental treatment such as the use of learning media control module while classes are not. Furthermore, the research was carried out using a quasi-experimental study, namely giving different treatments between the experimental class and the control class. Grades given experimental treatment such as the use of learning media control module while classes are not or only use the lecture method.

In the learning process, it is known that by using learning module media, student learning outcomes become better because they are able to activate and increase student motivation in the teaching and learning process. A learning outcome is a written statement of what the successful student/learner is expected to be able to do at the end of the module/course unit, or qualification [17]. Learning outcomes of students who use the module to be better because the students do not get bored. In contrast to the activity of students in the control class, the level of attention sometimes increasing and sometimes decreasing. This is due to less conventional learning encourages students to the spirit of learning. Students become easily bored and tired of the conventional learning activities, only certain students who pay attention and follow the lesson well. The difference of the two classes of learning outcomes in this case due to differences in the level of instructional media and student attention on the material projections are given. The more effective use of instructional media will be higher student learning outcomes. One of the benefits of teaching aids in the learning process students are learning materials will be more clearly understood by students [18], so that students can master the educational objectives and can achieve learning outcomes higher.

The percentage of students who pass the pre-test results of a class experiment and control class is 0% of students who graduated and by 100% that failed, while the percentage of students who pass the result of post-test of the experimental class experienced a significant increase in the amount of 87% of the students graduate. While in the control class the percentage of students who passed the post-test results were the same as the pre-test results or did not experience an increase. The influence of the actual module is only partially percent way to increase learning outcomes in mechanical drawing. Almost half of the students (49%) agree that with the understanding of learning to use the module consistently, effective learning outcomes can be obtained [19].

Conclusion

The conclusions obtained from this study include the learning outcomes of students who use the module in the experimental class (X TP 2) in the mechanical drawing subject which has an average Pre-test score of 50.77 and an average Post-test score of 78.40. The percentage of students who passed the post-test from the experimental class experienced a significant increase of 87%. From the cognitive learning outcomes of students who use the mechanical drawing learning module with this learning method, they get a significant increase in learning outcomes. Based on the results of the data obtained, it can be stated that the use of the module affects the learning outcomes of class X students majoring in mechanical engineering at Machining Engineering Department of SMKN 1 West Sumatra.

References

[1]   D. Pernanda, M. A. Zaus, R. Wulansari, and S. Islami, "Effectiveness of instructional media based on interactive cd learning on basic network at vocational high school: improving student cognitive ability," in *International Conferences on Educational, Social Sciences and Technology*, 2018, pp. 443–447.

[2]   J. Cox and R. Sagor, *At risk students: Reaching and teaching them*. Routledge, 2013.

[3]   E. Indrawan and N. Jalinus, "Review project based learning," *International Journal of Science and Research (IJSR)*, vol. 8, no. 4, pp. 1014–1018, 2019.

[4]   A. Ambiyar, R. Refdinal, W. Waskito, F. Rizal, and H. Nurdin, "Application of Assessment for Learning to Improve Student Learning Outcomes in Engineering Drawing Using CaD," 2018.

[5]   M. Jou, R. D. Tennyson, J. Wang, and S.-Y. Huang, "A study on the usability of E-books and APP in engineering courses: A case study on mechanical drawing," *Computers & Education*, vol. 92, pp. 181–193, 2016.

[6]   S. Syahril, R. A. Nabawi, and F. Prasetya, "The Instructional Media Development of Mechanical Drawing Course Based on Project-Based Learning," *International Journal of Innovation, Creativity and Change.*, vol. 11, no. 4, pp. 309–325, 2020.

[7]   E. H. Fini, F. Awadallah, M. M. Parast, and T. Abu-Lebdeh, "The impact of project-based learning on improving student learning outcomes of sustainability concepts in transportation engineering courses," *European Journal of Engineering Education*, vol. 43, no. 3, pp. 473–488, 2018.

[8]   W. Waskito, A. Azmi, and H. Nurdin, "Implementation of Authentic Assessment on Mechanical Technology Subjects," *International Journal of Innovation, Creativity and Change*, vol. 11, no. 4, pp. 299–308, 2020.

[9]   A. K. AA and D. Brahadeeswaran, "DEVELOPMENT OF KNOWLEDGE BASED TUTORING SYSTEM ON BASIC CONCEPTS OF ENGINEERING DRAWING".

[10]   D. Sugiyono, "Metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D," 2013.

[11]   A. Suharsimi, "Dasar-dasar evaluasi pendidikan," *Jakarta: Bumi Aksara*, 2009.

[12]   A. Suharsimi, "Prosedur Penelitian suatu Pendekatan dan Praktik," *Dokumentasi. Jakarta: Graha Pustaka*, 2012.

[13]   Z. Hanusz and J. Tarasińska, "Normalization of the Kolmogorov–Smirnov and Shapiro–Wilk tests of normality," *Biometrical Letters*, vol. 52, no. 2, pp. 85–93, 2015.

[14]   R. D. Yockey, *SPSS® Demystified: A Simple Guide and Reference*. Routledge, 2017.

[15]   A. Viglione, F. Laio, and P. Claps, "A comparison of homogeneity tests for regional frequency analysis," *Water Resources Research*, vol. 43, no. 3, 2007.

[16]   C. A. Willard, "Two-Sample t Test: Independent Samples Design," in *Statistical Methods*, Routledge, 2020, pp. 147–159.

[17]   S. Adam, "An introduction to learning outcomes." Citeseer, 2006.

[18]   A. Arsyad, "Media pembelajaran, edisi 1," *Jakarta: PT. Raja Grafindo Persada*, vol. 36, 2002.

[19]   S. Brooks, K. Dobbins, J. J. Scott, M. Rawlinson, and R. I. Norman, "Learning about learning outcomes: the student perspective," *Teaching in Higher Education*, vol. 19, no. 6, pp. 721–733, 2014.

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PRESTASI BELAJAR MAHASISWA PENDIDIKAN TEKNIK BANGUNAN DENGAN PREDIKTOR KESIAPAN BELAJAR DAN MOTIVASI BELAJAR

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis: (1) hubungan kesiapan belajar dan prestasi belajar mahasiswa PTB Gatek UNIMA, (2) hubungan motivasi belajar dan prestasi belajar mahasiswa PTB Gatek UNIMA, dan (3) hubungan antara kebiasaan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB FT UNIMA. Rancangan penelitian ini adalah penelitian kuantitatif dengan pendekatan penelitian korelasional. Dari hasil penelitian: 1) terdapat hubungan yang signifikan antara kesiapan belajar dan prestasi belajar, dan memberikan konstribusi sebesar 25,00%, 2) terdapat hubungan yang signifikan antara motivasi belajar dan prestasi belajar, dan memberikan konstribusi sebesar 12,11% 3) terdapat hubungan yang signifikan antara kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar, dan memberikan konstribusi sebesar 37,10%. Dengan demikian bahwa peningkatan kesiapan belajar, dan motivasi belajar berupa adanya pertimbangan logis dan obyektif; adanya kemampuan dan kemauan untuk belajar sama dengan orang lain; memiliki sikap kritis; adanya keberanian untuk menerima tanggung jawab secara individual; adanya ambisi untuk maju dan berusaha; kesiapan mental; adanya motif; adanya harapan; adanya insentif, akan meningkatkan prestasi belajar dalam hasil atau taraf kemampuan yang telah dicapai mahasiswa setelah mengikuti proses belajar mengajar dalam waktu tertentu baik berupa perubahan tingkah laku, keterampilan dan pengetahuan.. Atau dalam meningkatkan prestasi belajar siswa harus memperhatikan kesiapan belajar, dan motivasi belajar yang secara nyata memberikan sumbangan yang berarti.

Kata kunci : kesiapan belajar, motivasi belajar, dan prestasi belajar

PENDAHULUAN

Perkembangan ilmu pengetahuan dan teknologi serta tuntutan globalisasi secara bersama-sama telah mengakibatkan persaingan yang semakin ketat dalam penyediaan sumber daya manusia yang unggul. Kebutuhan sumber daya manusia (SDM) yang berkualitas sangat diperlukan agar dapat bersaing dalam era pasar bebas. Untuk mengoptimalkan dan memaksimalkan perkembangan seluruh sumber daya manusia yang dimiliki, dilakukan melalui pendidikan, baik melalui jalur pendidikan formal maupun jalur pendidikan non formal (UU No. 20 Tahun 2003).

Pendidikan memberikan peluang bagi setiap orang untuk dapat berbuat lebih baik bagi diri maupun lingkungan. Pendidikan juga memberikan kesempatan untuk dapat meningkatkan mutu hidup dan kehidupan, meningkatkan kesejahteraan, mengembangkan potensi yang dimiliki dan mampu memberikan dorongan ke arah yang lebih kondusif untuk pencerahan masa depan. Sebagai lembaga yang mempersiapkan lulusannya untuk memasuki lapangan kerja, pendidikan di Fatek UNIMA Jurusan Pendidikan Teknik Bangunan diharapkan menghasilkan kualitas lulusan yang baik. Untuk dapat mewujudkan hal tersebut, efektivitas dan efisien dalam penbelajaran.

Berdasarkan pengamatan, prestasi belajar mahasiswa FT UNIMA Jurusan Pendidikan Teknik Bangunan belum maksimal atau belum dapat menunjukan prestasi yang menonjol. Oleh karena itu, diharapkan penelitian ini dapat mengungkapkan arti penting dari faktor-faktor yang mempengaruhi prestasi belajar mereka.

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Terkait dengan prestasi belajar mahasiswa, faktor kesiapan belajar berperan mempengaruhi prestasi belajar mahasiswa. Kesiapan belajar merupakan salah satu aspek kepribadian yang sangat penting bagi individu. Seseorang dalam menjalani kehidupan ini tidak pernah lepas dari cobaan dan tantangan. Mahasiswa akan memiliki kemampuan pemecahan masalah tinggi, jika didasari kesiapan belajar yang kuat dan memecahkan masalah yang ada.

Selain itu, prestasi belajar juga dipengaruhi oleh motivasi belajar. Terdapat hasil penelitian menunjukkan bahwa motivasi belajar secara parsia berpengaruh signifikan terhadap prestasi belajar mahasiswa. Kebutuhan akan prestasi menjadi daya penggerak sekaligus memotivasi semangat belajar mahasiswa serta mendorongnya untuk mengembangkan daya kreativitasnya dan mengarahkan semua potensi dan *energy* yang dimilikinya demi mencapai prestasi belajar yang optimal.

Prestasi adalah hasil yang dicapai oleh seseorang menurut ukuran yang berlaku untuk kegiatan yang bersangkutan. Wagner dan John (1995:177) mengatakan *Achievement; To do one best, to be successful, to accomplish task requiring skill and effort, to be a recognized authority, to accomplish something important to do a difficult job well.* Secara bebas dapar diartikan adalah untuk melakukan sesuatu yang terbaik, untuk menjadi sukses, untuk menyelesaikan tugas yang membutuhkan keterampilan dan usaha, untuk menjadi otoritas yang diakui, untuk mencapai sesuatu yang penting untuk melakukan pekerjaan yang sulit dengan baik.

Prestasi belajar adalah suatu bukti keberhasilan belajar atau kemampuan seseorang siswa dalam melakukan kegiatan belajarnya sesuai dengan bobot yang dicapainya" (Winkel,1996:162). Prestasi belajar adalah kesempurnaan yang dicapai seseorang dalam berfikir, merasa dan berbuat. Prestasi belajar dikatakan sempurna apabila memenuhi tiga aspek yakni: kognitif, affektif dan psikomotor, sebaliknya dikatakan prestasi kurang memuaskan jika seseorang belum mampu memenuhi target dalam ketiga kriteria tersebut." Nasution (1996:17).

Prestasi belajar adalah hasil yang dicapai oleh seseorang setelah ia melakukan perubahan **belajar**, baik di sekolah maupun di luar sekolah. Di dalam webster's New Internasional Dictionary mengungkapkan tentang prestasi yaitu: "Achievement test a standardised test for measuring the skill or knowledge by person in one more line of work a study". Secara bebas dapat diartikan bahwa **prestasi** adalah standart test untuk mengukur kecakapan atau pengetahuan bagi seseorang didalam satu atau lebih dari garis-garis pekerjaan atau **belajar**. Dalam kamus populer prestasi adalah hasil sesuatu yang telah dicapai (Purwodarminto, 1979: 251).

Uno (2013:66) "kesiapan merupakan perilaku yang siaga untuk kegiatan atau pengalaman tertentu. Termasuk di dalamnya adalah kesiapan *mental set* (kesiapan mental), *physical set* (kesiapan pisik) atau *emotional set* (kesipan emosi perasaan) untuk melakukan suatu tindakan". Sejalan dengan Amiruddin (2016:12) "kesiapan adalah kapasitas (kemampuan potensial) baik bersifat fisik maupun mental untuk melakukan sesuatu". **Selanjutnya** Slameto (2010:54) ada dua faktor yang mempengaruhi keberhasilan mahasiswa dalam belajar yaitu: Faktor ekstern (yang berasal dari luar diri mahasiswa) dan intern (dari dalam diri mahasiwa). Faktor ekstern yaitu faktor yang berasal dari luar diri individu seperti lingkungan keluarga, sekolah dan masyarakat, sedangan faktor intern yaitu tiga tahap bagian yaitu faktor kelelahan (kelelahan jasmani dan kelelahan rohani), faktor jasmaniah (kesehatan, cacat tubuh) dan faktor psikologis (intelegensi, perhatian, minat, bakat, motif, kematangan, keterampilan dan kesiapan belajar). Prayitno (1997:13) menjelaskan bahwa mempersiapkan diri untuk mengikuti pelajaran adalah hal yang perlu diperhatikan mahasiswa, sebab dengan persiapan yang matang mahasiswa merasa mantap dalam belajar sehingga memudahkan mahasiswa berkonsentrasi belajar. Kondisi mahasiswa yang siap melakukan proses pembelajaran, akan berusaha merespon pertanyaan yang telah diberikan oleh dosen.

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Untuk memberikan jawaban yang benar tentunya mahasiswa harus mempunyai pengetahuan dengan cara membaca dan mempelajari materi yang akan diajarkan oleh dosen.

Teori-teori motivasi kerja bermaksud untuk menentukan apa yang memotivasi orang-orang dalam pembelajaran mereka. Awalnya para ahli berpendapat bahwa hanya uang yang memotivasi orang-orang dalam bekerja, keamanan dan barang kali gaya supervisi demokratis (hubungan manusia). Motivasi telah dipandang lebih dalam lagi dengan apa yang dikenal motif-motif dengan "tingkatan lebih tinggi", seperti kebutuhan akan penghargaan dan aktualisasi diri (Maslow) serta tanggung jawab, pengakuan, prestasi dan pertumbuhan (Herzberg).

Teori motivasi dari Mc. Clelland (dalam Kambey, 2006:91) sangat terkenal karena pemikiran tentang kebutuhan untuk berprestasi. Asumsi dasar yang membuat Mc. Clelland terpesona untuk mengadakan penelitian secara insentif ialah bahwa manusia pada hakekatnya, mempunyai kemampuan untuk berprestasi di atas kemampuan orang lain. Menurut Mc. Clelland (dalam Kambey, 2006: 91-92), pada dasarnya motivasi seseorang ditentukan oleh tiga kebutuhan, yaitu: "(1) dorongan untuk mencapai keberhasilan/berprestasi, (2) kebutuhan kekuasaan, (3) kebutuhan untuk berafiliasi".Dalam Kamus Lengkap Bahasa Indonesia (1995:575) Motivasi diartikan "kecenderungan yang timbul pada diri seseorang secara sadar atau tidak sadar melakukan tindakan dengan tujuan tertentu; usaha-usaha yang menyebabkan seseorang atau kelompok orang tergerak melakukan sesuatu karena ingin mencapai tujuan yang dikehedaki".

Menurut Djamarah (2002:114), motivasi adalah suatu pendorong yang mennguubah energi dalam diri seseorang ke dalam bentuk aktivitas nyata untuk mencapai tujuan tertentu. Menurut Usman (2010:29), motivasi timbul sebagai akibat dari dalam individu tersebut karena adanya ajakan, suruhan, atau paksaan dari orang lain sehingga dengan kondisi yang demikian akhirnya ia mau melakukan sesuatu atau belajar. Selanjutnya Djamarah (2002:117), menjelaskan bahwa motivasi ekstrinsik adalah motif-motif yang aktif dan berfungsi karena adanya rangsangan dari luar, seperti adanya kompetesi/persaingan.

Sardiman (2009:77), mengemukanan bahwa motivasi belajar dapat mempengaruhi aspek afektif. Mahasiswa yang memiliki motivasi belajar akan mengikuti proses pembelajaran yang diajarkan oleh dosen dengan baik untuk mencapai tujuan yang diinginkan. Motivasi belajar juga dipengaruhi faktor ekstern yaitu dari lingkungan keluarga seperti perhatian orang tua terhadap anak akan meningkatkan motivasi anak untuk belajar dan lingkungan sekolah seperti sarana prasarana yang ada disekolah akan mempengaruhi kelancaran kegiatan belajar yang dapat memotivasi belajar mahasiswa.

Menurut Dalyono. (2005), berhasil tidaknya seseorang dalam belajar disebabkan oleh dua faktor yaitu: a). faktor internal, yaitu faktor yang mempengaruhi dari dalam diri mahasiswa seperti kesehatan, minat, bakat, inteligensi, motivasi, dan cara belajar. b). faktor eksternal, yaitu faktor yang mempengaruhi dari luar diri siswa seperti: kondisi keluarga, sekolah, masyarakat, dan lingkungan sekitar. Sealanjutnya Djaali (2007: 128) menjelaskan bahwa "keberhasilan atau kegagalan pebelajar dalam mengikuti pelajaran di sekolah dipengaruhi oleh faktor-faktor, yaitu: (1) faktor dari dalam diri mahasiswa seperti kemampuan dasar umum, bakat, minat, motivasi, serta sikap dan kebisaaan belajar, (2) faktor yang berasal dari luar diri siswa seperti lingkungan fisik, sarana dan prasarana, lingkungan sosial, lingkungan keluarga, lingkungan masyarakat, dan lingkungan sekolah". **Dengan adanya motivasi belajar, mahasiswa akan siap menerima pelajaran yang diberikan oleh pengajar untuk mengoptimalkan prestasi belajarnya.**

METODE PENELITIAN
A. Rancangan Penelitian
Rancangan penelitian ini adalah penelitian kuantitatif. Menurut Mukhadis (2016: 211) rancangan penelitian kuantitatif adalah pemerian rencana dan tahapan (sintaks) penelitian secara eksplisit dan sistematis-sistemik serta dapat direplikasi, baik oleh peneliti sendiri maupun peneliti lain. Menurut Mukhadis, dkk (2003: 46-47) penelitian korelasi bertujuan untuk mengungkapkan hubungan korelatif antarvariabel. Hubungan korelatif mengaju pada kecendrungan bahwa variasi suatu variabel terikat diikuti variabel bebas. Penelitian sebagai representasi pemacahan masalah yang telah ditetapkan sebagai objek kajian dengan menggunakan pola pikir ilmiah. Rancangan penelitian yang digunakan adalah penelitian korelasional yang mempunyai arti penelitian hubungan, dengan menggunakan teknik analisis regresi.

B. Populasi dan Sampel
Populasi dalam penelitian ini yaitu seluruh mahasiswa PTB Fatek UNIMA, yang berjumlah 145 mahasiswa. Untuk sampel adalah 106 mahasiswa.

C. Instrumen Penelitian
Penelitian ini mengukur tiga variabel yang terdiri dari dua variable exogenous sebagai variabel bebas (penyebab), yaitu kesiapan belajar (X_1), motivasi belajar (X_2), sedangkan variabel endogenous sebagai variabel terikat (disebabkan) yaitu variabel prestasi belajar mahasiswa (Y). Instrumen penelitian untuk variabel beban menggunakan kuesioner Skala Likert terdiri empat opsi (5, 4, 3, 2, 1). Kuesioner dikembangkan oleh peneliti sendiri berdasarkan teori-teori yang digunakan. Kuesioner disebarkan kepada siswa yang menjadi responden dalam penelitian ini. Kemudian instrument tersebut dilakukan pengujian Validitas (ketepatan) dan Reliabilitas (data yang konsisten). Untuk variabel prestasi belajar siswa (Y) diambil nilai raport.

D. Teknik Pengumpulan Data
Teknik pengumpulan data dalam penelitian ini adalah menggunakan kuesioner (angket). Kuesioner merupakan teknik pengumpulan data yang dilakukan dengan cara memberi seperangkat pertanyaan atau pernyataan tertulis kepada responden untuk dijawabnya. Kuesioner merupakan teknik pengumpulan data yang efesien, digunakan bila jumlah respoden cukup besar dan tersebar di wilayah yang luas.

E. Teknik Analisis Data
Data yang diperoleh akan dianalisis dengan menggunakan analisis deskriptif dan analisis inferensial. Analisis deskriptif digunakan dalam hal penyajian data, ukuran sentral dan ukuran penyebaran. Analisis inferensial digunakan untuk menguji hipotesis dengan memakai metode statistik analisis regresi yang didahului dengan uji normalitas, dan uji signifikansi koefisien regresi dan linearitas data dengan bantuan program *SPSS versi 22*. Selanjutnya dihitung besar pengaruh antara variabel bebas dan variabel terikat. Besar pengaruh tercermin dari besarnya koefisien regresi (menggunakan analisis uji signifikansi "F"). Dalam rangka untuk memenuhi persyaratan instrumen penelitian, maka terlebih dahulu instrumen untuk memeriksa apakah instrumen tersebut sudah sesuai dengan indikator-indikator pada setiap variabel dengan aspek yang akan diukur. Kemudian instrumen diujicobakan pada 30 responden yang bukan menjadi anggota sampel.

HASIL PENELITIAN DAN PEMBAHASAN
A. Pengujian Persyaratan Analisis Statistik
1. Uji Normalitas Data
Dengan bantuan *SPSS versi 22* Hasil uji pada Tabel 5.7 menunjukkan bahwa nilai masing-masing variabel, yaitu variabel kesiapan belajar nilai Sig. = 0,200 > 0,05, dan variabel motivasi belajar nilai Sig. = 0,054 > 0,05 menyatakan bahwa data menyebar normal yakni semua nilai signifikan > 0.05.

Dengan demikian, pengujian dapat dilanjutkan untuk pengujian hipotesis.

2. Uji Linearitas Data

Berdasarkan hasil pengujian signifikansi menunjukkan $F_h = 34,602 > F_{(0,01;1/104)} = 6,84$, dan menunjukan $F_h = 0,932 < F_{t(0,01;31/73)} = 1,84$, yang berarti prestasi belajar (Y) atas motivasi belajar (X_1) signifikan dan hubungan keduanya data berpola linier. Dengan demikian, pengujian dapat dilanjutkan untuk pengujian hipotesis Dengan demikian, pengujian dapat dilanjutkan untuk pengujian hipotesis. Berdasarkan hasil pengujian signifikansi menunjukkan $F_h = 14,293 > F_{(0,01;1/104)} = 6,84$, dan menunjukan $F_h = 1,782 < F_{t(0,01;22/82)} = 1,980$, yang berarti prestasi belajar (Y) atas motivasi belajar (X_2) signifikan dan hubungan keduanya data berpola linier. Dengan demikian, pengujian dapat dilanjutkan untuk pengujian hipotesis.

B. Pengujian Hipotesis Penelitian

1. Hubungan kesiapan belajar dan prestasi belajar mahasiswa.
Menunjukkan nilai kesiapan belajar dan prestasi belajar dengan nilai $0,000 \leq 0,05$, dan memberikan konstribusi sebesar 25,00%. Maka H_0 ditolak dan Ha diterima, artinya signifikan, Dengan kata lain bahwa kesiapan belajar mempunyai hubungan yang signifikan dengan prestasi belajar.

2. Hubungan motivasi belajar dan prestasi belajar mahasiswa
Menunjukkan nilai motivasi belajar pada dan prestasi belajar dengan nilai $0,000 \leq 0,05$, dan memberikan konstribusi sebesar 12,11%. Maka H_0 ditolak dan Ha diterima, artinya signifikan. Dengan kata lain bahwa motivasi belajar mempunyai hubungan yang signifikan dengan prestasi belajar.

3. Hubungan kesiapan belajar dan motivasi belajar secara simultan dengan prestasi belajar siswa.
Menunjukkan nilai kesiapan belajar, motivasi belajar dengan prestasi belajar, dengan nilai $0,000 \leq 0,05$, maka H_0 ditolak dan Ha diterima, artinya signifikan. Dengan kata lain bahwa kesiapan belajar, dan motivasi belajar secara simultan mempunyai hubungan yang signifikan dengan prestasi belajar, dan memberikan konstribusi sebesar 37,10%, sedangkan sebesar 0,629 = 62,90% di sebabkan oleh variabel-variabel lain.

C. Hasil Pengujian Hipotesis
Berdasarkan pengujian hipotesis yang dilakukan, maka dapat dikemukakan hasil-hail pengujian hipotesis sebagai berikut: Dari hasil analisis regresi sederhana dan ganda menunjukkan bahwa terdapat hubungan yang signifikan secara individu maupun secara simultan antara kesiapan belajar dan motivasi belajar dengan prestasi belajar siswa.

D. Pembahasan Hasil Penelitian
1. Hubungan kesiapan belajar dan prestasi belajar mahasiswa PTB Fatek UNIMA
Berdasarkan hasil pengujian hipotesis, menunjukkan bahwa terdapat hubungan yang signifikan antara kesiapan belajar dan prestasi belajar mahasiswa PTB Fatek UNIMA. Hal ini berarti kesiapan belajar belajar memberikan konstribusi sebesar 25,00% pada prestasi belajar mahasiswa PTB Fatek Unima. Dari pernyataan Soejanto (1991:5), kesiapan diri siswa sangat penting untuk meraih keberhasilan dalam kegiatan belajar. Keberhasilan mahasiswa melakukan kesiapan sebelum mengikuti pelajaran dapat menentukan kesuksesan mahasiswa dalam belajar, sehingga akan mempengaruhi prestasi belajar mahasiswa. Song and Hill (2007), menyebutkan bahwa kemandirian terdiri dari beberapa aspek, yaitu: 1) personal attributes merupakan aspek yang berkenaan dengan motivasi dari pebelajar, penggunaan sumber belajar, dan strategi belajar. Motivasi belajar merupakan keinginan yang terdapat pada diri seseorang yang merangsang pebelajar untuk melakukan kegiatan belajar; 2) processes merupakan aspek yang berkenaan dengan otonomi proses pembelajaran yang dilakukan oleh pebelajar meliputi perencanaan, monitoring, serta evaluasi pembelajaran; dan 3) learning context adalah faktor lingkungan dan bagaimana faktor

tersebut mempengaruhi tingkat kemandirian pebelajar. Dessy Mulyani (2013), berdasarkan analisis data yang dilakukan, hasil penelitian ini menunjukkan bahwa korelasi antara kesiapan belajar pebelajar dengan prestasi belajar adalah 0,540 dengan signifikan 0,000. Norita, dkk, (2012) dalam penelitian mengemukakan bahwa tedapat hubnungan yang signifikan kesiapan belajar dan prestasi belajar. Data hasil penelitian ini menunjukkan bahwa terdapat hubungan pada tingkat koefisien korelasi cukup kuat antara kesiapan belajar siswa dengan prestasi belajar. Dari hasil penelitian ini terlihat bahwa semakin baik kesiapan belajar pebelajar maka akan semakin baik pula prestasi belajarnya.

2. Hubungan motivasi belajar dan prestasi belajar mahasiswa PTB Fatek UNIMA

Berdasarkan hasil pengujian hipotesis, menunjukkan bahwa terdapat hubungan yang signifikan antara motivasi belajar dan presrasi belajar mahasiswa PTB Fatek UNIMA. Hal ini berarti motivasi belajar memberikan konstribusi sebesar 12,11%. pada prestasi belajar mahasiswa PTB Fatek UNIMA. Dari pernyataan Song and Hill (2007), menyebutkan motivasi belajar merupakan keinginan yang terdapat pada diri seseorang yang merangsang pebelajar untuk melakukan kegiatan belajar. Norita, dkk, (2012) dalam penelitian mengemukakan bahwa tedapat hubnungan yang signifikan kesiapan belajar dan prestasi belajar. Inayah, dkk. (2013), motivasi belajar pebelajar berpengaruh secara langsung positif terhadap prestasi belajar. Norita, dkk, (2012) dalam penelitian mengemukakan bahwa tedapat hubnungan yang signifikan antara motivasi belajar dan prestasi belajar. Menurut Mc. Clelland (dalam Kambey, 2006), pada dasarnya motivasi seseorang ditentukan oleh tiga kebutuhan, yaitu: dorongan untuk mencapai keberhasilan/berprestasi; kebutuhan kekuasaan; dan kebutuhan untuk berafiliasi.

Menurut **Sardiman (2009),** Dalyono (2005), dan Djaali (2007) keberhasilan atau kegagalan pebelajar dalam mengikuti pelajaran di sekolah dipengaruhi oleh faktor internal dan eksternal, dalam hal ini adalah motivasi belajar.

3. Hubungan kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB Fatek UINMA

Hasil pengujian hipotesis menunjukkan bahwa terdapat hubungan yang signifikan antara kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB Fatek UNIMA. Besar pengaruhnya kesiapan belajar, dan motivasi belajar secara simultan memberikan konstribusi sebesar 37,10% untuk prestasi belajar.

Kesiapan belajar, dan motivasi belajar merupakan salah satu faktor pendukung prestasi belajar mahasiswa PTB Fatek UNIMA. Dengan hasil yang didapatkan diimplikasikan bahwa semakin tinggi kesiapan belajar, dan motivasi belajar, maka semakin tinggi pula prestasi belajar mahasiswa PTB Fatek UNIMA. Fakta tersebut membuktikan bahwa kesiapan belajar, dan motivasi belajar secara simultan memberikan hubungan yang besar dengan prestasi belajar mahasiswa PTB Fatek UNIMA. Akan tetapi kesiapan belajar, dan motivasi belajar bukan satu-satunya faktor yang mempengaruhi prestasi belajar mahasiswa PTB Fatek UNIMA, karena masih terdapat faktor faktor yang lain. Dari pernyataan **Wenda Norita, Sumadi, Zulkarnain, (2012), menjelaskan bahwa** (1) ada hubungan antara motivasi belajar dengan prestasi belajar, (2) ada hubungan antara kesiapan belajar dengan prestasi belajar, dan (3) semakin tinggi motivasi belajar maka akan semakin baik kesiapan belajar siswa dan ada hubungan dengan prestasi belajar. Norita, dkk, (2012) dalam penelitian mengemukakan bahwa tedapat hubnungan yang signifikan kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar.

Semakin tinggi motivasi belajar pebelajar maka semakin baik pula kesiapan belajar pebelajar sehingga akan cenderung semakin tingginya prestasi belajar yang diperoleh pebelajar dan sebaliknya jika motivasi belajar pebelajar rendah maka kesiapan belajar pebelajar juga buruk sehingga akan cenderung semakin rendahnya prestasi belajar yang diperoleh pebelajar.

Kesiapan belajar, dan motivasi belajar yang berkompeten akan memiliki berupa adanya pertimbangan logis dan obyektif; adanya kemampuan dan kemauan untuk belajar sama dengan orang lain; memiliki sikap kritis; adanya keberanian untuk menerima tanggung jawab secara individual; adanya ambisi untuk maju dan berusaha; kesiapan mental; adanya motif; adanya harapan; adanya insentif, akan meningkatkan prestasi belajar dalam hasil atau taraf kemampuan yang telah dicapai mahasiswa setelah mengikuti proses belajar mengajar dalam waktu tertentu baik berupa perubahan tingkah laku, keterampilan dan pengetahuan. Dengan demikian, kesiapan belajar, dan motivasi belajar akan mempengaruhi prestasi belajar mahasiswa. Mengacu penjelasan di atas, dapat disimpulkan bahwa adanya kesiapan belajar, dan motivasi belajar yang tinggi akan menumbuhkan prestasi belajar mahasiswa yang baik maupun tinggi.

SIMPULAN DAN SARAN
A. Simpulan
Berdasarkan hasil analisis data dan pengujian hipotesis dalam penelitian ini, dapat disimpulkan sebagai berikut:

Terdapat hubungan yang signifikan antara kesiapan belajar dan prestasi belajar mahasiswa PTB Fatek UNIMA. Kontribusi variabel kesiapan belajar dan prestasi belajar sebesar 25,00%.
Terdapat hubungan yang signifikan antara motivasi belajar mahasiswa PTB Fatek UNIMA. Kontribusi variabel kreativitas belajar dan prestasi belajar sebesar 12,11%.

Terdapat hubungan yang signifikan antara kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB Fatek UNIMA. Kontribusi variabel kesiapan belajar, dan motivasi belajar secara simultan dengan prestasi belajar mahasiswa PTB Fatek UNIMA sebesar 37,10%.

B. Saran
Berdasarkan kesimpulan penelitian, dikemukakan beberapa saran sebagai berikut:
Kemampuan kesiapan belajar perlu dipertahankan serta ditingkatkan dalam pelaksanaan pembelajaran untuk meningkatkan prestasi belajar mahasiswa, dan harus sesuai dengan ketentuan yang berlaku serta mempertimbangkan standar mutu pendidikan dalam menghadapi era globalisasi.

Perlu dipertahankan serta ditingkatkan motivasi belajar untuk menggali dan mengembangkan potensi para mahasiswa-mahasiswa dalam meningkatkan prestasi belajar mahasiswa PTB Fatek UNIMA. Institut maupun manajemen Fakultas/Jurusan perlu memperhatikan langkah-langkah kebijakan yang berkaitan dengan kesiapan belajar maupun motivasi belajar mahasiswa yang secara nyata mempunyai peranan yang cukup besar terhadap peningkatan prestasi belajar mahasiswa. Perlu dilakukan penelitian lanjutan dengan menggunakan variabel-variabel lain agar dapat terinventaris berbagai variabel yang dapat mempengaruhi atau mempunyai hubungan dengan prestasi belajar mahasiswa

Daftar Pustaka

Amiruddin. 2016. *Perencanaan Pembelajaran*, cetakan 1. Yogyakarta: Paratama Ilmu

Ahmadi, Abu dan Widodo Supriyono.2001. *Psikologi Belajar*. Bandung

Dalyono, M. 2005. *Psikologi Pendidikan*. Semarang: Rineka Cipta.

Dessy Mulyani, 2013, Hubungan kesiapan belajar siswa dengan prestasi belajar KONSELOR. *Jurnal Ilmiah Konseling*. Volume 2 Nomor 1, Januari 2013: 27-31

Djaali. 2007. *Psikologi Pendidikan*. Jakarta: Bumi Aksara

Djamarah, Syaeful B dan A. Zain. 2002. *Strategi Belajar Mengajar*. Jakarta: Rineka Cipta.

Djamarah, Syaeful B. 2012. *Prestasi Belajar dan Kompetensi Guru*. Jakarta: UsahaNasional

Fatchurrochman, Rudy 2011. Pengaruh Motivasi Berprestasi Terhadap Kesiapan Belajar, Pelaksanaan Prakerin Dan Pencapaian Kompetensi Mata Pelajaran Produktif. *INVOTEC,* Volume VII, No. 2, Agustus 2011: 175 −188

Gibson, James, dkk., 2006. *Orgnizational Behavior, Structure, Processes* (New York: McGraw Hill Companies, Inc

Handoko, T. Hani., 2010. *Manajemen Personalia dan Sumberdaya Manusia*, Yogyakarta: BPFE.

Inayah, Ridaul dkk. 2013. Tentang pengaruh kompetensi guru, motivasi belajar siswa, dan fasilitas belajar terhadap prestasi belajar mata pelajaran ekonomi pada siswa kelas XI IPS SMA Negeri 1 Lasem Jawa Tengah. *Jurnal Pendidikan Insan Mandiri*, Vol 2, No 1. 2013: 1-13.

Kambey, Daniel C., 1995. *Manajemen Sumberdaya Manusia*, Manado: Yayasan Tri Ganesha Nusantara.

Kamus Lengkap Bahasa Indonesia. 1995. Jakarta: Depdiknas.

Mukhadis, Amat. 2016. *Metodologi Penelitian Kuantitatif* (*Bidang Pendidikan dan Contoh Aplikasinya*). Malang: Aditya Media.

Mukhadis, Amat., Ibnu Suhadi., dan I Wawan Dasna. 2003. *Dasar-Dasar Metodologi Penelitian* (revisi). Malang: UM Press.

Nasution. 2003. *Asas-AsasKurikulum*. Jakarta: PT. BumiAksara

Norita, Wenda, dkk. 2012. Hubungan Antara Motivasi Belajar Dan Kesiapan Belajar Dengan Prestasi Belajar Geografi Siswa Kelas X S MANegeri 1 Kotabumi Lampung Utara. *Jurnal Penelitian Geografi Universitas Lampung*, 2012: 1-10

Purwodarminto,1979. *Kamus Umum Bahasa Indonesia*. Balai pustaka. Pelatihan: Jakarta.

Prayitno. 1997. *AUM PTSDL*. Padang: FIP UNP

Ridwan. 2011. *Belajar Mudah Penelitian Untuk Guru/Karyawan dan Peneliti Pemula*. Bandung: Alfabeta

Robbin, Stephen P. & Mary Coulter, 2005. *Management*, eight edition New Jersey: Prentice Hall.

Sardiman A.M. 2009*. Interaksi dan Motivasi Belajar Mengajar*. Jakarta: PT Raja Grafindo Persada.

Soejanto, Agoes. 1991. *Bimbingan Kearah Belajar yang Sukses*. Jakarta: Rineka Cipta.

Song, Liyan., & Hill, Janette. 2007. A Conceptual Model for Understanding Self-Directed Learning in Online Environments. *Journal of Interactive Online Learning*, 6(1): 27-42. University of Georgia.

Sugiyono. 2010. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta

Slameto. 2010. *Belajar dan Faktor-faktor yang Mempengaruhinya*. Jakarta: PT Rineka Cipta.

Undang-Undang Republik Indonesia, Nomor. 20, Tahun 2003, *Tentang Sistem Pendidikan Nasional*. Jakarta: Depdiknas

Uno, Hamzah. B, dan Satria Kono. 2013. *Assessment Pembelajaran*. Jakarta: PT. Bimi Aksara.

Usman, Uzer. 2010. *Menjadi Guru Profesional*. Bandung: Penerbit Remaja Rosda Karya.

Wagner, Jhon A. III dan Jhon R. Hollenbeck, 1995. *Management Of Organization Behavior*. New Jersey: Englewood Cliffs.

Winkel, W.S. 1996. *Psikologi Pengajaran*. Jakarta: penerbit PT Grasindo.

http://aadesanjaya.blogspot.com/2011/02/prestasi-belajar.html,di Akses tanggal 27 Juni 2018.

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ONLINE MICRO TEACHING AS A PREPARATION FOR PROSPECTIVE TEACHERS BEFORE TEACHING INTERNSHIPS AT VOCATIONAL HIGH SCHOOL DURING PANDEMIC

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Abstract Vocational High School is a secondary education level that prepares graduates to be ready to work in certain fields. Vocational education teachers have a very vital role in the learning process of vocational subjects. Besides having competence in their field, vocational education teachers must also be skilled in educating and teaching their vocational competence, so that it can be understood by their students. The purpose of this research was to (1) determine the pattern of online micro teaching activities; and (2) Analyse the impact of online micro teaching on the performance of ICEE student teaching practice. The method used in this research is a qualitative research method to find the appropriate pattern of online micro teaching preparation activities. The results of this research were (1) There are 2 patterns of activity that are used in online micro teaching, with strengthening basic teaching skills, and strengthening lesson plans analysis; (2) There is impact of micro teaching preparation by strengthening learning planning on online micro teaching performance, such as improving skills in using approaches, models, and learning methods and also improving at assessment skills.

Keyword: Vocational High School, Online Micro Teaching, prospective teachers, and teaching internship

INTRODUCTION

From 2020 until now, the world was hit by a pandemic disease case known as the COVID-19 pandemic. The COVID-19 pandemic has had various impacts on human life, including in the field of education. World Health Organization (WHO) issued policies to reduce the rate of spread, that was social and physical distancing. In line with that, the Indonesian government made a policy of online school from home, to overcome the spread of cases in the educational environment [1][2]. The Covid-19 pandemic has forced classroom learning to switch to online learning, which has had a major impact on the organization of education and the implementation of education. In terms of strengths, of course, online learning is not limited by space and time, that in line with the vision and mission of future learning [3]. There are several negative impacts on an educational system such as loss of human resources, investment for developing the online system for smart classes, and providing the data and information using the technology [4]. Besides that, the impact also occurs on the student side, such as student well-being, mental health, and declining academic achievement [5].

The impact of the COVID-19 pandemic has also occurred in vocational education. Vocational education includes all programs of education which prepare people to enter employment, upgrade them to better positions, and/or assist them in understanding and living in our technological society [6]. Vocational education as organized educational programs which are directly related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career require other than a baccalaureate of advanced degree [7]. Vocational education aims to prepare students to enter the workforce, develop professional attitudes, and also improve the independence of individuals in entrepreneurship according to the competencies that they have [8][9].

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The Vocational High School (VHS) is a type of vocational education at the secondary education level in Indonesia that prepares students specially to work in certain fields [8]. The orientation of learning implementation in VHS is different with the Senior High School [10]. Vocational High School aims at generating qualified graduates for professional working circumstances, having entrepreneurial passion, qualified skill, and able to develop their potential in adopting and adapting to developments in science, technology, and the arts [11][12].

So, VHS prepares graduates to be ready to work in industry, entrepreneurship, or continue to higher education.

Educational study programs at universities, especially at the Faculty of Engineering, are expected to be able to graduate skilled educators. The Informatics and Computer Engineering and Education (ICEE) was a study programs in Universitas Negeri Semarang. One of the graduate's profiles from this study program is to prepare prospective teachers in the field of Informatics Engineering, which is in line with its aim, to produce educational scholars who can teach at VHS in the field of informatics and computer engineering.

Teachers as the frontline in education have a very important role in educating and teaching VHS students according to their field of expertise. The learning in VHS will be effective if teachers have had successful experience in applying their skills and knowledges regarding operations and work processes in line with their competencies [13]. The role of teachers in vocational education cannot be separated from changes in learning in the Industrial Revolution 4.0 era. Teachers must be able to follow technological developments and use it in the learning process as an instructional media [14]. The preparation of lesson plans and learning tools is a very important stage for vocational teachers to teach competencies in the field of informatics and computer engineering by utilizing appropriate technology as instructional media.

Besides that, the 21st-century learning requires students to have 21st-century skills in order to be successful in their work and social life. The 21st-century skills include critical thinking and problem solving, creativity and innovation, communication, and collaboration [15][16]. The findings of research showed that student's the difficulties in developing 21st-century skills [17][18]. In an effort to overcome this, teachers must be able to organize 21st-century learning that teaches these skills. Planning, teaching practices, giving feedback, reflective practice, and continuous improvement have the hope of improving the skills of 21st-century teachers and, in turn, 21st-century learners. Only with the successful accomplishment of such 21st-century teaching skills will we be able to enhance the 21st-century learning of students [19].

As prospective teachers in vocational schools, students of the ICEE study program need to be given internships in school programs. Internships in schools are one of the efforts for students to get real teaching experience in SMK. Through internship programs at schools, they can gain hands-on experience in facing challenges as vocational teachers in learning situations in the era of the industrial revolution 4.0 and the 21st-century. However, before implementing the internship program, students need to be equipped with the skills to become a teacher, including skills in conducting learning both in the classroom and outside the classroom.

Micro teaching is one of the courses in the ICEE study program based on the TPACK framework. TPACK is a term used to describe what teachers need to know to effectively integrate technology into their teaching practices [20]. The components of the TPACK framework can be seen in Fig. 1. Teaching practice through Micro teaching courses needs to be given to the students as an effort to train teaching skills. The aim is they are ready to carry out internship activities at VHS.

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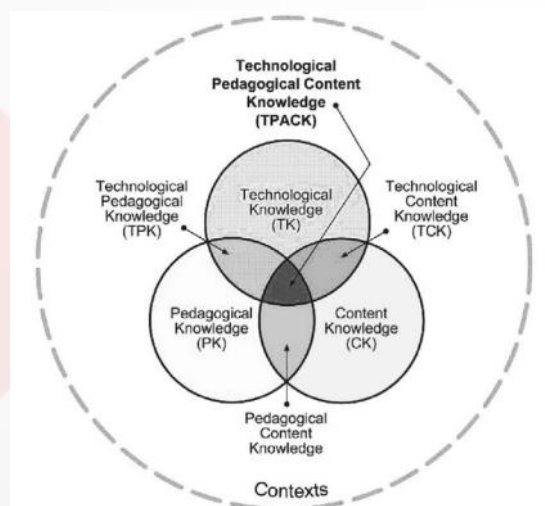Era Though Digital Ecosystems

Fig. 1. The Components of the TPACK Framework [20]

The implementation of micro teaching which was held offline turned into online during the covid-19 pandemic. Students cannot get direct experience of what it is like to teach in the classroom facing the various characteristics of students and their interactions. This has a real impact on their teaching skills. Various efforts are needed to reduce this impact. The objectives of this study are: (1) determine the pattern of online micro teaching activities; and (2) Analyse the impact of online micro teaching on the performance of ICEE student teaching practice.

METHODOLOGY

The method used in this study is a qualitative research method to find the appropriate pattern of online micro teaching preparation activities. Qualitative research involves a rich collection of data from various sources to gain a deeper understanding of individual participants, including their opinions, perspectives, and attitudes. This often involves an inductive exploration of the data to identify recurring themes, patterns, or concepts and then describing and interpreting those categories [21].

This research was conducted for 1 year by observing the micro teaching process of ICEE students for 2 semesters. The research based on case studies of the semester lecture plan with a different sequence pattern for micro teaching materials in each semester. The research subjects were ICEE students who took online micro teaching lectures during the 2021 pandemic period.

This study uses data collection techniques in the form of documentations, interviews and observations of students' performances in online micro teaching practices. Documentation and literature studies are used to see the results of student performance in online micro learning practices in the previous semester. Interviews were conducted after the students carried out the practice, to dig up information about the experiences students had during their practice. Observations are carried out when students carry out teaching practices. The type of test used is a performance test. The research instrument is a standardized rubric and observation sheet of Teacher Professional Education in Indonesia, to measure online micro teaching performance. Some of the indicators used for performance tests can be seen in Table 1.

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Table 1. Performance Test Indicators for Online Teaching Micro Practice

No	Indicators
1	Teaching skills
2	Mastery of concept/material
3	Skills in using approaches, models, and learning methods
4	Time Management
5	Ability to develop high order thinking skills
6	Communication skills: Verbal and non-verbal
7	Assessment skills

RESULTS AND DISCUSSION

This section presents the results and discussion of the patterns of online micro teaching preparation activities and their impact on student performance in conducting online micro teaching. The research results use naturalistic data with settings that occur naturally during the learning process.

A. *The Patterns of Online Micro Teaching Activities*

The pattern of online micro teaching activities in this study is structured based on student learning activities which are divided into several Course Learning Outcomes (CLO) for every semester. The pattern of learning activities is planned and arranged through a semester lesson plan. This semester's lesson plan is composed of several topics and activities derived from CLO and study literatures. These topics are curriculum analysis, lesson plans analysis, basic teaching skills analysis, developing learning resources, and micro teaching practices. There are two patterns of online micro teaching learning activities, each implemented in a different semester.

The First Pattern: Based on Basic Teaching Skills

This first online micro teaching pattern was carried out in the previous semester, in the Even Semester of the 2020-2021 academic year. Data was collected from documentation in the semester, through lesson plans and the results of student performance assessments in carrying out teaching practices. Data also comes from observations made by researchers when students carry out teaching practices and interviews with student responses after carrying out teaching practices. The pattern of online micro teaching activities that have been planned in lesson plans and implemented in the even semester can be seen in Table 2.

Table 2. The First Pattern of Online Micro Teaching

No	Topics	Number of Meetings (2 Hours Each)
1	Curriculum analysis	1 meeting
2	Lesson planning analysis	2 meetings
3	Basic teaching skills	4 meetings
4	Developing learning resource	1 meeting
5	Micro teaching practice	8 meetings

The highest number of meetings was on the topic of micro teaching practice, in 8 meetings. This is because Micro teaching practice takes 30 minutes for each student to do online micro teaching. While other students act as observers and VHS students.

The second largest number of meetings is basic teaching skills. The consideration is because the teacher must master the basic skills of teaching when carrying out learning activities in the classroom or outside the classroom.

It is very important for teachers to have basic teaching skills such as skills in opening and closing lessons, skills in explaining lessons, skills in asking questions, skills in carrying out variations, skills in providing reinforcement, skills in managing classes, skills in teaching small groups, and skills in leading small group discussions. Therefore, as prospective teachers in the IT field, students must also master these basic skills.

Curriculum analysis was carried out for 1 meeting. The aim is to provide reinforcement to students in studying curriculum structure, basic competencies and implementing them in syllabus planning, determining the distribution of basic competencies through effective weeks, annual programs, and semester programs. Lesson planning analysis is carried out for 2 meetings to provide reinforcement to students in preparing learning objectives, learning activities by paying attention to learning models and strategies, as well as preparing evaluation instruments. This stage was only carried out in 2 meetings with the consideration that students had already obtained these competencies in other subjects. Developing learning resources provide opportunities for students to develop learning media and other teaching resources for the needs of micro teaching practices.

The Second Pattern: Based on The Strengthening of The Lesson Plan Analysis
The second pattern of online micro teaching was carried out in the Odd Semester of the 2021-2022 academic year. Data was collected from documentation through lesson plans and the results of student performance test in carrying out teaching practices. Data also comes from observations made by researchers when students carry out teaching practices, the other data from interviews with student, about their responses after carrying out teaching practices. The pattern of online micro teaching activities is designed through lesson plans to provide reinforcement to several indicators that have not been achieved in the first pattern. The results of the second pattern of micro teaching activities can be seen in Table 3.

Table 3. The Second Pattern of Online Micro Teaching

No	Topics	Number of Meetings (2 Hours Each)
1	Curriculum analysis	1 meeting
2	Lesson planning analysis	4 meetings
3	Basic teaching skills	2 meetings
4	Developing learning resource	1 meeting
5	Micro teaching practice	8 meetings

There is no difference in the highest number of meetings in the second pattern. Micro teaching practices are still carried out in 8 meetings. The technical implementation is still the same, the teacher practices the micro teaching practice for 30 minutes, some students act as observers and some other students act as vocational students.

The second largest number of meetings is lesson planning analysis. The number of meetings on this topic changed from 2 meetings in the first pattern to 4 meetings. This is because there needs to be a strengthening of several performance test indicators related to this topic. There is some additional material for strengthening lesson plans. These materials include (1) analysis of competency achievement indicators, learning objectives, and materials based on selected basic competencies; (2) analysis of learning activities according to the selected learning model; (3) analysis of evaluation planning and assessment of learning outcomes; and (4) analysis of learning tools and media.

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Curriculum analysis was carried out for 1 meeting, the aims still same when compared to the first pattern. Developing learning resources is carried out during 1 meeting, the aim is to provide opportunities for students to develop learning media or other teaching resources for the needs of micro teaching practices.

Basic teaching skills experienced have different number of meetings, from 4 meetings become 2 meetings. The consideration is that basic teaching skills can be strengthened when providing reflection and feedback after students carry out micro teaching practices.

B. *The Impact of Online Micro Teaching on The Performance of ICEE Student Teaching Practice*

The impact of Micro Teaching Online includes the impact of implementing the first pattern and the second pattern. This data is obtained from documentations, interviews, and observations of online micro teaching practices performance are processed in such a way as to determine the success or achievement of indicators of online micro teaching practice performance. These results are grouped into two categories impact, in High Performance and Medium Performance. The impact of implementing the first pattern on the Performance of Students' Micro Teaching Online Practices can be seen in Table 4. Meanwhile, the impact of implementing the second pattern can be seen in Table 5.

Table 4. The Impact of the First Pattern Implementation on the Performance of Students Online Micro Teaching Practices

No	Medium Performance	High Performance
1	Time Management	Teaching skills
2	Skills in using approaches, models, and learning methods	Mastery of concept/material
3	Ability to develop high order thinking skills	Communication skills: Verbal and non-verbal
4	Assessment skills	

Table 5. The Impact of the Second Pattern Implementation on the Performance of Students Online Micro Teaching Practices

No	Medium Performance	High Performance
1	Time Management	Teaching skills
2	Ability to develop high order thinking skills	Mastery of concept/material
3		Skills in using approaches, models, and learning methods
4		Communication skills: Verbal and non-verbal
5		Assessment skills

Through the results of Table 4 and Table 5, we can see several increases in the positive impact for the second pattern, based on the strengthening of the lesson plan analysis. Strengthening material in lesson plan analysis has an impact on students' abilities in using approaches, models, and learning methods. This is because students have more time to practice how to plan learning activities that implement the use of learning models. Students also have enough time to discuss the plans they have made in a discussion class.

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Furthermore, students can implement learning models in online micro teaching practices. Assessment skill is another indicator that increases on the second pattern. Just like the previous reasons, planning related to the analysis of learning outcomes assessment can be strengthened by adding 1 special meeting for strengthening material, workshops for preparing assessment instruments, as well as class discussions for solving problems related to assessment.

CONCLUSIONS

This study provides several conclusions related to the implementation of online micro teaching:

1. The pattern of online micro teaching activities is arranged based on the composition of the topics in the semester learning plan. There are 5 sequential topics in this activity, namely curriculum analysis, lesson planning analysis, basic teaching skills analysis, developing learning resources, microteaching practice. There are 2 patterns of activity, in the first pattern, the emphasis is on basic teaching skills, while in the second pattern, the emphasis is on lesson plans analysis.
2. There is impact of microteaching preparation by strengthening learning planning on online microteaching performance, such as improving skills in (1) using approaches, models, and learning methods; and (2) assessment.

REFERENCES

[1] H. Pratomo, "From Social Distance to Physical Distance: A Challenge for Evaluating Public Health Interventions Against COVID-19," *Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*, vol. 1, pp. 60-63, Special Issue. 2020.

[2] D. Herdiana, "Social Distancing: Indonesian Policy Reponse To the Corona Virus Disease 2019 (Covid-19)," *Jurnal Ilmu Administrasi: Media Pengembangan Ilmu Dan Praktek Administrasi*, vol. 17, no. 1, pp. 93-110, 2020.

[3] H. M. Süt, and B. Öznaçar, "Effects of COVID-19 period on educational systems and institutions," *International Journal of Curriculum and Instruction*, vol. 13, no.1, pp. 537-551, Special Issues. 2021.

[4] A. Abidah, H. N. Hidaayatullaah, R. M. Simamora, D. Fehabutar, and L. Mutakinati, "The Impact of Covid-19 to Indonesian Education and Its Relation to the Philosophy of "Merdeka Belajar", *Studies in Philosophy of Science and Education (SiPoSE)*, vol. 1, no. 1, pp. 38-49, April. 2020.

[5] S. B. Goldberg, *Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students*. US: Department of Education, 2021.

[6] G. H. Silvius and R. C. Bohn, *Planning and Organizing Instruction*. Illionis: McKnight Publishing Company, 1976.

[7] C. C. Calhoun and A. V. Finch, *Vocational education: concepts and operations*. Belmont, CA: Wadsworth Pub. Co, 1982.

[8] S. Dharma, Sugiyono, E. Mulyatiningsih, Sutopo, Irwanto, J. E. Palunsu, P. Triatmojo, and R. Siswanto, 2012. *Tantangan Guru SMK Abad 21*. Jakarta: Direktorat Pembinaan Pendidik dan Tenaga Kependidikan Pendidikan Menengah, Kementerian Pendidikan dan Kebudayaan.

[9] O. O. Kennedy, "Philosophical and sociological overview of vocational-technical education in Nigeria," *Journal of Academic Research in Business and Social Sciences*, vol. 1, pp. 167-175, 2011.

[10] P. K. Nashiroh, W. Kamdi, and H. Elmunsyah, "The effectiveness of web-programming module based on scientific approach to train logical thinking ability for students in vocational high school," in *AIP Conference Proceedings*, Vol. 1887, No. 1, AIP Publishing LLC, 2017.

[11] S. Patmanthara, and W. N. Hidayat, "Improving vocational high school students digital literacy skill through blended learning model," *Journal of Physics: Conference Series*, Vol. 1028, No. 1, IOP Publishing, 2018.

[12] A. Setiani, S. Patmanthara, H. W. Herwanto, and K. L.Wu, "Development of Web-based 2013 Curriculum Learning Set Compiler Apps for Teachers in Vocational High Schools," *Letters in Information Technology Education (LITE)*, vol. 4, no. 1, pp. 5-10, 2021.

[13] Sugiyo, Setiyawami, Sugiyono, and T. J. Rahardjo. "The Role of Vocational Education on the Advancement of Human Development in Indonesia," in Proc. *International Conference on Science and Education and Technology (ISET 2019)*, Atlantis Press, 2020.

[14] H. Rosina, V. Virgantina, A. Yahyaa, D. Vina, and B. Sutthiporn, "Vocational education curriculum: Between vocational education and industrial needs," *ASEAN Journal of Science and Engineering Education*, vol. 1, no. 2, pp. 105-110, 2021.

[15] I. W. Redhana, "Mengembangkan keterampilan abad ke-21 dalam pembelajaran kimia," *Jurnal Inovasi Pendidikan Kimia*, vol. 13, no. 1, pp. 2239-2253, 2019.

[16] S. Kendra, *21st Century Skills A Handbook.* Delhi: Laxmi Print India, 2020.

[17] Fitriati, and S. Prayudi, "21st Century Teaching and Learning: Student Teacher's Perceptions and Challenges in Higher Education Institutions," *Al Khawarizmi: Jurnal Pendidikan dan Pembelajaran Matematika*, vol. 5, no. 1, pp. 12-23, 2021.

[18] D. J. C, Tindowen, J. M. Bassig, and J. -A. Cagurangan, "Twenty-First-Century Skills of Alternative Learning System Learners" *SAGE Open*, vol. 7 no. 3, 2017. https://doi.org/10.1177/2158244017726116

[19] S. Kim, M. Raza, and E. Seidman, "Improving 21st-century teaching skills: The key to effective 21st-century learners," *Research in Comparative and International Education*, vol. 14 no. 1, pp. 99–117, 2019. https://doi.org/10.1177/1745499919829214

[20] D.A. Schmidt, E. Baran, A. D. Thompson, P. Mishra, M. J. Koehler, and T. S. Shin, "Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers." *Journal of research on Technology in Education*," vol. 42, no. 2, pp. 123-149, 2009.

[21] H. Nassaji, "Qualitative and descriptive research: Data type versus data analysis," *Language teaching research*, vol. 19, no. 2, pp. 129-132, 2015.

Model Kurikulum Praktik Kerja Lapangan Bagi Mahasiswa Program Studi Kependidikan Di Jurusan Teknik Elektro Ft Unnes

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Ringkasan

Proses belajar mengajar di perguruan tinggi merupakan suatu proses pendidikan untuk pengembangan potensi dan pegembangan karakter setiap mahasiswa untuk bidang kognitif, affektif maupun psikomotor sebagai hasil dari sinergi antara pendidikan yang berlangsung di kampus, keluarga dan masyarakat.

Capaian pembelajaran mata kuliah (CPMK) harus mampu diraih setiap mahasiswa pada proses belajar mengajar yang mereka tempuh secara efektif dan efisien agar capaian pembelajaran lulusan (CPL) mampu mereka raih dengan sebaik-baiknya, dalam arti lulus di semua mata kuliah yang ditempuhnya sejumlah minimal 144 SKS untuk program sarjana.

Nama mata kuliah yang berkarakter lapangan/industri pada program studi Pendidikan Teknik Elektro (PTE) serta program studi Pendidikan Teknik Informatika dan Komputer (PTIK) adalah Praktik Industri.

Tujuan dari penelitian ini adalah: "mengembangkan model kurikulum praktik kerja lapangan bagi mahasiswa program studi kependidikan di jurusan Teknik Elektro FT Unnes".

Pendekatan dari penelitian ini adalah kualitatif. Sumber data penelitian adalah: kurikulum tahun 2020 pada program studi PTE, kurikulum tahun 2020 pada program studi PTIK, serta dokumen-dokumen bimbingan terkait pelaksanaan Praktik Kerja Lapangan.

Analisis penelitian ini adalah deskriptif kualitatif untuk mendapatkan model yang sesuai dengan kebutuhan jurusan Teknik Elektro, Fakultas Teknik maupun DUDIKA. Didapatkan dua model kurikulum terkait pelaksanaan Praktik Kerja lapangan, yaitu: a) model manajamen praktik industri; b) model penyelenggaraan praktik industri.

Ketercapaian internalisasi kompetensi dan karakter industri pada mahasiswa pada praktik industri bisa berhasil jika didukung komitmen yang kuat dari lembaga, dalam hal ini jurusan Teknik Elektro dan atau prodi Pendidikan Teknik Elektro maupun Pendidikan Teknik Informatikan dan Komputer serta gugus Praktik Kerja lapangan Fakultas Teknik.

Kata Kunci: model kurikulum, praktik industri, DUDIKA.

1. Latar Belakang

Proses belajar mengajar di perguruan tinggi merupakan suatu proses pendidikan untuk pengembangan potensi dan pegembangan karakter setiap mahasiswa untuk bidang kognitif (pengetahuan), affektif (sikap) maupun psikomotornya (keterampilan) sebagai hasil dari sinergi antara pendidikan yang berlangsung di kampus, keluarga dan masyarakat.

Proses pendidikan tersebut ditujukan untuk pengembangan potensi mahasiswa agar memiliki kemampuan yang semakin meningkat dalam hal pengetahuan, sikap (spiritual dan sosial), serta keterampilan yang diperlukan untuk kehidupan dirinya dan kehidupan bermasyarakat pada umumnya, berbangsa, serta berkontribusi pada kesejahteraan hidup umat manusia.

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Untuk bisa lulus studinya maka setiap mahasiswa program sarjana harus mampu melewati proses belajar mengajar secara efektif dan efisien agar mereka mampu mencapai capaian pembelajaran mata kuliah (CPMK) dengan sebaik-baiknya, dalam arti lulus di semua mata kuliah yang ditempuhnya, sejumlah 144 SKS hingga maksimal 160 SKS (Kepmendiknas No. 232/U/2000, pasal 5).

Program studi Pendidikan Teknik Elektro (PTE) dan pogram studi Pendidikan Teknik Informatika dan Komputer (PTIK) merupakan dua program studi kependidikan yang ada di Jurusan Teknik Elektro Fakultas Teknik Universitas Negeri Semarang. Dinamakan program studi kependidikan karena kurikulum dan lulusannya dididik dan diharapkan bisa menjadi pendidik yang profesional setelah mereka lulus.

Untuk memperkuat bekal kompetensi dan karakter industri, di PTE maupun PTIK ada mata kuliah Praktek Industri (PI). Deskripsi mata kuliah Praktek Industri (PTE) adalah: "Pelaksanaan Praktik Kerja Lapangan (praktik industri) selama 2 bulan disesuaikan dengan rumpun studi yang dipilih yang ada pada buku panduan, membuat laporan, ujian PKL" (Teknik Elektro-PTIK, 2020). Sedangkan Deskripsi mata kuliah Praktik Industri di PTIK adalah: "Mata kuliah ini merupakan kesempatan bagi mahasiswa untuk mempraktekan ilmu yang sudah didapat diperkuliahan pada bidang industri" (Teknik Elektro-PTIK, 2020).

Praktek Kerja Lapangan (PKL) atau Praktik Industri (PI) adalah Praktek Kerja yang dikerjakan secara perorangan ataupun berkelompok (2 hingga 5 mahasiswa) untuk memberikan pengalaman praktis penerapan bidang keahlian dengan mempelajari suatu sistem pada suatu perusahaan/industri atau memberikan alternatif solusi atas permasalahan yang ada di lapangan dan melaporkannya dalam bentuk laporan karya ilmiah (Fakultas Teknik, 2020).

Bobot SKS untuk mata kuliah PKL/PI ini adalah 4 SKS dengan tujuan memberikan pengalaman kerja langsung (real) kepada mahasiswa dalam rangka menanamkan (internalisasi) iklim kerja positif yang berorientasi pada peduli mutu proses dan hasil kerja, serta memberikan bekal etos kerja yang tinggi bagi mahasiswa untuk memasuki dunia kerja dalam menghadapi tuntutan pasar kerja global. Dengan demikian mahasiswa diharapkan bisa mencapai tujuan PKL tersebut sehingga dapat melakukan komunikasi terhadap konsumen.

Pada dasarnya lingkungan kampus sangat jauh berbeda dengan lingkungan kerja. Di kampus mahasiswa masih memiliki waktu yang longgar untuk melakukan suatu hal di waktu jam perkuliahan. Berbeda dengan ketika mahasiswa berada dalam lingkungan kerja, mereka harus menggunakan waktu secara efektif dan efisien sehingga pekerjaan dapat terselesaikan dengan cepat, karena waktu juga menentukan kepercayaan konsumen terhadap pekerjaan yang dihasilkan.

Pada pelaksanaan program PKL, hari dan jam masuk kerja menyesuaikan jam kerja kantor DUDIKA (Dunia Usaha, Dunia Industri dan Dunia Kerja) masing-masing. Suasana kerja para mahasiswa juga sama dengan karyawan biasa.

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Ketika di suatu industri produksi barang ataupun jasa, tidak jarang ada konsumen yang ragu ketika mahasiswa PKL yang melayaninya. Tetapi dalam hal ini, pihak DUDIKA sering sangat membantu dengan meyakinkan konsumen terhadap kemampuan mahasiswa PKL untuk melayani mereka.

Untuk tercapainya program PKL sesuai dengan tujuan kurikulum, mahasiswa wajib mematuhi segala peraturan yang berlaku dalam DUDIKA atau tempat melaksanakan program PKL. Mahaiswa juga tidak dibenarkan menolak tugas yang diberikan pembimbing lapangan selama tidak menyimpang dari tujuan PKL.

Durasi waktu yang harus ditempuh mahasiswa untuk PKL sangat bervariasi bergantung pada kebijakan kampus dan kesediaan DUDIKA yang menjadi tempat PKL. Berakhirnya PKL, semestinya tidak hanya berarti kembalinya mahasiswa ke kampus lagi tetapi harus memiliki arti telah didapatkannya suasana kerja DUDIKA sekaligus tantangannya. Ketika mahasiswa ditarik dari lokasi PKL, bukan berarti internalisasi nilai-nilai kerja DUDIKA selesai. Mahasiswa diharapkan bisa merasakan betul, karakter pekerjaan di DUDIKA sekaligus bentuk tanggung jawabnya dalam menyelesaikan pekerjaan tersebut.

Dari sekian banyak mahasiswa yang ada di prodi PTE maupun PTIK, tidak semuanya mendapatkan lokasi PKL yang memadai, dalam arti jenis pekerjaan yang dikerjakan sehari-hari mampu memberikan bekal kemampuan yang kuat sesuai kompetensinya. Tidak jarang terjadi mahasiswa mendapatkan lokasi PKL yang jauh dari idealisme untuk penguatan kompetensi keilmuan.

Ketidakmaksimalan mahasiswa mendapatkan bekal kompetensi yang memadai di lokasi PKL tidak semata-mata karena kurang kuatnya karakter dan tantangan kerja yang ada di DUDIKA, tetapi ada kalanya karena durasi waktu PKL yang relatif singkat hanya selama 1 hingga maksimal 1,5 bulan, sehingga belum cukup kuat karakter dan tantangan kerja mampu terinternalisasi dengan baik pada mahasiswa.

Melihat adanya persoalan pada kualitas objek/lokasi PKL dan persoalan durasi yang dirasa kurang, ada baiknya jurusan Teknik Elektro ataupun lembaga yang bertanggung jawab untuk PKL bisa mengkaji lebih jauh model kurikulum yang tepat supaya tujuan untuk membekali mahasiswa dengan suasana kerja dan tantangan kerja di DUDIKA bisa tercapai.

Selama ini mahasiswa cenderung mencari lokasi PKL sendiri, sementara PKL dijadwalkan pada semester antara yang relatif singkat waktunya hanya sekitar 1 bulan maksimal 1,5 bulan. Akan lebih baik jika mahasiswa tidak harus mencari lokasi PKL sendiri tetapi mahasiswa tinggal memilih atau diarahkan untuk bisa PKL pada DUDIKA yang menjadi mitra Jurusan Teknik Elektro. Untuk waktu yang selama ini dirasa terlalu singkat, bisa diupayakan untuk lebih panjang waktunya dengan cara mengatur waktu kuliah pada semester berikutnya di kampus.

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Tujuan dari penelitian ini adalah: "mengembangkan model kurikulum praktik kerja lapangan bagi mahasiswa program studi kependidikan di jurusan Teknik Elektro FT Unnes". Hasil penelitian ini diharapkan bisa memberikan masukan dan rekomendasi model kurikulum yang lebih memaksimalkan capaian pembelajaran PKL.

B. Tinjauan Pustaka

Sesuai dengan buku Panduan Praktik Kerja Lapangan (PKL) / Praktik Industri (PI) Fakultas Teknik Unnes 220, tujuan umum yang akan dicapai dalam pelaksanaan PKL/PI adalah:

a) Memberi kesempatan kepada mahasiswa untuk mengenal dan mengetahui secara langsung tentang pola kerja di suatu institusi, seperti perusahaan/industri, laboratorium/workshop dan sejenisnya sebagai salah satu penerapan disiplin dan pengembangan ilmu. Di samping itu, mahasiswa dapat mempelajari aspek-aspek kemandirian ataupun kewirausahaan dari berbagai tempat kerja parktik tersebut, sehingga berguna bagi pengembangan karier dikemudian hari.

b) Memperoleh wawasan tentang dunia kerja yang diperoleh di lapangan. Mahasiswa akan merasakan secara langsung perbedaan antara teori di bangku kuliah dengan yang ada di lapangan. PKL/PI sangat membantu mahasiswa dalam meningkatkan pengalaman kerja sehingga kelak dapat menjadi tenaga kerja yang profesional.

c) Memahami konsep-konsep non-akademis di dunia kerja. PKL/PI akan memberikan pendidikan berupa etika kerja, disiplin, kerja keras, profesionalitas, dan lain-lain.

d) Meningkatkan hubungan kerjasama perguruan tinggi dan dunia kerja. PKL/PI dapat menjadi media promosi dunia akademik pada dunia kerja. Di samping itu membantu perusahaan/Industri mendapatkan tenaga kerja akademis yang sesuai dengan kualifikasinya.

Praktek Kerja Lapangan adalah salah satu bentuk emplementasi secara sistematis dan sinkron antara program pendidikan di sekolah dengan program penguasaan keahlian yang diperoleh melalui kegiatan kerja secara langsung didunia kerja untuk mencapai tingkat keahlian tertentu.

Disamping dunia usaha, Praktek Kerja Lapangan (PKL) Dapat memberikan keuntungan pada pelaksanaan itu sendiri yaitu sekolah, karena keahlian yang tidak diajarkan di sekolahan bias didapat didunia usaha , sehingga dengan adanya Praktek Kerja Lapangan (PKL) dapat meningkatkan mutu dan relevensi Pendidikan Menengah Atas yang dapat diarahkan untuk mengembangkan suatu system yang mantap antara dunia pendidikan dan dunia usaha.

Maksud dilaksanakannya Praktek Kerja Lapangan (PKL) yang diwujudkan dalam kerja disuatu perusahaan. Selain sebagai salah satu syarat tugas akhir Praktek Kerja Lapangan (PKL), Praktek Kerja Lapangan (PKL) juga sebagai kegiatan Siswa untuk mencari pengalaman kerja sebelum memasuki dunia kerja yang sesungguhnya, yang tercermin dalam Pendidikan Nasional yang berdasarkan Pancasila yang bertujuan meningkatkan kecerdasan, kreativitas, dan ketrampilan agar dapat menumbuhkan manusia yang dapat membangun dirinya sendiri serta bertanggung jawab atas Pembangunan Bangsa dan Negara dalam pencapaian perekonomian meningkat dan kehidupan yang makmur.

Karena pertumbuhan perekonomian yang meningkat, didukung pula oleh tumbuhnya persaingan dibidang industri dan teknologi yang memaksa kita untuk ikut terjun kedalam dunia industri, bisnis, dan perdagangan.

Tujuan Khusus yang akan dicapai dalam pelaksanaan PKL/PI adalah:

a. Menjelaskan manajemen industri dan atau pengelolaan kelembagaan serta tenaga kerja yang ada di institusi/lambaga/laboratorium/workshop/perusahaan/industri yang ditempati.

b. Menemukan dan atau menyelesaikan suatu masalah tertentu serta menganalisisnya secara mendalam yang dituangkan dalam laporan PKL/PI dan apabila memungkinkan, kasus tersebut dapat diangkat menjadi tugas akhir atau Skripsi.

C. Metode Pelaksanaan

Penelitian ini yang ditujukan untuk mencari model Praktik Kerja Lapangan pada program studi kependidikan di jurusan Teknik Elektro dilakukan dengan pendekatan kualitatif.

Sumber data penelitian adalah: kurikulum tahun 2020 pada program studi Pendidikan Teknik Elektro, kurikulum tahun 2020 pada program studi Pendidikan Teknik Informatika dan Komputer, serta dokumen-dokumen bimbingan terkait pelaksanaan Praktik Kerja Lapangan.

Analisis penelitian ini adalah deskriptif kualitatif berdasar data-data yang terkumpul. Dalam hal pengembangan model kurikulum praktik kerja lapangan bagi mahasiswa program studi kependidikan di Jurusan Teknik Elektro FT Unnes, maka data-data tersebut akan dideskripsikan untuk mendapatkan model yang sesuai dengan kebutuhan jurusan Teknik Elektro, Fakultas Teknik maupun Dunia Usaha, Dunia Industri dan Dunia Kerja.

D. Hasil Penelitian

Selama ini Praktik Kerja Lapangan yang pada program studi Pendidikan Teknik Elektro (PTE) dan pogram studi Pendidikan Teknik Informatika dan Komputer (PTIK) dinamakan mata kuliah Praktik Industri (PI) telah lama berlangsung.

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Praktik industri adalah salah satu bentuk implementasi secara sistematis dan sinkron antara program pendidikan di kampus dengan program penguasaan keahlian yang diperoleh melalui kegiatan kerja secara langsung didunia kerja untuk mencapai tingkat keahlian tertentu. Hasil yang didapatkan selama pelaksanaan PKL/PI adalah:

1. Praktik industri memberi kesempatan kepada mahasiswa untuk mengenal dan mengetahui secara langsung tentang pola kerja di suatu institusi, seperti perusahaan/industri, laboratorium/workshop dan sejenisnya sebagai salah satu penerapan disiplin dan pengembangan ilmu.

2. Dari Praktik industri mahasiswa dapat mempelajari aspek-aspek kemandirian ataupun kewirausahaan dari berbagai tempat kerja parktik tersebut, sehingga berguna bagi pengembangan karier dikemudian hari.

3. Dari Praktik industri mahasiswa memperoleh wawasan tentang dunia kerja yang diperoleh di lapangan. Mahasiswa akan merasakan secara langsung perbedaan antara teori di bangku kuliah dengan yang ada di lapangan.

4. Praktik industri sangat membantu mahasiswa dalam meningkatkan pengalaman kerja sehingga kelak dapat menjadi tenaga kerja yang profesional.

5. Dari Praktik industri mahasiswa bisa memahami konsep-konsep non-akademis di dunia kerja. PI akan memberikan pendidikan berupa etika kerja, disiplin, kerja keras, profesionalitas, dan lain-lain.

6. Praktik industri akan meningkatkan hubungan kerjasama perguruan tinggi dan dunia kerja.

7. Praktik industri dapat menjadi media promosi dunia akademik pada dunia kerja sekaligus membantu perusahaan/Industri mendapatkan tenaga kerja akademis yang sesuai dengan kualifikasinya.

8. Pada panduan Praktik Kerja Lapangan (PKL)/Praktik Industri (PI) tidak dideskripsikan secara khusus bahwa praktik industri yang dikhususkan untuk mahasiswa prodi kependidikan, seharusnya tujuan praktik industri setelah didapatkannya internalisasi karakter industri adalah memiliki bekal yang memadai untuk mentransfer karakter industri pada anak didiknya di sekolah.

9. Gugus PKL FT belum sepenuhnya membangun kemitraan dengan DUDIKA hingga terbangunnya MoU untuk keterlaksanaan praktik industri atau belum memiliki daftar mitra DUDIKA yang bisa dimanfaatkan mahasiswa saat membutuhkan DUDIKA untuk praktik industri.

10. Prodi PTE dan atau PTIK tidak/belum memberikan pilihan DUDIKA yang bisa menjadi objek pelaksanaan praktik industri untuk mahasiswa walaupun selama ini sudah dibangun kesepahaman dengan beberapa DUDIKA.

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11. Durasi praktik industri sesuai dengan karakter beberapa DUDIKA sebenarnya belum cukup jika praktik industri hanya dilaksanakan selama 1 bulan, sehingga hal ini perlu ditinjau kembali oleh gugus PKL FT. Dengan demikian Perlu dilakukan kajian oleh unit PKL maupun prodi untuk ketercukupan durasi waktu dengan mempertimbangkan perkuliahan blok setelah dilakukannya PI oleh mahasiswa

12. Kurangnya dukungan manajerial sistem untuk keberhasilan PI di lapangan

Mengingat keragaman luaran program studi pendidikan di Lembaga Pendidikan Tenaga Kependidikan (LPTK), pemetaan kompetensi lulusan yang berkualitas sangat dibutuhkan untuk menyiapkan guru profesional. Dengan asumsi mahasiswa telah menguasai kompetensi akademik yang dipersyaratkan dan dipandang sebagai individu yang telah matang (dewasa), maka penguatan kompetensi lewat Praktik Kerja Lapangan sangat bermanfaat untuk mematangkan kompetensinya.

Kolaborasi yang sinergis antara LPTK, pemerintah, dan DUDIKA merupakan kunci keberhasilan program yang harus diwujudkan secara terencana, harmoni dan berkelanjutan, yang diarahkan pada tujuan: (a) perkembangan dan pertumbuhan mahasiswa secara optimal, (b) perkembangan profesionalisme guru dan calon guru.

Sarjana Pendidikan atau disingkat dengan S.Pd merupakan gelar yang didapatkan oleh mahasiswa setelah lulus dari kuliah kependidikan. Semua mahasiswa yang mendapatkan gelar tersebut adalah mahasiwa yang kuliah di pendidikan dengan jurusannya masing-masing. Tujuannya satu, bagaimana cara untuk menghasilkan tenaga pendidik yang berkualitas. Hal tersebut merupakan esensi dasar dari dari Lembaga Pendidikan Tenaga Keguruan (LPTK) di mana para lulusannya nanti akan diterjunkan langsung untuk mengajar di sekolah formal maupun informal sebagai sarjana pendidikan yang tidak hanya pinter mengajar tetapi juga harus didukung oleh kompetensi bidang studi yang mumpuni.

Terkait upaya untuk menyiapkan sarjana pendidikan yang tidak hanya mumpuni dibidang pedagogik tetapi juga mumpuni dibidang kompetensi kejuruannya, dibutuhkan model manajemen atau pengelolaan Praktik Industri yang secara nyata mampu menyiapkan sistem manajemen maupun sistem penyelenggaraan Praktik Industri yang tidak hanya menjadikan layanan Praktik Industri lebih tertata tetapi lebih dari itu bisa menjadi model manajemen yang memudahkan mahasiswa sekaligus lembaga maupun dosen pembimbing dalam proses penyelenggaraan Praktik Industri.

Model manajemen yang dikembangkan untuk kepentingan Praktik Industri digambarkan:
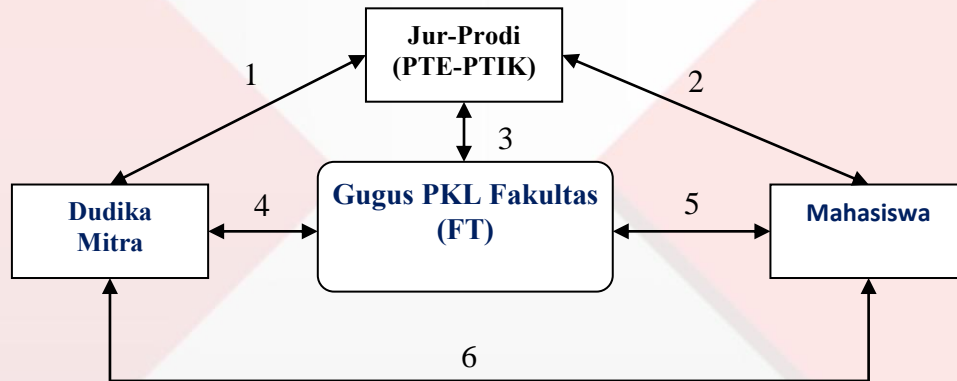
Gambar 1. Model Manajemen Praktik Industri

Model manajemen praktik industri yang dikembangkan memiliki mekanisme kerja dan koordinasi sebagai berikut:

1. Untuk membangun sistem kesiapan dan ketersediaan "mitra Praktik Industri" maka Jurusan Teknik Elektro dan atau program studi Pendidikan Teknik Elektro (PTE) serta pogram studi Pendidikan Teknik Informatika dan Komputer (PTIK) harus bisa membangun komunikasi sekaligus membuat kesepakatan dalam bentuk MoU dengan DUDIKA sebagai tempat praktik industri bagi mahasiswa program studi PTE dan PTIK.

2. Untuk membangun kepercayaan sekaligus kesiapan layanan penyelenggaraan praktik industri maka Jurusan Teknik Elektro dan atau program studi PTE maupun PTIK harus membangun komunikasi yang baik dengan mahasiswa dalam bentuk:

   a. Informasi pada mahasiswa tentang kategori DUDIKA yang bisa menjadi lokasi praktik industri sekaligus informasi tentang kesiapan DUDIKA mitra yang bisa menjadi lokasi praktik industri bagi mahasiswa.

   b. Pembekalan pada mahasiswa yang akan melaksanakan praktik industri dengan materi tentang tujuan pelaksanaan praktik industri, karakter industri yang harus terinternalisasi pada mahasiswa serta ketaatan mahasiswa tata-tertib yang berlaku di industri mitra dan pemenuhan tanggung jawab yang harus mampu diselesaikan oleh mahasiswa yang diberikan oleh industri mitra.

3. Jurusan Teknik Elektro dan atau program studi PTE maupun PTIK harus membangun komunikasi dan koordinasi yang baik dengan gugus Praktik Kerja Lapangan (PKL) yang ada di Fakultas Teknik. Komunikasi dilakukan dalam rangka membangun kerjasama untuk mewujudkan DUDIKA mitra, dimana

realisasinya bisa lewat jurusan/prodi dan atau lewat fakultas. Termasuk dalam komunikasi dan koordinasi ini adalah pembekalan mahasiswa untuk pelaksanaan praktik industri.

4. Selain Jurusan TE dan atau prodi PTE maupun PTIK, diharapkan Fakultas Teknik mampu melakukan komunikasi dengan DUDIKA untuk menyiapkan lokasi praktik industri bagi mahasiswa yang dilengkapi dengan MoU. Penyiapan DUDIKA mitra oleh FT diharapkan mampu melengkapi sekaligus menambah DUDIKA mitra yang dibangun dan disipakan oleh Jurusan TE dan atau prodi PTE maupun PTIK.

5. Sebagai penanggung jawab manajemen PKL, gugus PKL Fakultas Teknik membangun komunikasi yang baik dengan mahasiswa dalam bentuk:

    c. Informasi pada mahasiswa tentang DUDIKA mitra yang bisa menjadi lokasi pilihan praktik industri bagi mahasiswa.

    d. Pembekalan pada mahasiswa yang akan melaksanakan praktik industri.

6. Walaupun penyiapan DUDIKA mitra sudah menjadi tanggung jawab jurusan TE dan atau prodi PTE maupun PTIK serta gugus PKL FT, dimungkinkan mahasiswa secara mandiri bisa mencari lokasi praktik industri. Selain itu pada sistem manajemen praktik industri ini diharapkan mahasiswa selalu melakukan koordinasi dengan DUDIKA mitra baik sebelum penerjunan, selama praktik industri maupun pasca praktik industri setelah mahasiswa ditarik ke kampus.

Selain model manajemen praktik industri, untuk mendukung kelancaran pelaksanaan praktik industri maka perlu dikembangkan model pelaksanaan praktik industri. Model ini dikembangkan dengan maksud untuk memberikan arah dan kepastian pada mahasiswa tentang apa yang harus mereka lakukan agar praktik industri yang mereka lakukan mampu memberikan hasil terbaik baik bagi mahasiswa maupun bagi lembaga, dalam hal ini jurusan Teknik Elektro dan atau prodi Pendidikan Teknik Elektro maupun Pendidikan Teknik Informatikan dan Komputer serta gugus Praktik Kerja lapangan Fakultas Teknik.

Model penyelenggaraan yang dikembangkan untuk kepentingan Praktik Industri digambarkan:
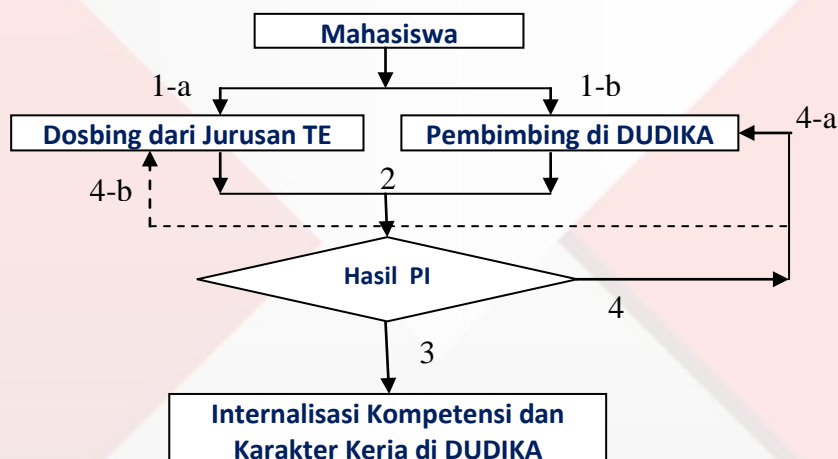
Gambar 2. Model Penyelenggaraan Praktik Industri

Model pelaksanaan praktik industri yang dikembangkan memiliki mekanisme kerja sebagai berikut:

1. Selama mahasisiwa melaksanakan praktik industri maha mahasiswa harus selalu berkomunikasi dengan dosen pembimbing (dosbing) dan pembimbing lapangan yang ditunjuk oleh DUDIKA.

   a. Komunikasi dengan dosen dilakukan dalam rangka pembimbingan agar mahasiswa mampu melaksanakan praktik industri dengan sebaik-baiknya.

   b. Komunikasi dengan pembimbing di DIDUKA dimaksudkan agar tujuan internalisasi kompetensi dan karakter industri mampu dilaksanakan dengan baik oleh mahasiswa lewat bimbingan dan arahan di lapangan.

2. Untuk mendapatkan hasil terbaik pada pelaksanaan praktik industri maka dosen pembimbing bersama-sama dengan pembimbing lapangan di DUDIKA harus mengarahkan sekaligus membimbing mahasiswa agar internalisasi kompetensi dan karakter industri mampu dikuasai dengan baik oleh mahasiswa.

3. Hasil Praktik Industri (PI) harus bisa termonitor "sudah berhasil" atau "belum berhasil" sesuai tahapannya. Jika sudah berhasil maka bisa dipastikan internalisasi kompetensi dan karakter industri telah dikuasai dengan baik oleh mahasiswa.

4. Jika belum berhasil maka baik dosen pembimbing maupun pembimbing lapangan di DUDIKA harus bisa mengarahkan dan membimbing agar praktik industrinya berhasil.

   a. Jika hasil monitor pembimbing lapangan terlihat bahwa internalisasi kompetensi dan karakter industri belum dikuasai dengan baik oleh mahasiswa, maka langkah-2 harus lebih diintensifkan sehingga capaian internalisasi kompetensi dan karakter industri akhirnya mampu dikuasai dengan baik oleh mahasiswa.

b. Jika pembimbing lapangan memberi informasi kepada dosen bahwa internalisasi kompetensi dan karakter industri belum dikuasai dengan baik oleh mahasiswa, maka dosen pembimbing harus lebih optimal pada tahapan atau langkah-2 sehingga capaian internalisasi kompetensi dan karakter industri akhirnya mampu dikuasai dengan baik oleh mahasiswa.

5. Penutup

Simpulan yang didapat dari penelitan ini adalah:

1. Berdasar analisis dan kajian data-data dokumentasi maupun lapangan diketahui bahwa dibutuhkan penanganan yang lebih intensif untuk pelaksanaan Praktik Kerja Lapangan atau Praktik Industri.

2. Agar pelaksanaan Praktik Kerja Lapangan atau Praktik Industri berhasil, dikembangkan dua model kurikulum pelaksanaan yaitu:
   a. Model manajemen praktik industri
   b. Model pelaksanaan praktik industri

3. Untuk keberhasilan implementasi dua model kurikulum tersebut dibutuhkan komitmen yang kuat dari lembaga, dalam hal ini jurusan Teknik Elektro dan atau prodi Pendidikan Teknik Elektro maupun Pendidikan Teknik Informatikan dan Komputer serta gugus Praktik Kerja lapangan Fakultas Teknik.

DAFTAR PUSTAKA

Azhar. 2009. Kondisi LPTK sebagai Pencetak Guru Yang Profesional. Tabularasa-Jurnal Pendidikan PPs Unimed, Vol.6 No.1 Juni 2009.pp (113).

Fakultas Teknik. 2020. Buku Panduan Praktik Kerja Lapangan (PKL)/Praktik Industri (PI). Semarang: FT Unnes.

Omstein. Levin. Gutek. 2011 Foundations of Educatio. Canada : Cengange Learning   Guru dengan 6 Motivasi.   http://www.kompasiana.com/tiuruli_sitorus/guru-dengan-6-motivasi_552b7b6a6ea834c16a8b4584) diakses : Sabtu 11 Februari 2017 Pukul 23.00

Guru Profesional dan Tantangan Global. http://aceh.tribunnews.com/2016/11/24/guru-profesional-dan-tantangan-global. Diakses : Sabtu 11 Februari 2017 Pukul 24.00

Keputusan Menteri Pendidikan Nasional Republik Indonesia Nomor 232/U/2000 Tentang Pedoman Penyusunan Kurikulum Pendidikan Tinggi dan Penilaian Hasil Belajar Mahasiswa.

Kualitas Pendidikan di Indonesia. https://pramithasari27. wordpress.com/ pendidikan/kualitas-pendidikan-di-indonesia/) diakses: Jumat 03 Maret 2017 Pukul: 12:40

Teknik Elektro-PTE. 2020. Kurikulum Unnes 2020 Merdeka Belajar-Kampus Merdeka, Program Studi Sarjana Pendidikan Teknik Elektro (PTE)

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Teknik Elektro-PTIK. 2020. Kurikulum Unnes 2020 Merdeka Belajar-Kampus Merdeka, Program Studi Sarjana Pendidikan Teknik Informatika dan Komputer (PTIK).

Upaya Pemerintah dalam Meningkatkan Kualitas Guru di Indonesia. https://oioey.wordpress.com/2016/07/19/upaya-pemerintah-dalam-meningkatkan-kualitas-guru-di-indonesia/) diakses: Jumat 03 Maret 2017 Pukul: 12:42

https://gamelab.id/news/199-keuntungan-yang-diperoleh-mahasiswa-saat-praktek-kerja-lapangan.

http://edukasi.kompas.com/read/2013/01/19/07432623/Penguatan LPTK Perlu Dukungan Pemerintah (diunduh tanggal 13 januari 2021).

http://seputarpendidikan003.blogspot.com/2013/06/pengertian-mutupendidikan. tml#. UuX9PfsxXIU (diunduh tanggal 10 Januari 2021)

https://www.kompasiana.com/jhonmiduk/dilema-lulusan-sarjana pendidikan_ 575f3984 c423bdef0c3ba427

Fieldwork Practice Curriculum Model For Students Of Educational Study Programs In Electrical Engineering Ft Unness

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The process of teaching and learning in college is an educational process for the development of potential and development of the character of each student for the cognitive, affective and psychomotor fields as a result of the synergy between education that takes place on campus, family and community. The achievement of course learning (CPMK) must be able to be achieved by every student in the teaching and learning process that they take effectively and efficiently so that the achievement of graduate learning (CPL) is able to achieve as well as possible, in the sense of graduating in all courses that he took a minimum of 144 credits for undergraduate programs. The name of courses of field / industrial character in the Electrical Engineering Education (PTE) study program as well as the Informatics and Computer Engineering Education (PTIK) study program is Industrial Practice. Objective: "developing a fieldwork practice curriculum model for students of educational study programs in the electrical engineering department of FT Unnes". Method: The approach of this research is qualitative. The sources of research data are: curriculum in 2020 in PTE study program, curriculum in 2020 in PTIK study program, as well as guidance documents related to the implementation of Field Work Practices. This research analysis is qualitative descriptive to get a model that suits the needs of electrical engineering majors, Faculty of Engineering and DUDIKA. Results: Two curriculum models are obtained related to the implementation of fieldwork practices, namely: a) the management model of industrial practice; b) model of implementation of industrial practices. Conclusions: The achievement of internalization of competence and character of industry in students in industrial practice can be successful if supported by a strong commitment from the institution, in this case majoring in Electrical Engineering and or Electrical Engineering Education program as well as Informatics and Computer Engineering Education and field work practice group of the Faculty of Engineering.

Keywords: curriculum model, industry practice, DUDIKA

BACKGROUND

The process of teaching and learning in college is an educational process for the development of potential and development of the character of each student for the cognitive field (knowledge), affective (attitude) and psychomotor (skills) as a result of the synergy between education that takes place on campus, family and community.

The education process is aimed at developing the potential of students to have an increasing ability in

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terms of knowledge, attitudes (spiritual and social), as well as skills necessary for their lives and community life in general, nationality, and contribute to the welfare of human life.

To be able to pass their studies, every undergraduate student must be able to pass the teaching and learning process effectively and efficiently so that they are able to achieve the achievement of course learning (CPMK) as well as possible, in the sense of graduating in all courses taken, a total of 144 credits to a maximum of 160 credits (Kepmendiknas No. 232/U/2000, article 5).

Electrical Engineering Education (PTE) study program and Informatics and Computer Engineering Education (PTIK) study program are two educational study programs in the Department of Electrical Engineering, Faculty of Engineering, Semarang State University. Named educational study program because the curriculum and graduates are educated and expected to become professional educators after they graduate.

To strengthen the provision of competence and character of the industry, in PTE and PTIK there are Industrial Practice (PI) courses. The description of the Industrial Practice (PTE) course is: "Implementation of FieldWork Practices (industrial practice) for 2 months adjusted to the selected study family in the guidebook, making reports, PKL examinations" (Electrical Engineering- PTIK, 2020). While the description of Industrial Practice courses at PTIK is: "This course is an opportunity for students to practice the knowledge that has been obtained in the industrial field" (Electrical Engineering-PTIK, 2020).

FieldWork Practice (PKL) or Industrial Practice (PI) is a Work Practice that is done individually or in groups (2 to 5 students) to provide practical experience applying areas of expertise by studying a system in a company / industry or providing alternative solutions to problems in the field and reporting them in the form of scientific work reports (Faculty of Engineering, 2020).

The weight of credits for PKL / PI courses is 4 credits with the aim of providing direct work experience (real) to students in order to instill (internalization) a positive work climate oriented to the quality of processes and work outcomes, and provide high work ethic for students to enter the workforce in the face of the demands of the global job market. Thus students are expected to achieve the PKL's goals so that they can communicate to consumers.

Basically the campus environment is very different from the work environment. On campus students still have a loose time to do something during lecture hours. Unlike when students are in a work environment, they must use time effectively and efficiently so that the work can be completed quickly, because time also determines consumer confidence in the work produced.

In the implementation of the PKL program, the day and hours of work adjust the working hours of the DUDIKA office (Business World, Industrial World and The World of Work) respectively. The working atmosphere of the students is also the same as ordinary employees. When in an industry of production of goods or services, not infrequently there are consumers who hesitate when street vendors who serve it. But in this case, DUDIKA is often very helpful by convincing consumers of the ability of street vendors to serve them.

To achieve the PKL program in accordance with the objectives of the curriculum, students must comply with all applicable regulations in DUDIKA or where to implement the PKL program. Mahaiswa is also not allowed to refuse the duties given by field supervisors as long as they do not deviate from the PKL's objectives.

The duration of time that students must take for street vendors varies greatly depending on campus policy and the willingness of DUDIKA which is the place of street vendors. The end of street vendors, should not only mean the return of students to campus again but must have the meaning of having obtained the work atmosphere of DUDIKA as well as the challenges. When students are withdrawn from the PKL location, it does not mean the internalization of DUDIKA work values is completed. Students are expected to feel right, the character of the work at DUDIKA as well as the form of responsibility in completing the work.

Of the many students in PTE and PTIK study programs, not all of them get adequate street vendor locations, in the sense that the type of work done daily is able to provide strong ability according to their competence. Not infrequently students get the location of street vendors who are far from idealism for strengthening scientific competence.

The inaccuracy of students getting adequate competence at the street vendor location is not solely due to the lack of character and work challenges that exist in DUDIKA, but there are times because the duration of the street vendor's

time is relatively short only for 1 to a maximum of 1.5 months, so it is not strong enough character and work challenges can be internalized properly in students.

Seeing the problem in the quality of objects / locations of street vendors and the problem of duration that is considered lacking, it is good for the Department of Electrical Engineering or institutions responsible for street vendors can further study the right curriculum model so that the goal to equip students with work atmosphere and work challenges at DUDIKA can be achieved.

During this time students tend to look for the location of street vendors themselves, while street vendors are scheduled in semesters between relatively short time only about 1 month maximum of 1.5 months. It would be better if students do not have to find their own street vendor location but students just choose or are directed to be able to PKL at DUDIKA which is a partner of the Department of Electrical Engineering. For a time that has been felt too short, it can be attempted for longer time by arranging the next semester of college time on campus.

The purpose of the study is: "developing a fieldwork practice curriculum model for students of educational study programs in the electrical engineering department of FT Unnes". The results of this study are expected to provide input and recommendations of curriculum models that further maximize the learning achievements of street vendors.

OBJECTIVE

In accordance with the Guidebook of FieldWork Practices (PKL) / Industrial Practice (PI) of the Faculty of Engineering Unnes 220, the general objectives to be achieved in the implementation of PKL / PI are:
a) Provide opportunities for students to know and know firsthand about working patterns in an institution, such as companies / industries, laboratories / workshops and the like as one of the

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application of disciplines and the development of science. In addition, students can learn aspects of independence or entrepreneurship from various parktic workplaces, so it is useful for career development in the future.

b) Gain insight into the world of work gained in the field. Students will feel firsthand the difference between the theory in college and those in the field. PKL / PI is very helpful for students in improving work experience so that later they can become a professional workforce.

c) Understand non-academic concepts in the world of work. PKL / PI will provide education in the form of work ethics, discipline, hard work, professionalism, and others.

d) Improve the cooperative relationship between universities and the world of work. PKL / PI can be a medium of promotion of the academic world in the world of work. In addition, it helps companies / industries get an academic workforce that is in accordance with their qualifications.

FieldWork Practice is one form of systematic and synchronous implementation between educational programs in schools with mastery programs of expertise obtained through work activities directly in the world of work to achieve a certain level of expertise.

In addition to the business world, Field Work Practices (PKL) can provide benefits to the implementation itself, namely schools, because skills that are not taught in schools can be obtained in the business world, so that with the Practice of Field Work (PKL) can improve the quality and relevensi of Upper Secondary Education that can be directed to develop a steady system between the world of education and the business world.

The purpose of the implementation of Field Work Practices (PKL) is realized in the work of one company. In addition to being one of the final task requirements of FieldWork Practice (PKL), FieldWork Practice (PKL) is also an activity of students to seek work experience before entering the real world of work, which is reflected in National Education based on Pancasila which aims to increase intelligence, creativity, and skills in order to foster humans who can build themselves and be responsible for the development of the nation and state in achieving The economy is improving and the life is prospering.

Because of the increasing economic growth, supported by the growing competition in the field of industry and technology that forces us to participate in the world of industry, business, and trade.

The specific objectives to be achieved in the implementation of PKL / PI are:

a. Describes industrial management and/or institutional and labor management in institutions/lambaga/laboratories/workshops/occupied companies/industries.

b. Find and/or resolve a particular problem and analyze it in depth as outlined in the PKL/PI report and where possible, the case may be elevated to the final task or thesis.

METHOD

This research aimed at finding a fieldwork practice model in the education study program in the department of Electrical Engineering is carried out with a qualitative approach.

The sources of research data are: curriculum in 2020 in Electrical Engineering Education study program, curriculum in 2020 in Informatics and Computer Engineering Education study program, as well as guidance

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documents related to the implementation of Field Work Practices.

This research analysis is qualitative descriptive based on the data collected. In terms of the development of fieldwork practice curriculum model for students of educational study program in the Department of Electrical Engineering FT Unnes, then the data will be described to get a model that suits the needs of the department of Electrical Engineering, Faculty of Engineering and Business, Industrial World and World of Work.

RESULTS

During this time the FieldWork Practice in the Electrical Engineering Education (PTE) study program and the Informatics and Computer Engineering Education (PTIK) study program called industrial practice (PI) courses have been going on for a long time.

Industrial practice is one form of systematic and synchronous implementation between on-campus education programs with mastery programs acquired through direct work activities in the world of work to achieve a certain level of expertise. The results obtained during the implementation of PKL / PI are:

1. Industrial practice provides opportunities for students to know and know firsthand about work patterns in an institution, such as companies / industries, laboratories / workshops and the like as one of the application of disciplines and the development of science.

2. From industrial practice students can learn aspects of independence or entrepreneurship from various parktic workplaces, so that it is useful for career development in the future.

3. From industrial practice students gain insight into the world of work gained in the field. Students will feel firsthand the difference between the theory in college and those in the field.

4. Industry practices are very helpful for students in improving work experience so that later they can become a professional workforce.

5. From industrial practice students can understand non-academic concepts in the world of work. PI will provide education in the form of work ethics, discipline, hard work, professionalism, and others.

6. Industrial practices will improve the cooperative relationship between universities and the world of work.

7. Industrial practice can be a medium of promotion of the academic world in the world of work while helping companies / industries get an academic workforce that is in accordance with their qualifications.

8. In the guidance of FieldWork Practices (PKL) / Industrial Practice (PI) is not specifically described thatthe industrial praktik devoted to education study students, should the purpose ofindustrial rickets after the internalization of industrial character is to have adequate provisions to transfer the character of the industry to their students in school.

9. FT Street Vendor Group has not fully built a partnership with DUDIKA until the establishment of an MoU forthe implementation of industrial praktik or does not have a list of DUDIKA partners that students can use when needing DUDIKA for practice industrial.

10. PTE and or PTIK prodi do not / have not provided the choice of DUDIKA which can be the object ofthe implementation of industrial praktik for students even though it has been built an understanding with several DUDIKA.

11. The duration ofindustrialraktik in accordance with the character of some DUDIKA is actually not enough ifthe industrialraktik p is only carried out for 1 month, so this needs to be reviewed by the FT street vendor group. Thus it is necessary to conduct a study by the PKL unit and study program for the adequacy of the duration of time by considering the block lectures after the pi by students.

12. Lack of system managerial support for PI success in the field.

Given the external diversity of educational study programs at the Educational Institution of Education personnel (LPTK), mapping the competence of qualified graduates is needed to prepare professional teachers.
Assuming students have mastered the required academic competencies and are viewed as mature individuals, strengthening competence through FieldWork Practices is very useful to mature their competence.

Synergistic collaboration between LPTK, the government, and DUDIKA is the key to the success of the program that must be realized in a planned, harmonious and sustainable manner, which is directed at the objectives: (a) optimal student development and growth, (b) the development of teacher professionalism and prospective teachers.

Bachelor of Education or abbreviated as S.Pd is a degree obtained by students after graduating from education. All students who get the degree are students who study in education with their respective majors. The goal is one, how to produce qualified educators. This is the basic essence of the Institute of Teacher Training (LPTK) where graduates will be parachuted directly to teach in formal and informal schools as educational scholars who not only teach but must also be supported by qualified field of study competencies.

Related to efforts to prepare educational scholars who are not only qualified in the field of pedagogy but also qualified in the field of vocational competence, it takes a management model or management of Industrial Practices that are clearly able to prepare a management system and industrial practice implementation system that not only makes Industrial Practice services more organized but more than that can be a management model that facilitates students as well as institutions and guidance lecturers in the process of implementing Industrial Practices.

Management models developed for the benefit of Industrial Practice are described:
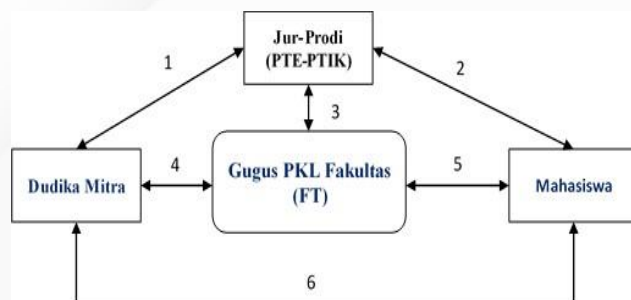
Figure 1. Industrial Practice Management Model

The developed industrial practice management model has the following mechanisms of work and coordination:

1. To build a system of readiness and availability of "Industrial Practice partners" then the Department of Electrical Engineering and or electrical engineering education (PTE) study programs and informatics and computer engineering education (PTIK) study programs must be able to build communication while making

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agreements in the form of MoUs with DUDIKA as a place of industrial practice for students of PTE and PTIK study programs.

2. To build trust as well as readiness of industrial practice implementation services, the Department of Electrical Engineering and or PTE and PTIK study programs must build good communication with students in the form of:

a. Information on students about the CATEGORY OF DUDIKA that can be the location of industrial practice as well as information about the readiness of DUDIKA partners who can be the location of industrial practices for students.

b. Debriefing to students who will carry out industry practices with material about the purpose of industrial practice implementation, the character of the industry that must be internalized to students as well as the obedience of students to applicable rules in the partner industry and fulfillment of responsibilities that must be able to be completed by students provided by partner industries.

3. Department of Electrical Engineering and or PTE and PTIK study programs must build good communication and coordination with the FieldWork Practice (PKL) group at the Faculty of Engineering. Communication is carried out in order to build cooperation to realize DUDIKA partners, where the realization can be through majors / study programs and or through faculty. Included in this communication and coordination is the provision of students for the implementation of industrial practices.

4. In addition to the TE Department and/or PTE and PTIK study programs, it is expected that the Faculty of Engineering will be able to communicate with DUDIKA to prepare industrial practice locations for students equipped with MoUs. The preparation of partner DUDIKA by FT is expected to be able to complement and add to the partner DUDIKA built and inserted by the TE Department and or PTE and PTIK study programs.

5. As the person in charge of PKL management, the PKL group of the Faculty of Engineering establishes good communication with students in the form of:

c. Information on students about DUDIKA partners that can be the location of choice of industrial practice for students.

d. Debriefing to students who will carry out industrial practices.

6. Although the preparation of dudika partners has become the responsibility of TE and/or PTE and PTIK study programs and FT street vendor groups, it is possible for students to independently find industrial practice locations. In addition, in this industrial practice management system, it is expected that students always coordinate with DUDIKA partners both before fielding, during industry practices and post-industrial practices after students are drawn to campus.

In addition to the industrial practice management model, to support the smooth implementation of industrial practices, it is necessary to develop a model of implementation of industrial practices. This model was developed with the intention to provide direction and certainty to students about what they should do so that their industrial practices are able to provide the best results both for students and for institutions, in this case the department of Electrical Engineering and or Electrical Engineering Education and Informatics and Computer Engineering Education and the FieldWork Practice group of the Faculty of Engineering.

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Implementation models developed for the benefit of Industrial Practice are described:
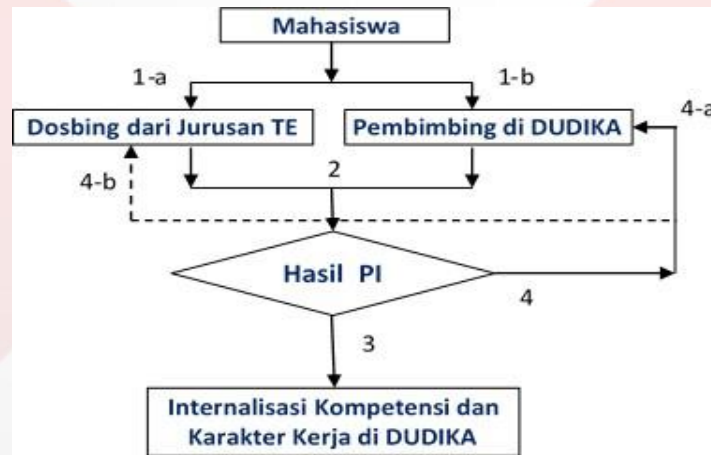

Figure 2. Model of Implementation of Industrial Practices

The model of implementation of industrial practices developed has the following mechanisms of work:

1. As long as students carry out industrial practices students must always communicate with dosbing lecturers and field guides appointed by DUDIKA.
a. Communication with lecturers is carried out in the framework of guidance so that students are able to carry out industrial practices as well as possible.
b. Communication with mentors at DIDUKA is intended so that the objective of internalization of competence and industry character can be implemented properly by students through guidance and direction in the field.
2. To get the best results on the implementation of industrial practices, guidance lecturers together with field advisors at DUDIKA must direct and guide students so that the internalization of competence and industry character can be mastered properly by students.
3. Industrial Practice Results (PI) must be able to be monitored "already successful" or "not successful" according to the stage. If it has been successful, it can be ascertained that the internalization of competence and character of the industry has been mastered well by students.

4. If it has not succeeded then both guidance lecturers and field guides at DUDIKA must be able to direct and guide so that their industry practices are successful.
a. If the results of field guidance monitors show that the internalization of competence and character of the industry has not been mastered properly by students, then step-2 must be intensified so that the achievement of internalization of competence and industry character is finally able to be mastered properly by students.
b. Jika pembimbing lapangan memberi informasi kepada dosen bahwa internalisasi kompetensi dan karakter industri belum dikuasai dengan baik oleh mahasiswa, maka dosen pembimbing harus lebih optimal pada tahapan atau langkah-2 sehingga capaian internalisasi kompetensi dan karakter industri akhirnya mampu dikuasai dengan baik oleh mahasiswa.

CONCLUSION

The conclusions obtained from this research are:

1. Based on the analysis and study of documentation and field data, it is known that more intensive handling is needed for the implementation of Field Work or Industrial Practices.
2. In order for the implementation of the Field Work Practice or Industrial Practice to be successful, two implementation curriculum models were developed, namely:
a. Industrial practice management model
b. Industrial practice implementation model
3. For the successful implementation of the two curriculum models, a strong commitment from the institution is needed, in this case the Department of Electrical Engineering and or Electrical Engineering Education Study Program as well as Information and Computer Engineering Education as well as the Faculty of Engineering fieldwork group.

REFERENCES

[22] Azhar. 2009. Kondisi LPTK sebagai Pencetak Guru Yang Profesional. Tabularasa-Jurnal Pendidikan PPs Unimed, Vol.6 No.1 Juni 2009.pp (113).

[23] Fakultas Teknik. 2020. Buku Panduan Praktik Kerja Lapangan (PKL)/Praktik Industri (PI). Semarang: FT Unnes.

[24] Omstein. Levin. Gutek. 2011 Foundations of Educatio. Canada : Cengange Learning Guru dengan 6 Motivasi. http://www.kompasiana.com/tiuruli_sitorus/guru-dengan-6-motivasi_552b7b6a6ea834c16a8b4584) diakses : Sabtu 11 Februari 2017 Pukul 23.00

[25] Guru Profesional dan Tantangan Global. http://aceh.tribunnews.com/2016/11/24/guru-profesional-dan-tantangan-global. Diakses : Sabtu 11 Februari 2017 Pukul 24.00

[26] Keputusan Menteri Pendidikan Nasional Republik Indonesia Nomor 232/U/2000 Tentang Pedoman Penyusunan Kurikulum Pendidikan Tinggi dan Penilaian Hasil Belajar Mahasiswa.

[27] Kualitas Pendidikan di Indonesia. https://pramithasari27. wordpress.com/ pendidikan/kualitas-pendidikan-di-indonesia/) diakses: Jumat 03 Maret 2017 Pukul: 12:40

[28] Teknik Elektro-PTE. 2020. Kurikulum Unnes 2020 Merdeka Belajar-Kampus Merdeka, Program Studi Sarjana Pendidikan Teknik Elektro (PTE)

[29] Teknik Elektro-PTIK. 2020. Kurikulum Unnes 2020 Merdeka Belajar-Kampus Merdeka, Program Studi Sarjana Pendidikan Teknik Informatika dan Komputer (PTIK).

[30] Upaya Pemerintah dalam Meningkatkan Kualitas Guru di Indonesia. https://oioey.wordpress.com/2016/07/19/upaya-pemerintah-dalam-meningkatkan-kualitas-guru-di-indonesia/) diakses: Jumat 03 Maret 2017 Pukul: 12:42

[31] https://gamelab.id/news/199-keuntungan-yang-diperoleh-mahasiswa-saat-praktek-kerja-lapangan

[32] http://edukasi.kompas.com/read/2013/01/19/07432623/Penguatan LPTK Perlu Dukungan Pemerintah (diunduh tanggal 13 januari 2021).

[33] http://seputarpendidikan003.blogspot.com/2013/06/pengertian-mutupendidikan. tml#. UuX9PfsxXIU (diunduh tanggal 10 Januari 2021)

[34] https://www.kompasiana.com/jhonmiduk/dilema-lulusan-sarjana pendidikan_ 575f3984 c423bdef0c3ba427

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SENSORY QUALITY OF PIE CRUST FROM LOCAL CORN FLOUR WEST SUMATRA

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Abstract: West Pasaman is the city with the highest corn production in West Sumatra. High corn production is mostly used for animal feed. The utilization of corn in West Pasaman in processed food is not optimal, even though corn has good nutritional content. Corn has a weakness that is easy to rot, so it needs to be processed into intermediate food products such as flour so that it is resistant to storage and is easily applied to processed foods, such as pies. Pies vary a lot from the filling, so it is necessary to innovate the pie crust. The purpose of this study was to analyze the sensory quality (shape, color, aroma, texture, and taste) of pie crust from local cornflour and commercial corn flour. This research was conducted at the culinary arts workshop, Department of Family Welfare, Faculty of Tourism and Hospitality, Universitas Negeri Padang, in September 2021. This type of research was a pure experiment, using a Completely Randomized Design, which consisted of 2 treatments (Local Corn Flour, and Commercial Corn Flour) and 3 repetitions. The resulting pie crust was analyzed for sensory quality using an organoleptic test, which involved 5 expert panelists. After the data was obtained, it was tabulated in the form of a table and a t-test was performed. Based on the research that has been done, it shows that there are differences in the color of the local corn flour pie crust and commercial corn flour pie crust, while the shape, aroma, texture, and taste are not different.
Keywords: Local Cornflour, Commersial Cornflour, Pie Crust, Sensori Quality.

INTRODUCTION

Pasaman Barat is a city that has the highest corn production in West Sumatra. Under data from the Central Statistics Agency of West Sumatra in 2020 corn production in West Pasaman Regency reached 263,879.71 tons [1]. Jastra [2] stated that the development of maize in West Pasaman is a type of horse tooth (*hybrid variety*) that has a bland, starchy taste, and is useful for meeting industrial needs, especially for animal feed needs, the higher the need for animal feed (breed chicken), the maize production will increase. The use of corn in West Pasaman in food processing has not been optimal, even though corn has good nutritional value.

Suwarno [3] explained that corn contains low-calorie carbohydrates, magnesium, a source of vitamins and minerals, so it is good for fulfilling nutrition and body health such as maintaining heart health and controlling blood sugar. Suarni and Yasin [3] further explained that corn contains the required dietary fiber with a relatively low glycemic index (GI) compared to rice so that corn is a recommended food ingredient for diabetics [4]. Corn is a food source of carbohydrates and protein that has the potential as an alternative food ingredient to replace rice which is the result of secondary crops and plays an important role in people diet patterns after rice [5]. Therefore, the use of corn in food processing needs to be increased.

Besides the excellent nutritional content, corn has the disadvantage of being easily damaged if not stored properly. Bintoro [6] explained that corn is easily rotten, moldy, and sprouts when stored directly (without processing) for a long time. To avoid this damage, corn should be processed into intermediate food products that are resistant to storage and easy to apply to processed foods. One example is cornflour.

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Corn flour is obtained by grinding corn kernels. Army Auliah [7] explained "Corn flour is flour obtained by grinding corn kernels (*Zea mays L*)". Making cornflour using an 80 mesh sieve to get a fine flour texture like wheat [8]. Flour is one of the recommended alternative forms of intermediate food products, because it is more resistant to storage, easy to mix (made composites), enriched with nutrients (fortified), formed, and processed more quickly according to the demands of modern life that are all practical [9]. The cornflour produced can be applied to make various foods that are liked by many Indonesian people, for example, pie.

Pie is a salty dough for short pastry groups with a dry and crunchy texture that functions as a container and can be filled with savory or sweet fillings. Pie has a savory taste, dry and crunchy texture that serves as a container or place for stuffing [10]. Ruaida and Elida [11] explain that pie is a small snack originating from Europe, consisting of a bowl-shaped base or shell and a filling in the middle. Pie is a type of salty dough that belongs to the short pastry group. Pies vary a lot in fillings or toppings, so it is necessary to innovate on pie crusts, one of which is making pie crusts from corn flour.

Based on research conducted [12] by Rahmi Holinesti, et al. [12] it is known that local corn can be processed into cornflour with good quality and can be applied to the manufacture of pie crusts with the best substitution of 40%. Therefore, in this study, further experiments were carried out to determine the difference in the quality of the pie crust made from local cornflour with commercial corn flour on the market.

RESEARCH PROCEDURES AND MATERIALS

This study used a completely randomized design (CRD) method with two treatments and three repetitions. The data was collected by means of a sensory quality test involving 5 expert panelists, in the field of pastry expertise. Sensory tests were carried out to see the sensory quality of local corn flour pie crust and commercial corn flour pie crust which included shape (neat), color (golden yellow), aroma (sweet corn), texture (dry and crunchy), and taste (savory). After conducting a sensory quality test and obtaining data, then tabulated in tabular form and tested using the t-test to see the difference between treatments, if the data obtained count is greater than ttable then Ha is accepted (there is a significant difference).

This research was conducted at culinary arts Workshop, Department of Family Welfare, Faculty of Tourism and Hospitality, Universitas Negeri Padang, in September 2021.

The tools used during the research consisted of preparation tools, processing tools, and presentation tools. Preparation tools are tools used to prepare the materials used before entering the processing process. The preparation tools included in this study were scales, mixing bowl, spoon, and flour sieve. Processing equipment is a tool used during the processing of food ingredients. Processing tools included in this research are refrigerator, rolling pin, brush, pie mold, fork, baking sheet, and oven. Serving utensils are tools used to serve food after going through the ripening process. The serving tool used to present the pie during the study was a mica box with a size of 7X13cm. The mica box has a transparent shape so that we can directly see the product or its contents [13].
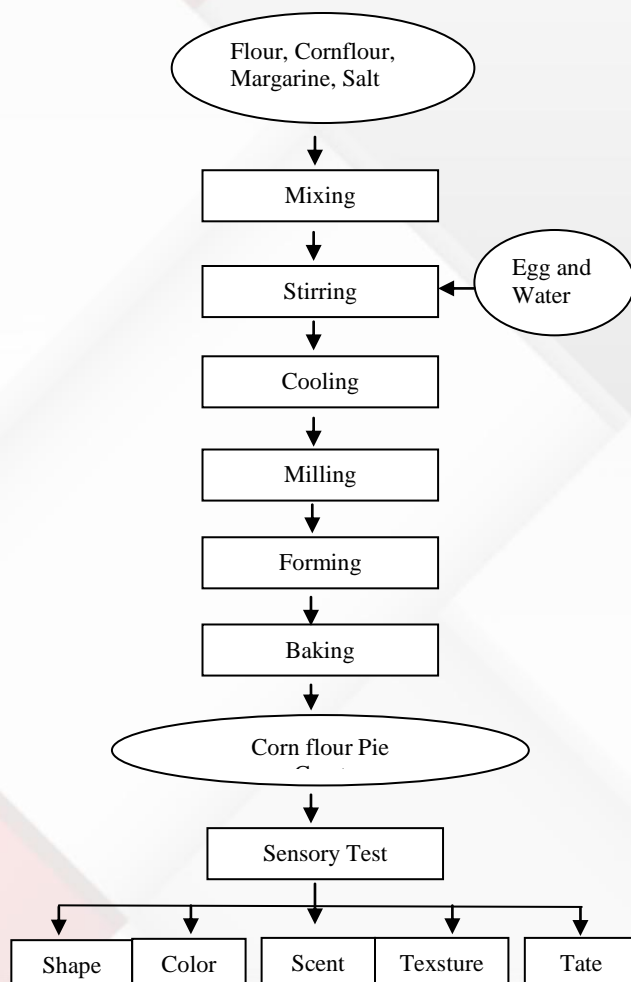
The ingredients used are wheat flour, local corn flour, commercial corn flour, margarine, eggs, salt, and water. More details can be seen in Table 1.

Table 1. Corn Flour Pie Peel Ingredients

No	Ingredients	Ingredients Composition	
		X1 (Local corn flour)	X2 (Commercial corn flour)
1.	Flour	60 g	60 g
2.	Cornflour	40g	40 g
3.	Margarine	50 g	50 g
4.	Egg	26 g	26 g
5.	Salt	2,5 g	2,5 g
6.	Water	5 g	5 g

The procedure for making pie crust from corn flour can be seen in Figure 1.

Flour, Cornflour, Margarine, Salt

↓

Mixing

↓

Stirring ← Egg and Water

↓

Cooling

↓

Milling

↓

Forming

↓

Baking

↓

Corn flour Pie Crust

↓

Sensory Test

→ Shape | Color | Scent | Texsture | Tate

Figure 1. Flowchart of Making Corn Flour Pie Peel

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Sensory test results on the quality of pie crusts using local corn flour and pie crusts using commercial corn flour can be seen in Figure 2.

	Neat Shape	Color Golden Yellow	Corn Fragrant Fragrant	Dry Texture	Crispy Texture	Taste Taste Savory
X1	3.8	3.53	2.8	3.47	3.6	3.67
X2	3.8	2.67	2.87	3.67	3.6	3.47
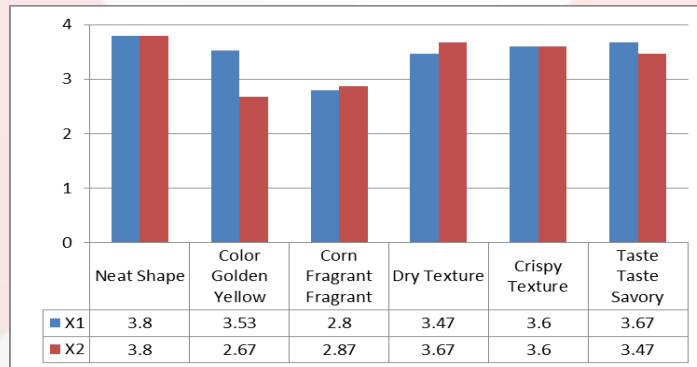
Figure 2. Sensory test results on the quality of pie crusts

Based on Figure 2, it can be seen that the sensory test on the quality of the pie crust made using local corn flour and the pie crust made using commercial corn flour obtained differences in the golden yellow color, while the neat shape, fragrant aroma of corn, dry and crunchy texture, and savory taste there is no visible difference.

A. Shape

The shape is one of the sensory qualities seen by the eye that affects the quality of food so that it can become the attraction of the food. Rahmi Holinesti and Pupe Selvia Dewi [14] explained that shape is the appearance of food as a whole. Wulandari and Priyanti [15] further explained that the pie shell can be oval, round, or a lotus flower according to the mold used. The shape of the pie shell in this study was neat and there were no differences between treatments.

The neat shape of the pie shell is obtained from X1 and X2 data with a difference of 3.8 (X1) - 3.8 (X2) = 0. An effort to see a significant difference is evidenced by tcount smaller than ttable which states Ho is accepted, and vice versa, if tcount is greater than ttable then it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount < ttable (0 < 2,308) this means that Ho is accepted. Based on these data, it was stated that there was no difference in neat shape between the two treatments.

The neat shape of the cornflour pie crust was obtained from the process of making the pie crust using a mold with the same shape and size in all treatments. Lili Dasniati and Wirnelis Syarif [16] explained that dough can be shaped by hand and can also be shaped using a mold. This study uses the same mold. Nurhamidah, et al. [17] explained that the neat shape is obtained from the formation by the mold, the emphasis, and the work done when molding the dough. Fajiarningsih [18] further explained that a uniform and neat shape is obtained from using a rolling pin to roll dough or to thin the dough so that it produces dough with an even thickness so that it is easy to print and obtain the same shape and thickness. The pie crust was made at the time of the study by the same person, so the use of cornflour did not make any difference in the neat shape of the pie crust.

B. Color

Color is one of the sensory qualities that play an important role in a dish because it can support the appearance of the food. Mustika and Elida [19] explain that color is one of the important factors in determining food quality. Rahmi Holinesti and Pupe Selvia Dewi [14] further explained that color is the quality that is first assessed in the acceptance of a food product and can affect the assessment. The color of

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the pie crust in this study is golden yellow, but there are differences in the sensory quality of the pie crust color made using local cornflour and pie crust made using commercial corn flour.

The golden yellow color of the pie crust is obtained by X1 and X2 data with a difference of 3.53 (X1) – 2.67 (X2) = 0.86. Efforts to see a significant difference are evidenced by tcount less than ttable which states that Ho is accepted, and vice versa, if tcount is greater than ttable, it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount > ttable (2,417 < 2,308) this means that Ha is accepted. Based on these data, it was stated that there was a golden yellow color difference

between the two treatments. The sensory quality of the color produced from the pie crust made using local corn flour resulted in an average of 3.53 in the golden yellow category, while the color of the pie crust made using commercial corn flour resulted in an average of 2.67 with a moderately golden yellow category.

The color of the pie crust is influenced by the color properties of the raw materials used in making the pie crust, so the color of the cornflour can affect the color of the pie crust. Moh Taufik, et al. [20] explained that the color produced in food is influenced by the raw materials for making food. The color of the pie crust produced from local corn flour has a higher average than the color of the pie crust produced from commercial cornflour (the color is more brownish). Hardiyanti, et al. [21] explained that the brown color of cookies is obtained after baking, non-enzymatic browning reactions, or Maillard reactions. Browning reaction is an event that begins with the reaction of an amino group on an amino acid, peptide, or protein with a glycosidic hydroxyl group on sugar, which ends with the formation of a brown nitrogen polymer or melanoidin.

C.   Aroma

Aroma is one of the sensory qualities which is a fragrant smell emitted by food that can stimulate the sense of smell. Nani Lestari, et al. [22] explained that aroma is a fragrant smell emitted by food that can be observed with the sense of smell. Hearsa Annisa Amaliya and Elida [23] further explained that aroma is a distinctive smell emitted by a food that stimulates the sense of smell which can increase appetite. So the aroma caused by food affects the delicacy of a food and has a very strong appeal from a dish. The aroma of the pie crust produced in this study was the smell of corn, and there were no differences between treatments.

On the fragrant aroma of corn pie crust, data obtained X1 and X2 with a difference of 2.87 (X1) - 2.8 (X2) = 0.7. Efforts to see a significant difference are evidenced by tcount less than ttable which states that Ho is accepted, and vice versa, if tcount is greater than ttable, it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount < ttable (0.009 < 2.308) this means that Ho is accepted. Based on these data, it was stated that there was no difference in the fragrant aroma of corn between the two treatments.

The aroma of the pie crust is influenced by the raw materials used in making the pie crust, such as margarine, flour, and other ingredients. Hearsa Annisa Amaliya and Elida [23] explained that the aroma produced in making the pie crust is obtained from the basic ingredients, namely margarine and the use of flour. In the study used the same ingredients so that the use of corn flour did not make a difference in the scent of the pie crust.

D.   Texsture

The texture is one of the sensory qualities, a good pie crust texture is dry and crunchy. Anwar, et al. [24] describe the assessment of different food textures such as smooth, hard, soft, dry, wet, and oily. Wulandari and Priyanti [15] further explained that pie has dry and crispy skin. The texture of the pie crust produced in this study was dry and crunchy, and there were no differences between treatments.

On the dry texture of the pie crust, X1 and X2 data were obtained with a difference of 3.47 (X1) – 3.67

(X2) = 0.2. Efforts to see a significant difference are evidenced by tcount less than ttable which states that Ho is accepted, and vice versa, if tcount is greater than ttable, it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount < ttable (-1.542 < 2.308) this means that Ho is accepted. Based on these data, it was stated that there was no difference in dry texture between the two treatments. On the crispy texture of the pie crust, X1 and X2 data were obtained with a difference of 3.6 (X1) - 3.6 (X2) = 0. Efforts to see a significant difference were evidenced by tcount smaller than ttable which stated Ho was accepted, and vice versa, if tcount is greater than ttable then it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount < ttable (0 < 2,308) this means that Ho is accepted. Based on these data, it is stated that there is no difference in crunchy texture between the two treatments.

The dry texture of the pie crust is influenced by the ingredients used in making the pie crust, such as margarine and water. In addition, the temperature during the burning process and the length of the baking time also affect the dry texture of the pie crust. The temperature used when baking pie dough is 180°C for 30 minutes [25]. The temperature and baking time were the same in both treatments, so the use of corn flour did not give any difference in the dry texture of the pie crust. The crunchy texture of the pie crust is influenced by protein which is the main component in wheat flour, the higher the gluten content, the higher the protein. Wa Ode, et al. [26] explain the factors that affect the texture, namely the content of starch and protein as the main components contained in flour. Wulandari [27] also explained that the texture of cookies is determined by the water content, amount and content of fat, carbohydrates and protein that compose and are influenced by all the raw materials used. So that the use of corn flour does not make a difference in the crispy texture of the pie crust.

E.   Taste

Taste is one of the most important sensory qualities. Dwi Setyaningsih, et al. [28] explained that color is the main aspect of food, food that has a good taste and is an attraction for the people. Taste is one of the desired tastes in food processing. The taste has a salty, sweet, sour, bitter, and delicious category or umami which comes from Japanese. The taste of the pie crust produced in this study is savory and there is no difference between treatments.

On the savory taste of the pie crust, X1 and X2 data were obtained with a difference of 3.67 (X1) – 3.47 (X2) = 02. An attempt to see a significant difference was evidenced by tcount smaller than ttable which stated Ho was accepted, and vice versa, if tcount is greater than ttable, it can be stated that Ha is accepted. The description of the data that has been tested shows that tcount < ttable (1,628 <2,308) this means that Ho is accepted. Based on these data, it was stated that there was no difference in the taste of the pie crust between the two treatments.

The savory taste of the pie crust is influenced by the ingredients used in making the pie crust such as salt, margarine, flour, and eggs. Budi Sutomo [29] explained that the function of eggs is to bind other ingredients, provide moisture, add nutritional value, and provide a savory taste, as well as other ingredients. Susilawati and Fadilah [30] further explained that the taste of corn cookies comes from the cornflour used and other additives such as sugar, eggs, margarine in the composition of cookies. Pie crust made using cornstarch has a strong corn flavor. Hardiyanti, et al. [21] explained that the taste of cookies produced from corn flour has more of a corn aroma and is preferred. In the study used the same amount of corn flour so that it did not make a difference to the taste of the pie crust.

CONCLUSION

Based on the research, the sensory quality of pie crusts made from local corn flour and commercial corn flour, was neat shape, golden yellow color, fragrant corn aroma, dry and crunchy texture, and savory taste. The difference in the sensory quality of the pie crust found in the color of X1 (3.53) with a golden yellow category, and X2 (2.67) with a moderately golden yellow category. While the sensory quality of the shape, aroma, texture, and taste have no difference. The shape is neat, aroma is fragrant, texture is dry, and the taste is savory.

SUGGESTION

Suggestions that can be conveyed in this study are dough should not be stirred too long because the dough needed is sand dough, not doughy dough. The temperature used is 180°C for 30 minutes. Use dry stuffing like pie milk or pie brownies. It is recommended to conduct further research on packaging, shelf life, and nutritional content of pie crusts.

REFERENCE LIST

[35]Central Bureau of Statistics. 2021. Production of food crops: Harvested area, productivity and maize production 2016-2020. Central Bureau of Statistics

[36]Jastra, Y. 2012. "Development of hybrid corn to increase farmers' income in West Pasaman". Journal of Applied Research and Policy Publications, 6(1).

[37]Suwarno, J. (2010). "Protein and Organoleptic Test on Tempe With Sweet Corn (Zea mays saccharata) as the basic ingredients". (Doctoral dissertation, University of Muhammadiyah Surakarta).

[38]Suarni, S., & Yasin, M. (2015). Corn as a functional food source. Food Crops Science and Technology, 6(1).

[39] Lalujan, Lana E., et al. "Chemical and Nutritional Composition of Local Corn Varieties'Manado Kuning' as a Food Substitute for Rice." Journal of Agricultural Technology (Agricultural Technology Journal 8.1 (2017).

[40]Bintoro, N. (2008). Engineering Aeration Methods in Bulk Corn Storage in Silos. Journal of agricultural engineering. Yogyakarta

[41] Army Auliah. "Combination formulation of sago and corn flour in noodle making." Chemica: Scientific Journal of Chemistry and Chemistry Education 13.2 (2013): 33-38.

[42]Nur Aini., Wijonarko, G., & Sustriawan, B. (2016). Physical, chemical, and functional properties of corn flour processed through fermentation. Agritech, 36(2), 160-169.

[43]Claudia R., Estiasih, T., Ningtyas, DW, & Widyastuti, E. 2015. "Development of Biscuits From Orange Sweet Potato Flour (Ipomoea Batatas L.) And Fermented Corn Flour (Zea Mays)": A Literature Review (In) Press September 2015). Journal of Food and Agroindustry, 3(4).

[44]Utami, D. N. 2016. "The Difference in Pie Quality With Different Gayam Flour Substitution". Doctoral dissertation, Semarang State University.

[45]Ruaida, Elida. 2012. Bread and Cake. Padang: Padang State University.

[46]Rahmi Holinesti and Lusi Andriyani. 2021. Quality Pie Peel From Corn Flour. Journal of Food and Technology Education.

[47]Laurensia Hendrata, Yuwono, Elisabeth Christine, Soewito, Bambang Mardiono. 2015. Design of cupid cakes cupcake packaging designs in Surabaya. Supercolor dkv journal, 1.6: 12.

[48]Rahmi Holinesti and Pupe Selvia Dewi. 2020. Effect of Tempe Flour Substitution on Nastar Quality. Journal of Catering and Technology Education, 1(2):15-21.

[49]Wulandari, O. M., & Priyanti, E. 2020. Utilization of Jackfruit as Raw Material for Pie, Mille Crepes, and Lasagna. In Senaster National Seminar on Applied Technology Research" (Vol. 1, No. 1)

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

[50] Lili Dasniati and Wirnelis Syarif (2020). The Effect of Corn Flour Substitution on the Quality of Cookies. Journal of Food and Technology Education. Vol 1num 3. 2020.*.

[51] Nurhamidah Rangkuti, Yuliana Yuliana. Rahmi Holinesti 2015. "The Effect of Banana Kepok Flour Substitution on the Quality of Cookies." Journal of Home Economics and Tourism 9.2 (2015).

[52] Fajiarningsih, H. 2013. "The Effect of the Use of Potato Flour Composite (Solanum Tuberosum L) on the Quality of Cookies". Food Science and Culinary Education Journal, 2 (1).

[53] Mustika, D., Elida, E., & Syarif, W. (2021). Effect of Taro Flour Substitution on Pie Skin Quality. Journal of Home Economics and Tourism, 15(2).

[54] Moh Taufik., Seveline., Selvi Susnita., Dheanisya Qausarina Aida. 2019. Formulation of Cookies Made from Wheat Flour and Tempe Flour with the Addition of Gotu Kola Flour. Journal of Halal Agroindustry, 5(1): 9-10

[55] Hardiyanti, H., Kadirman, K., & Rais, M. (2018). Effect of Corn Flour Substitution (Zea mays L.) in Cookies Making. Journal of Agricultural Technology Education, 2(2), 123-128.

[56] Nani Lestari., Syarif, W., & Holinesti, R. (2015). The Substitution of Taro Flour on the Quality of Cookies. Journal of Home Economics and Tourism, 8(1).

[57] Hearsa, Annisa Amaliya, and Elida. "Quality Analysis of Pie Peel With Green Bean Flour Substitution". 2019. Journal of Geography Capita Selecta 2.2:7-14.

[58] Anwar Hanifa Maulida., Faridah, A., Hasnur, Y., Syarief, W., & Budiarti, A. P. 2021. "Substitution of Corn Flour on the Quality of Dry Milk". Journal ISBN 978-623-95788-2-4

[59] Anita Humaida. 2021. "Use of Purple Sweet Potato Flour in Making Pie Peels". Final Project. Padang: Padang State University.

[60] Wa Ode Irmayanti., Hermanto., Nur Asyik. 2017. Organoleptic and Proximate Analysis of Sweet Potato (Ipomea Batatas L) and Mung Beans (Phaseolus Radiatus L)-Based Biscuits. Journal of Food Science and Technology, 2(2): 413-424.

[61] Wulandari, F.K. 2016. Analysis of Nutritional Content, Energy Value and Organoleptic Test of Rice Flour Cookies with Breadfruit Flour Substitution. Food Technology Study Program. Faculty of Animal Husbandry and Agriculture. Diponegoro University. Semarang. Journal of Food Technology Applications 5(4) 2016.

[62] Dwi, Setyaningsih, Anton, A, Maya, P. S. 2010. Sensory analysis for the food and agro industry. IPB Press

[63] Budi Sutomo. 2012. The secret of success in making cakes, breads, cookies, and market snacks. Jakarta: Nsbooks

[64] Susilawati, S. B., Syam, H., & Fadilah, R. (2020). Effect of Modified Pregelatinized Corn Flour on Cookies Quality. Journal of Agricultural Technology Education, 4, 27-48.

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and Vocational Competence
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Differences In The Final Result Of Foundation Using Manual Techniques And Air Brush Techniques For Bridal Makeup On Oily Skin

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Abstract—The application of foundation by using Airbrush to get the impression of more natural makeup. The study aims to analyze foundation results using manual techniques, airbrush techniques and analyze differences in foundation end results using manual techniques and airbrush techniques for Bridal Makeup on oily skin. This type of research is experimental research with the design of nonequivalent group desaign research. This research variable consists of a free variable (X) and a bound variable (Y). The study population was beauty and cosmetology class 2016 and 2017 students with 6 people sample. This type of data uses primary data with a data source of 7 panelists. Data collection techniques are carried out by means of observation and documentation. The data analysis techniques in this study were conducted with normality tests, homogeneity tests and hypothesis tests. The result of this study is the use of Manual techniques on oily skin in bridal makeup the highest average value is in the indicator of smoothness of the result which is 2.85 has a smooth criteria, on the endurance indicator which is 2.76 has a resistance criteria, and in the average indicator of the result which is 2.57 has a durability criteria. The use of Airbrush technique on oily skin in bridal makeup the highest average value is in the indicator of smoothness of the result which is 3.81 has a very smooth criteria, on the endurance indicator which is 3.71 has a very resistant criteria, and in the indicator of flatness of results that is 3.66 has a very resistant criteria. There are differences in the use of Manual techniques and Airbrush techniques on oily skin in bridal makeup. It is recommended that students add knowledge about the installation *of Manual techniques and Airbrush techniques.*

Keywords: differences, manual techniques, air brush techniques,bridal makeup, oily skin

I. INTRODUCTION

Beauty is every woman's desire. In this modern era, makeup has been heard a lot. In life, makeup has become a necessity to beautify the appearance, there are various ways So that women look beautiful from the outside, including with makeup. A woman's face can Beautify the face from the outside and maintain its beauty. Makeup is nothing new. Known or done, makeup has been known and used primarily by women for thousands of years.

According to Dianas, A., & Astuti, M [1]In today's era, the world of cosmetology is getting wider and more diverse Therefore, beauty is what every human being wants in the modern era Today, make-up is something that we have often heard about in life, make-up has become a necessity to support one's appearance. Decorative purposes is to create a fresh look, appear younger than usual cover up flaws in the face to change one's appearance according to personal character. Cosmetology also aims to support one's self-confidence.

According to Gusnaldi[2] said that beauty is something that can be enjoyed. by the eye and always associated with the element of art. Makeup is a lot of makeup. used in beauty such as bridal makeup According to Rifki [3] explained that: Bridal makeup depicts a work of cultural art that is rising on A communal group and always trying to maintain its existence as A work of art. Bridal makeup is also evolving in line with the changes.

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human environment.Western bridal makeup is a natural makeup by applying correction in part of the bride's face, a smooth and durable foundation. Bridal makeup has characteristic simple, soft elegant yet still charming, Tresna [4] for it is needed the perfect foundation. Bride makeup or also called modern brides that is One of the concepts of a long dress wedding where the bride uses a white dress and It's soft makeup and doesn't look heavy. Makeup is a lot of makeup. used in beauty such as bridal makeup, Astuti[5]

Gusnaldi [5] brides tend to wear white dresses, which represent purity and a soft touch, so western bridal makeup usually wears natural colors, pedestals bright eyeshadows that don't shine and lipsticks that aren't bright or pastel colors It can be affected by the smoothness and durability of cosmetics attached to the face. during the wedding process. Outdoor conditions that can not be expected such as the wind blowing Too tight, hot or exposure to sunlight that is too long can change the makeup of the bride and groom West.

Western bridal makeup is one part of the bridal makeup course in the Department of Beauty And Cosmetology of Padang State University, in the course Bridal Makeup is learned how to apply correctly and properly on foundation for bridal makeup, based on the author's observations of students major Beauty and Cosmetology figures 2017, the author sees still lack of knowledge of students how the application of proper foundation on bridal makeup, for example color selection improper foundation on n bridal makeup, students tend to use foundationthat is thick and does not make makeup becomes unnatural and not soft

Researchers conducted an interview on June 7, 2021 with several college students major beauty and cosmetology class 2017 with a total of 15 students, based on the results of the interview 13 of the 15 students, in interviewed did not understand the technique. applying foundation with Airbrush, they can only apply foundation in a manual and have never tried to apply foundation using the technique Airbrush.

The type of foundation used for Airbrush is liquid foundation according to Pangaribuan [6] Liquid foundation cosmetics contain water based foundation which is an ingredient The base is water, so it will more easily absorb into the skin and lighter than oil. This foundation cosmetic can moisturize the skin and will produce makeup that is smooth.

The development of technology greatly relieves humans in everyday life. Simply put, technology is a scientific finding applied to solving practical problems. The development of technology today is mechanical and even automatic. With equipment that wears In advanced technology, the makeup process can be done effectively and efficiently. Technology that can.

The development of technology greatly relieves humans in everyday life. Simply put, technology is a scientific finding applied to solving practical problems. The development of technology today is mechanical and even automatic. With equipment that wears In advanced technology, the makeup process can be done effectively and efficiently. Technology that can Used in the makeup process is airbrush. Airbrushing is the process of spraying various liquid materials such as ink or dyes, including paint, with air power become a fine mist charged to coat different surfaces

The history of the wedding dress and its development, wedding ceremonies, selection of clothing and accessories, knowledge of cosmetics and makeup tools. The ability (skill aspect) in make- up corrective techniques, make-up designs, bridal hairstyles, hand bouquet arranging and being able to make up western brides as well as carrying out western bridal make-up shows by showing a responsible, honest and responsible attitude (attitude aspect).

Based on the observations of researchers in the field during PLI on January 1 - March 1, 2021 at LKP MUA Community Jakarta. Researchers discovered a new technique of applying foundation with Using airbrush. The application of Airbrush is done after the application of the foundation to Get a more natural makeup impression. Based on interview with Oscar Daniel One of the famous makeup artists in Jakarta on March 10, 2020 that airbrush technique is very Suitable for Long Dress Bride Makeup. Cosmetics for this Airbrush technique are Bevore cream, foundation liquid and then the application of Airbrush is done after application Foundation. According to Oscar Daniel, the advantages of this Airbrush technique after application The foundation can be re-corrected.

II. THEORETICAL STUDIES

The type of research used is pseudo-experiments. This research design uses Nonequivalent group desaign. This study used free variables (X) and bound variables (Y). The study population was a cosmetology and beauty student Bp 16 and 17 with 6 people sampled. This type of data uses primary data with a data source of 7 panelists. Data collection techniques Use observation and documentation. Data analysis techniques in this study were conducted with normality test, homogeneity test and hypotesis test.

III.RESULTS AND DISCUSSIONS

1. Frequency Distribution of Smoothness, Durability, Flatness and Observer's Fondness for Foundation Final Results For Western Bridal Makeup On Oily Facial Skin With
Using Manual Techniques (X1).

Distribution of the smoothness frequency of the foundation's final result using manual techniques (X1) in the sample 1 most rate very smooth and smooth that is with a very ideal number of 0 people (0.00%) and the number in fine 6 people (85.71%). In the sample 2 most rate very fine That's one person (14.29%). In the sample of 3 most rated ideal is 3 people (42.86%). Average eye smoothness results with manual technique (X1) most on fine assessment.

Distribution of foundation end result end endurance frequency using manual techniques (X1) in the sample 1 most rated resistant and quite resistant i.e. with the resistance of 3 people (42.86%) and a fairly resistant number of 2 people (28.57%) In the sample of 2 most rated resistant, which is 6 people (85,71%). In the sample of 3 most rated resistant, namely 4 people (57.14%). Average size impression eyelid folds using manual techniques (X1) most on hold rate That is (61.90%)

Distribution of the final result of the foundation's flatness frequency using manual techniques (X1)In the sample 1 most rated average is 6 people (85.71%). In the sample of 2 at most Fairly flat rate of 4 people (57.14%). In the sample 3 most rated flat and fairly flat That is an average of 3 people (42.86%) and quite an average of 3 people (42.86%). Average average of final results foundation using manual techniques (X1) most on flat assessment is (52,38%).

Distribution of observer's preferred frequency to foundation end results using Manual engineering (X1) in the sample of 1 most rated dislikes, namely 4 people (57.14%). At The 2nd most rated preferred sample was 4 people (57.14%). In the sample of 3 most rated Likes are an average of 5 people (71.43%). Average observer's fondness for the foundation's final results with Using manual techniques (X1) the most on like ratings is (57.14%).

2. Smoothness Frequency Distribution, Flatness Durability and Observer Favorite Results End of Foundation for Western Bridal Makeup on Oily Facial Skin with Using The Airbrush Technique (X2).

Frequency distribution of the smoothness of the foundation's final results using airbrush techniques (X2) in the sample of 1 most rate very finely, which is 6 people (85.71%). In the 2nd most sample Many people rate it as very subtle, which is 5 people (71.43%). In the sample of 3 most rated very fine That's an average of 6 people (85.71%). Average smoothness of the final result of the foundation using the technique airbrush (X2) is mostly at very fine ratings i.e. (80.95%).

Distribution of end-result endurance frequency distribution of foundation using airbrush technique (X2) in the sample 1 most rated very resistant, namely 4 people (57.14%). In the 2nd most sample Many people rated very resistant at 5 people (71.43%). In the sample of 3 most rated very Hold is an average of 6 people (85.71%). Average durability of the end result of the foundation by using airbrush (X2) technique is most at highly resistant assessment i.e. (71.43%). Distribution of the final result of the foundation by using airbrush technique (X2) in the sample of 1 most rated very flat at 5 people (71.43%). In the 2nd most sample Many people rate very evenly at 6 people (85.71%). In the sample of 3 most rated very flat That's an average of 5 people (71.43%).

Average flatness of the final result of the foundation using techniques Airbrush.
Distribution of observer's favorite frequency using airbrush (X2) techniques on The 1st most rated sample of likes was 5 people (71.43%). In the sample of 2 at most I think I like 6 people (85.71%). In the sample of 3 most rated very flatly. 7 people (100%). Average observer's favorite by using the most airbrush (X2) technique many on very like ratings that is (85.71%)

TEST ANALYSIS PREREQUISITES

Based on the normality test of the effect using manual techniques and airbrush techniques on the final result of the foundation for western bridal makeup on oily facial skin is obtained sig value > 0.05. means that the data distribution is normally distributed in all research groups.

Based on the homogeneity test the influence of manual techniques and airbrush techniques on the final result Foundation for western bridal makeup on oily facial skin obtained a sig value of > 0.05. This means that the spread of data proved homogeneous in all research groups.

On the subtlety indicator the result is obtained the value of $p = 0.000$ ($p < 0.05$). It means there is difference in smoothness of foundation final results for Western Bridal Makeup on facial skin Oily techniques using manual techniques and airbrush techniques. Ha accepted and Ho is rejected.

On the endurance indicator obtained the value $p = 0.003$ ($p < 0.05$). That means there's a difference. durability of foundation final results for Western Bridal Makeup on oily facial skin with Using manual techniques and airbrush techniques. Ha is accepted and Ho is rejected.

DISCUSSION

Foundation final results for Western Bridal Makeup on Oily Facial Skin with Using Manual Techniques (X1)

Based on research seen from the aspect of smoothness of the final results of foundation for makeup Western brides on oily facial skin obtained an average panelist rating of 2.85. Value it is declared low and is not included in the ideal foundation smoothness results. because the final result on makeup still looks wrinkle lines and less sticking

The second aspect of assessment is the durability of the final result of foundation for bridal makeup.Western on oily facial skin obtained an average panelist rating of 2.76. The value is also it is low and still falls into the category of less resistant. This can be seen in the results.
The end of makeup is still visible there are gaps in all parts of the face that are given foundatoin

The third aspect of assessment is the flatness of the final result of the foundation for bridal makeup.Western on oily facial skin obtained an average panelist rating of 2.57. The value is alsoIt is low and still falls into the less even category.

The fourth aspect assessed is the observer's fondness for the foundation's final results.
for western bridal makeup on oily facial skin by using manual techniques on Oily facial skin averaged a panelist rating of 2.52. This value indicates that the Observer still do not like the final result of the application of the foundation.

From the results of the study it can be concluded that the final result of foundation for bridal makeup western on oily facial skin by using manual techniques on oily facial skin less smooth, less resistant, less flat and less preferred. The makeup results still show a little lump, there is still a slight gap in all parts of the face that are foundationed, less attached and fused with the skin of the face and almost visible wrinkle lines on the body.

Foundation Final Results for Western Bridal Makeup on Oily Facial Skin with Using The Airbrush Technique (X2)

Based on research seen from the aspect of smoothness of the final results of foundation for makeup western brides on oily facial skin using airbrush techniques obtained on average Panelist rating of

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3.81. The value of achieving the value criteria is ideal. It's from the results makeup after using the airbrush technique is very attached and blended with the skin of the face And very invisible wrinkle lines on the face.

The second aspect of assessment is the durability of the final result of foundation for bridal makeup. western on oily facial skin using airbrush techniques obtained average rating panelists 3.71. Foundation end result durability assessment with airbrush engineering including in the category of very resistant, no gumpulan, and no skin cracks are visible throughout part of the face.

The third aspect of assessment is the flatness of the results obtained by the average panelist assessment of 3.66. Assessment of the flatness of the foundation's final results with airbrush techniques falls into the very category flat

The fourth aspect that is assessed is the observer's favorite aspect by using techniques. airbrush on oily facial skin averaged a panelist rating of 3.85. This value shows that the observer really likes the results of applying foundation on makeup.

According to Han (2011:9) the application of airbrush techniques will produce more results. smoother and longer lasting and superior in terms of making color gradation, shadow (shading) and a sparkling effect (shimmer) that can not be obtained through regular makeup so that the results are more perfect.

From the results of the study it can be concluded that the final result of foundation for bridal makeup western on oily facial skin by using airbrush techniques on oily facial skin Very resistant, very smooth and even. So airbrush technique can be used as a technical choice. application of foundation on oily facial skin

Difference in Foundation Final Results Using Manual Techniques and Airbrush Techniques To Western Bridal Makeup On Oily Facial Skin

On the subtlety indicator the result is obtained the value of p = 0.000 (p < 0.05). It means there is difference in smoothness of foundation final results for Western Bridal Makeup on facial skin oily with the application of Manual techniques and Airbrush techniques. Application of airbrush engineering provides a smoother foundation finish than manual techniques

On the endurance indicator obtained the value p = 0.003 (p < 0.05). That means there's a difference. durability end result foundation for Western Bridal Makeup on oily facial skin with Application of Manual techniques and airbrush techniques. Application of airbrush techniques provides results the end of the foundation is more resistant, there is no gumpulan, and there are no visible skin gaps in the The whole face.

On the average indicator the result is obtained the value p = 0.005 (p < 0.05). That means there's a difference. flatness of the final result of foundation for Western Bridal makeup on oily facial skin with Application of Manual techniques and airbrush techniques. Application of airbrush techniques provides results Very flat foundation ending.

In the observer's favorite indicator, the value p = 0.000 (p < 0.05). It means there is observer's fondness for foundation final results for Western Bridal Makeup on facial skin oily with the application of Manual techniques and airbrush techniques. Application of airbrush engineering preferred by observer compared to using manual techniques

From the results of the above research it can be concluded that the use of airbrush techniques is better. for oily facial skin on western bridal makeup. Because the Airbrush technique can disguise or cover oily facial skin. In addition, the airbrush technique is more resistant, without clumping. and without visible skin gaps all over the face. Therefore, it is recommended to applying western wedding makeup for oily facial skin is an airbrush technique, because It can cover oily facial skin.

CONCLUSION

use of manual techniques of oily facial skin on western bridal makeup based on expert assessment, and after the use of data calculations can be concluded that the highest average value contained in the softness index which is 2.85, has an index of softness and durability index It's 2.76. resistance, and the average return index, 2.57, have resistance criteria.

Use of airbrush techniques on oily facial skin on western bridal makeup based on observational evaluation, and after the calculation of the data can be concluded that The highest average value is at a smooth 3.81, having excellent criteria and durability. The index is 3.71. the criteria is very durable and the average yield index of 3.66 has criteria very durable.

There are differences in the use of manual techniques and airbrush techniques on the skin of the face. oily when applying western bridal makeup on the endurance index obtained p = 0.003 (petlt; 0.05) there is an incredible difference in durability from the final results of the Foundation for the Makeup The Western bride on a brave face with the application of techniques and airbrush skills. On results the flatness indicator obtained the value p = 0.005 (p and lt; 0.05). This means that there is a difference in the flatness of the results. end of Western Bridal Makeup Foundation on oily facial skin when applied manual techniques And airbrush technique.

RERERENCES

[1] Gusnaldi.2003.the power of makeup. Jakarta : PT Gramedia pustaka umum.

[2] Dianas, A., & Astuti, M. (2021). Pengaruh Hasil Pengaplikasian Foundation dengan Teknik Airbrush Terhadap Hasil Rias Wajah Cikatri. *Jurnal Pendidikan Tambusai*, *5*(3), 7446-7453.

[3] Rifki, T. (2009). *Tata Rias Pengantin.* Jakarta: PT Gramedia Pustaka

[4] Tresna, P. W. (2016). The Influence of Transformational Leadership to Organizational Citizenship Behavior with Job Satisfaction as Mediator Variable (Study about Leadership of the Chairmen at Three Universities in Tasikmalaya). *Review of Integrative Business & Economics Research*, *5*(2), 295-303.

[5] PEBRINA, D. P., & Astuti, M. (2020). PERBANDINGAN HASIL RIAS FANTASI TEMA FLORA DENGAN TEKNIK MANUAL DAN TEKNIK AIRBRUSH. *Jurnal Tata Rias dan Kecantikan*, *2*(3).
Gusnaldi.2008. *I Do Bridal Make-Up*. Jakarta : Gramedia Pustaka Utama.

[6] Gusnaldi.2008. *I Do Bridal Make-Up*. Jakarta : Gramedia Pustaka Utama.

[7] Pangaribuan,(2012. Pangaribuan Lina. (2012). Kosmetika, Medan; UNIMED.

Astuti, M. (2014). Pengembangan Media

Pembelajaran Menggunakan Video Mata Kuliah Dasar Tata Rias Program Studi Pendidikan Tata Rias Dan Kecantikan FT UNP. *Pakar Pendidikan*, *12*(2), 118-127.

Astuti, M., & Thaitami, S. H. (2022). 3D
Multimedia E-Book Based on Mobile
Learning Basic Competency of Artistic Hair
Coloring. *International Journal of Natural*

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Science and Engineering, *6*(3).

Efrianova, V., & Astuti, M. (2020). PKM
peningkatan Penerapan Iptek dan Keterampilan Tata Rias Pengantin dan Mahendi Berbasis 4.0 bagi Ibu-ibu PKK dan Remaja Putri di Nagari Maninjau Kabupaten Agam.

Diah, H., & Astuti, M. (2021). Pengembangan
Media Pembelajaran Video Tutorial Rias Wajah Pengantin Barat di SMK N 6 Padang. *Jurnal Pendidikan Tambusai*, *5*(3), 7454-7460.

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Validity Of Job Sheet Electrical Control Techniques Simulator (EKTS) Industrial Electrical Installation Practices In The Electrical Engineering Department

Syaiful Islami, Risfendra, and Sukardi

Abstract This article aims to reveal the validity of Job Sheet Electrical Control Techniques Simulator (EKTS) Industrial Electrical Installation Practices in the Electrical Engineering Department. Based on the observation, the existing problem is the unavailability of a job sheet that causes the learning process has not to be maximized. The method used is Research and Development with development model Analysis, Design, Development, Implementation, and Evaluation (ADDIE). The validation process is accompanied by a discussion or direct interview with the expert on improvements to be made. The design of a Job Sheet EKTS Industrial Electrical Installation Practices is consulted first with experts. Then, the design is judged by the competent people who have understood the module development principle. Data collection instrument in the form of a questionnaire. The results obtained are a valid Job Sheet EKTS Industrial Electrical Installation Practices on aspects of content, aspects of the format, and presentation aspects.

Index Terms— EKTS, Industrial Electrical Installation Practices, job sheet, validity

INTRODUCTION

Industrial Electrical Installation course students in the installation of electrical power and controlling and controlling the rotation of a single-phase electric motor using three-phase sockets, TPST and TPDT switches properly and in accordance with the requirements of electrical installations. This course also provides the ability for students to be able to install power installations to start a star or reverse the direction of rotation of a three-phase electric motor using a magnetic switch, push button and thermal overload relay [1].

This course consists of 2 credits of theory and 3 credits of practice. The results of the initial observations show that students' interest, motivation and learning outcomes are still low. The low is because the existing job sheet cannot be understood by students in carrying out practice. The contents of the job sheet are limited because they still use the manual that is used when presenting the module, so students cannot directly practice if it is not explained beforehand. The job sheet at least does not consist of what basic competencies you want to achieve, completion of time, equipment or materials needed to complete short data tasks, work steps, tasks that must be tried, and reports that must be done [2]. So that the old worksheet needs to be improved and developed.

The development of this industrial electrical installation practices job sheet will be developed using the Electrical Control Techniques Simulator (EKTS). EKTS is a simulator application that can be used to design electromechanical systems. This application provides a variety of electromechanical systems using relays, time relays, buttons, motors, switches, and some basic mechanical systems. The main use of this simulator

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is to simulate the basics of Electromechanical systems, because EKTS has a useful feature to correct errors if there are errors in the installation of equipment. Another feature of this EKTS is that there is a record of the entire set of elements that are generally widely used in the real area [3]. Students can download the job sheet and this application and carry out a dialogue about the work to be done anywhere and anytime without being limited by space and time [4][5].

METHOD

The development procedure in this study follows the sequence of activities in the ADDIE model presented by Branch [6].

A. Analysis

The analysis includes the needs analysis in the development of entrepreneurship module based-product. Needs analysis has several steps that are done that is:

Curriculum Analysis

Curriculum analysis refers to the synopsis and syllabus of entrepreneurship courses so that the resulting module does not deviate from the learning outcome.

Student Analysis

The subject of this research is the students of Electrical Engineering Education in the odd semester of academic year 2019/2020. Students who take Industrial Electrical Installation Practices have an 18-20-year age range. At that age learners basically have been able to analyse and create their own hypotheses to a problem. Where, according to Anderson, each category in Bloom's Taxonomy revision, "the student at that age lies in the create category in which learners have been able to design, build, plan, produce, discover, update, refine, strengthen, beautify, transform [7].

B. Design

This stage verifies the form of troubleshooting to be performed and determines the appropriate testing method. This stage includes the translation of needs and learning objectives into specific job sheet-making objectives. This stage designs a job sheet EKTS according to needs analysis. In addition, at this stage also designed instruments to perform product validation instruments, instruments of practicality, instruments of effectiveness and instrument validation instruments.

C. Development

This development stage generates and validates job sheet EKTS. The validation process is accompanied by a discussion or direct interview with the expert on improvements to be made. The design of a job sheet EKTS is consulted first with experts. Then, the design is assessed by the people who are competent (validator) who has understood the principles of module development, the lecturer FT-UNP Postgraduate and lecturer Industrial Electrical Installation Practices.

Validations of this module there are three kinds, namely as follows.
1) Content validity, i.e. whether the module has been designed in accordance with the course syllabus.
2) Format validity, i.e. the suitability of job sheet components with predefined elements.
3) The validity of presentation that is valid with respect to the use of language, writing, drawing, and appearance in making learning media.

D. Implementation

Implementation stage is done by preparing the learning environment and student involvement in lectures consisting of preparation of lecturers and students. Students are given a job sheet EKTS to find out

the practicalities and effectiveness of using the job sheet.

Design lecture implementation using one group pre-test post-test. The pre-test is given at the beginning of the lecture. Post-test is given at the end of the lecture.

E. Evaluation

This stage assesses the quality of product development and development process both before and after implementation, by determining the evaluation criteria, determining the instrument, and evaluating.

The statistical procedure that shows the popular logical validity is the validity of the test content based on the content validity of the content.

One of the statistics that shows the validity of the content of item is as proposed by Aiken. Aiken has formulated the Aiken's V formula for calculating the Content Validity Coefficient based on the research results of a panel of experts as much as n on a product development module of entrepreneurship based on products in terms of the extent to which the item represents the measured constants [8]. In this case, representing the measured constituent means the relevant item is relevant to its performance indicator since the behavioural indicator is the operational translation of the attribute being measured. Assessment is done by giving a number between 1 (i.e. not highly representative or highly irrelevant) to 4 (i.e. very representative or highly relevant). The Aiken Statistics V can be formulated as follows:

$V = \sum s / [n(c-1)]$

Description:

$s = r - lo$

lo = the lowest validity score (in this case = 1)

c = highest validity score (in this case = 4)

r = numbers given by an appraiser.

The results of Aiken calculations ranged from 0 to 1 and the numbers 0.6 can be interpreted to have a high enough coefficient. The value of V 0.6 and above is expressed in a valid category.

RESULT AND DISCUSSION

The validity test data was obtained from the validator's response to the validity of the product-based module.

A. Content Validation

In this validation phase, the job sheet EKTS undergoes several fixes based on suggestions from the validator.

TABLE I.
THE VALIDATOR'S ASSESSMENT OF CONTENT

No	Indicator	Aiken's V	Category
1	Indicator 1	0,867	Valid
2	Indicator 2	0,858	Valid
	Total	0,862	Valid

Based on Table I it can be concluded that the Content assessment on the job sheet EKTS is Valid with Aiken's V value of 0.862. In the first indicator the value of Aiken's V of 0.867 with the category Valid and on the second indicator Aiken's V value of 0.858 with the category Valid.

B. Format Validation

At the format validation stage, the product-based entrepreneurship module undergoes several fixes based on suggestions from the validator.

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TABLE II.
THE VALIDATOR'S ASSESSMENT OF FORMAT

No	Indicator	Aiken's V	Category
1	Indicator 1	0,875	Valid
2	Indicator 2	0,864	Valid
	Total	0,869	Valid

Based on Table II it can be concluded that the valuation of the job sheet EKTS format is Valid with Aiken's V value of 0.869. In the first indicator the value of Aiken's V of 0.875 with the category Valid and on the second indicator Aiken's V value of 0.864 with the category Valid.

C. *Validation* of Presentation

In the presentation validation stage, the product-based module undergoes several fixes based on suggestions from the validator.

TABLE III.
THE VALIDATOR'S ASSESSMENT OF PRESENTATION

No	Indicator	Aiken's V	Category
1	Indicator 1	0,883	Valid
2	Indicator 2	0,750	Valid
	Total	0,817	Valid

Based on Table III it can be concluded that the assessment of the job sheet EKTS presentation is Valid with Aiken's V value of 0.817. In the first indicator the value of Aiken's V is 0.883 with the valid category and on the second indicator Aiken's V value of 0.750 with the valid category. Based on the suggestions given validator, then revised the job sheet so as to obtain a job sheet EKTS valid and feasible to be tested as a learning media on industrial electrical installation practices.

Based on the results of the research, a validated job sheet has fulfilled the requirements of a good job sheet, which comprises job sheet components in accordance with indicators, conformity of the content in the learning job sheet, clarity of instructions, the preparation of the material in the learning job sheet, the suitability of the format, display and language on the learning job sheet to make it easier for students to understand industrial electrical installation practices and applying it. Valid means it has provided accurate information about the developed teaching materials [9]. Validation of the job sheet EKTS is conducted by a validator consisting of three experts. All of the validators are experts in the field of study, therefore the validation of this result has been accountable. The three aspects of validation when summed the score of validity values obtained from each validator then obtained Aiken's V with an average of 0.849. This earned value is in a valid category.

In the content of the job sheet, the validator stated that the job sheet EKTS developed as one of the learning media has been in accordance with the curriculum, and learning outcomes that must be achieved by the students, including the suitability of the module contents, clarity of instructions, the preparation of the material, the suitability between the material practiced with the media learning, image suitability with the material being practiced, display images and text so as to facilitate students to understand the learning materials. The validation value of the content of entrepreneurship module based on the developed product is 0.862 with the valid category. Content validation is a requirement regarding the process of finding the correct concepts and in accordance with the applicable curriculum. Valid validation results for content validation indicate that the product-based entrepreneurship module developed has been well-suited to the current curriculum.

In aspect format, validation value from validator also gets the valid value that is 0,869 is categorized valid. The validity of the job sheet EKTS format is the suitability of job sheet components with predefined elements. Based on the validity value obtained from the validator it can be concluded that the job sheet EKTS developed has been in accordance with the requirements of the construction of learning job sheet.

The presentation validity is an indicator of validity with respect to the use of language, writing, drawing, and appearance in the manufacturing of job sheet EKTS. The validation value of the job sheet EKTS presentation is 0.817 with the valid category. Thus, the validation of the presentation also obtains a valid value. This indicates that the job sheet EKTS developed has been perfectly in line with the technical requirements of a learning job sheet.

CONCLUSION

Research on the development of job sheet EKTS is developed by using ADDIE model, which consists of analysis, design, development, and evaluation. The validity of the job sheet EKTS developed meets the content, format, and presentation aspects. So it can be concluded that the job sheet EKTS developed is valid for use in learning.

REFERENCES

[1] Tim Kurikulum UNP, "Sistem Informasi Kurikulum Universitas Negeri Padang," 2020. http://kurikulum.unp.ac.id/index.php/root/kurikulum/5 (accessed Jan. 08, 2020).

[2] M. A. Abdillah, "Kelengkapan Jobsheet Dalam Meningkatkan Hasil Belajar Mata Pelajaran Kelistrikan Otomotif Pada Siswa," *J. gardan*, vol. 3, no. 1, 2013.

[3] R. Mufaidah and Munoto, "Pengembangan Buku Ajar Siswa Berbasis Inquiry Learning Berbantuan Software EKTS untuk Meningkatkan Hasil Belajar Siswa Kelas XI TITL pada Mata Pelajaran Instalasi Motor Listrik di SMKN 2 Lamongan," *J. Pendidik. Tek. Elektro*, vol. 9, no. 2, pp. 273–278, 2020.

[4] N. S. Hanum, "Keefektifan E-Learning sebagai Media Pembelajaran (Studi Evaluasi Model Pembelajaran E-Learning SMK Telkom Sandhy Putra Purwokerto," *J. Pendidik. Vokasi*, vol. 3, no. 1, 2013.

[5] P. L. Devi, M. B. R. Wijaya, and Suwahyo, "Pengembangan Perangkat Pembelajaran Jobsheet berbasis Performance Assessment untuk Meningkatkan Kompetensi Conventional Engine Tune Up," *Sainteknol*, vol. 15, no. 1, pp. 95–100, 2017.

[6] R. M. Branch, *Instructional Design: The ADDIE Approach*. New York: Springer Science Business Media, LLC, 2009.

[7] L. W. Anderson, *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objective*. New York: David Mckay Company, Inc, 2001.

[8] A. Syaifuddin, *Realibilitas dan Validitas*. Yogyakarta: Pustaka Belajar, 2014.

[9] O. Candra *et al.*, "Validity of development on authentic assessment tool of curriculum 2013 based in information technology," *Int. J. Sci. Technol. Res.*, vol. 8, no. 12, pp. 265–267, 2019.

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Implementation of Inquiry-Based Practicum Modules in Composite Material Courses

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The purpose of this research is to develop an inquiry-based practicum module and test the feasibility of the module. The method used in this research is the R&D (Research and Development) method and uses the ADDIE model in making inquiry-based practicum modules. From previous research, composite materials practicum modules for composite materials courses in the Mechanical Engineering Education Study Program have been produced with the results of subject matter expert validation for this practicum module being included in the "Very Eligible" category with a feasibility percentage of 93.75%. The evaluation results from the learning media expert are also included in the "Very Eligible" category with an eligibility percentage of 87.5%. In this study, the finished module will be tested for implementation to students and determine the feasibility level of this practicum module.

Keywords: composite materials course , implementation test, inquiry , practicum module.

I. INTRODUCTION

Nowadays, technological developments are increasingly rapidly following the times, as well as materials that are getting more and more discoveries with better quality. Of course, this requires a lot of time and money to get good results as well as materials that are difficult to obtain, especially for composite materials.

Composite material is a multi-phase system composed of matrix material and a reinforcing material. The matrix material is a continuous phase and the reinforcement is a dispersed phase. The reinforcing material can be in the form of fibers, particles or, flakes [1]. In the UNG Mechanical Engineering Education Study Program, there are composite materials courses with a concentration/field of material science. Judging from the type of subject that is research-based, it is necessary to have experiments carried out through practical activities.

Practicum is an activity where students are allowed to experience themselves or do it themselves, follow a process, observe an object, analyze, prove and draw their own conclusions about an object, state or process of something. Thus, students will have more confidence in something than just getting information given based on lecturers and books as well The information provided in the lesson will last longer because students are allowed to experiment on their own [2]. According to Prastowo [3] that the module in general can be interpreted as the smallest unit of learning method, which can be studied by students individually (*self-instructional*) after students complete a module, then students can continue the next module.

It can be said that the practicum module is almost the same as the learning module. This is because, the practicum module contains the titles of the practicum, the purpose of the practicum, the theoretical basis of the practicum carried out, tools and materials and work procedures from the practicum, then there is a student worksheet containing the observations obtained during the practicum. This research is a continuation of research that has been carried out for the development of an inquiry-based practicum module in the Composite Materials course. But the implementation stage has not yet been carried out due to the pandemic period *covid-19* [4].

Therefore, researchers want to carry out the stages of implementing the practicum module as an alternative to overcome these problems.

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I. *METHOD*

In previous research, several steps have been carried out on the ADDIE model, namely: Analyze-Design-Development-Evaluation [4]. This research was conducted to find out results (implementation) of this practicum module by testing the practicum module on students who contract composite materials courses.

A. *Research Object*

The subjects in this study were the test subjects of the module, namely the students of the Mechanical Engineering Education Study Program, FT UNG who contracted the Composite Materials course.

B. *Data Collection Techniques*

There are several types of data collection tools used in educational research, such as questionnaires, interviews and observations. In this study, the data collection tool used is a questionnaire. The questionnaire is a list that contains a series of questions regarding a problem to be studied. This technique is used to obtain information from respondents about the learning media users based on the indicators that have been mentioned. The questionnaire used in this study aims to obtain feasibility data from the module that has been developed. The feasibility in question is the feasibility of the media and material components. Aspects of the questionnaire take the example of [5]. Questionnaires from students in terms of aspects: (a) media, (b) material, (c) language, and (d) learning modules. The readability of the learning module is adjusted to the media aspect.

TABEL 1

Aspects and indicators of a questionnaire for students

No	Aspects	indicatorss
1	Media	Interactive image media.
2	Material	a. The material is in accordance with the learning
		b. Menarik minat membaca mahasiswa.
3	Language	a. Sociable language
		b. Easy for students to understand.
4	Learning Module	a. Guide students to think creatively.
		b. Provide motivation for student in carry out a task
		c. Make it easier for the student to do the assignment

C. *Data Analysis Techniques*

The analytical method used in quantitative research is a descriptive analysis method. Descriptive analysis is a description or systematic, factual, and accurate description of the problem being investigated. The instrument will be used in quantitative research to collect data, the instrument is used to measure the value of the variable to be studied. Each instrument must have a scale to produce accurate data. To get accurate data, there is a method of Like rt. Scale Like rt with four variations of answers is the scale used in this study. ScaleLikertchosen because it can measure a person's attitudes, reactions, opinions, and perceptions of something. Each answer from the respondent is converted in the form of numbers for later analysis.

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The following is the value of the Likert scale used in this resear

TABEL 2

Likert scale for the questionnaire.

No	Category	Score
1	Very suitable	4
2	In accordance	3
3	Not suitable	2
4	It is not in accordance with	1

The scores obtained from the respondents were then converted into four scales of eligibility categories in the following table:

TABLE 3.

Eligibility Category.

NO.	Score Range	Category
1	Mi+1,5 Sdi <x≤ Mi + 3 Sdi	Very Eligible
2	Mi < x≤ Mi + 1,5 Sdi	Eligible
3	Mi-1,5 Sdi <x≤ Mi	Quite Eligible
4	Mi-3 Sdi <x≤Mi – 1,5 Sdi	Less Eligible

The ideal mean (Mi) and standard deviation (Sbi) are obtained using the following formula:

Mi =(1/2)((highest score + lowest score).

Sbi =(1/2)(1) (1/3)(Maximum score – minimum score) (2)

The score for the eligibility category in the table above will be used as a reference for the evaluation results of experts and users/students. These results then show the feasibility level of the learning module

D. Feasibility Percentage

Persentase jumlah skor menurut Sugiyono dalam [5]

$$Feasibility \% = \frac{Actual\ Sore}{Expected\ Score} \times 100\%$$

(3)

Description:
Actual Score = total score of the instrument that has been filled by the respondent.

Expected Score = total score of the instrument assuming each item is answered very well (SS) with a score of 4
By criteria:
0% < eligibility % 25%, not eligible
 25% < eligibility% 50%, less feasible
 50% < eligibility% 75%, eligible
75% < eligibility% 100%, very feasible

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II. RESULTS AND DISCUSSION

A. Results

Results study previously) about the development of an inquiry-based practicum module in the course of the composite materials by obtaining results from the validation test of material experts, namely 93.75% and media experts 87.5% [4]. Product trials are carried out after module validation by media and material experts who have analyzed, revised and the module has been declared suitable for use in the field. This trial was conducted to find out the students' initial opinion on the developed module. Aspects assessed by students include media, materials, language, and module learning. Product trial data were obtained using a questionnaire consisting of 25 questions. The number of students who contracted composite materials courses who took part in product trials or implementations amounted to 6 students. The following are the results of product trials.

known:

The number of aspect scores of the module test results (X) = 95.50

Items of material expert validation aspect criteria = 25 Highest score = 4

The lowest score = 1, then ;

Ideal maximum score = 25 x 4 = 100 Ideal minimum score = 25 x 1 = 25 Percentage of feasibility of module test results:

Feasibility % = Actual score/expected score x 100 %

$$\text{Feasibility \%} = \frac{\text{Actual Score}}{\text{Expected Score}} X100\% = \frac{95.50}{100} X100\% = \textbf{95,5\%}$$

B. Discussion

Based on the presentation of the feasibility of the practicum module test results, the results obtained are 95.5%, with categories "**Very Eligible**". Based on the data above and comparison with the previous results, namely the validation of material experts 93.75% and media experts 87.5%, the average value is obtained 92.25% and get the percentage graph the feasibility of the practicum module as shown below:
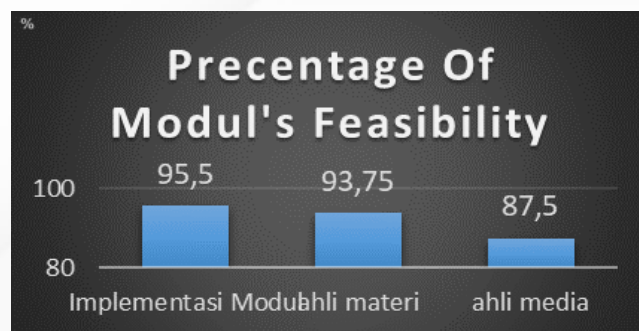
Figure 1. Graph of modul's feasibility precentage

Penelitian This study aims to produce a practicum module as a learning medium for composite materials courses and conduct a feasibility test on the practicum module.

The steps for developing this practicum module use the model (ADDIE) which consists of 5 stages, namely: *Analyze, Design, Development, Implement, evaluate.* But at not done due to limitations caused by the pandemic period *covid-19.* The resulting product is a composite material practicum module.

The practicum module developed by the researcher has the characteristics of using an inquiry-based learning model. Researchers choose an inquiry-based practicum module so that students can develop scientific and independent work skills. Inquiry is a good alternative if it is combined with developing a practicum module because the inquiry learning model emphasizes the process of searching and finding.

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Learning model *inquiry* which is one of the learning models developed so that participants find and use various sources of information and ideas to improve their understanding of a particular problem, topic, or issue [6]

III. *CONCLUSION*

A. *Conclusion*

Berdasarkan Based on the results of further research on inquiry-based practicum modules in composite materials courses, the researchers can draw the following conclusions::

1. From this study, it is known that the results of the implementation of the composite material practicum module for composite materials courses at the Mechanical Engineering Education Study Program, Faculty of Engineering, State University Gorontalo. This practicum module was developed using the ADDIE learning design model (*Analysis-Design-Develop-Implement-Evaluate)* previously without implementation.

2. The feasibility level of the inquiry-based composite material practicum module in the Mechanical Engineering Education Study Program, Faculty of Engineering, State University of Gorontalo, was determined through the validation of the practicum module by material experts and media experts which had been carried out previously and then a comparison was made with the results of implementation through this research. The results of the implementation of the practicum module is 95.50 which is in the score range of 81.25-100 in the Very Eligible category and gets a feasibility presentation of 95.5%. Then a comparison of the results of the material expert validation were carried out 93.75 % and the media expert validation was 87.5%, so the average percentage was 92.25%, by category " Very Eligible

B. *Suggestion*

This practicum modules as the result of research should be submitted for copyright.

I. *REFERENCES*

[1] Mardiyati, M. 2018. Komposit Polimer Sebagai Material Tahan Balistik. *Jurnal Inovasi Pertahanan Dan Keamanan*, *1*(1), 20–28.

[2] Wahyudi, W., & Lestari, I. 2019 Pengaruh Modul Praktikum Optika Berbasis Inkuiri Terhadap Keterampilan Proses Sains dan Sikap Ilmiah Mahasiswa. Jurnal Pendidikan Fisika Dan Keilmuan (JPFK), 5(1), 33–44.

[3] Hidayati, T. H., & Pustikaningsih, A. 2016 Pengaruh Komitmen Profesi Dan Self Efficacy Terhadap Niat Untuk Melakukan Whistle Blowing. Nominal, Barometer Riset Akuntansi Dan Manajemen, 5(1).

[4] Bahrun. 2019 Pengembangan Modul Praktikum Berbasis Inkuiri Pada Mata Kuliah Material Komposit. Skripsi Program Studi Pendidikan Teknik Mesin Universitas Negeri Gorontalo (UNG). Gorontalo

[5] Pramana Y. 2017 Pengembangan Modul Pembelajaran Autocad Dengan Konsep Pembelajaran Berbasis Proyek Di Jurusan Teknik Arsitektur SMK Begeri 2 Wonosari. Skripsi. Yogyakarta; Universitas Negeri Yogyakarta.

[6] Abidin. 2014 Desain Sistem Pembelajaran Dalam Konteks Kurikulum 2013. Bandung: Refika Aditama.

THE EFFECT OF THE APPLICATION OF THE GUIDED INQUIRY-BASED COOPERATIVE LEARNING MODEL ON STUDENTS' LEARNING RESULTS

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This study aims to see the effect of guided inquiry-based cooperative learning model that is practiced to students on learning outcomes. This study is included in the Pre-Experimental design and Intact-Group Comparison, namely: using a group, one group as a research trial and one group not being treated, only as a comparison or control class. This study uses a population of all students in the class of 2019 who program microteaching courses as many as 33 people and have been divided into 5 groups. The division of groups is carried out by the lecturer in a homogeneous manner. The samples used were 2 groups taken by simple random sampling technique. One group will be the control class or comparison where the learning activities are not applied by the guided inquiry learning model. One other group is used as an experimental class, a class that is applied by a guided inquiry learning model during teaching and training activities. Statistical analysis was carried out by using the 5% error rate test. The data that has been obtained has shown the completeness of learning outcomes with guided inquiry learning by 60% or 0.06 while the conventional class is 20% or 0.02. The results of the statistical analysis also show an increase in thinking skills in experimental class students

Keywords: guided inquiry, learning model, learning outcome

I. INTRODUCTION

Education is the key for a country not to be left behind from other countries. Thus, education is a process for students to learn to be able to think critically, understand, and understand. All experiences that have a human way of thinking, feeling, acting or behaving can be considered educational. The progress and success of a nation can be checked from the quality and the existing education system.

The success of education is influenced by many factors. One factor that is quite influential on the achievement itself is the ability of educators to provide assessments, evaluate the learning process, and student learning outcomes. According to Budiman and Jailani (2014), the learning objectives set out in the curriculum can be said to be achieved by paying attention to abilities. Another factor that supports the success of learning is the learning model/method in the teaching and learning system, the learning model is intended so that learning is varied and not monotonous. In determining the learning model, it is necessary to have learning objectives to be achieved, because the learning objectives to be achieved affect the learning model applied. Dimyanti (2013) states that the selection and application of the right learning method can improve the learning process through the application of the right model. If the teacher applies a teaching model that is suitable and in accordance with the learning objectives to be

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achieved, the subject matter, it is very likely that a conducive, creative, and innovative learning process will be created so as to motivate students to be more enthusiastic in learning Based on information obtained through an interview in October with one of the investigators in the field of Basics of Building Construction, the learning outcomes of class X DPIB students in the subject of Basics of Building Construction are low.

This is evidenced by the lack of understanding of the material in students which causes 65% of students to get learning outcomes below the standard / KKM (75). The material in the Basics of Building Construction subject itself is real, tiered and complex so that it does not direct students to just know and memorize but must understand the content of the material and be able to apply it. The KKM has not been achieved because the learning model in the learning process has not been able to make students understand the material. The learning model carried out in class X DPIB SMK still uses conventional methods (teacher centered) namely lectures with whiteboard instruments and powerpoint presentation media. Participation of students when learning takes place is less. Students tend to be passive, explore less and are less interested in learning activities so they cannot understand the material as a whole. So that the problem is not sustainable, it is necessary to improve the learning model, especially in semester 1 in class X DPIB. It is necessary to find a formula so that learning is more innovative, creative, effective, fun and can transfer the learning center to students (student centered).

The cooperative learning model is an alternative learning that can be practiced to create a learning situation that is conducive, active, creative, and also not boring according to the nature of the subject matter. Rohman (2009) stated that the cooperative learning model is a learning model that emphasizes positive interdependence between individual students, individual responsibility, face-to-face, intensive communication between students, and evaluation of group processes. The cooperative learning model itself is based on constructivist theory, which means that knowledge is built and generated from within students, not from outside the minds of students so that in the process Students will exchange views with other students in their groups and generate new knowledge for them. The cooperative learning model has many kinds of methods in its approach and will always develop according to the problems encountered in the scope of learning, one of which is the guided inquiry method. This cooperative learning model has been developed by Rahayu, Setyosari & Prayitno in 2006 by combining other approaches.

In the guided inquiry type, students will identify or organize their own problems to be studied. In this learning model, students are given more time to think both in groups and individually. The teacher in this method acts as a guide who gives a problem and helps supervise and guide them in solving the problem. But the longer the teacher reduces the portion of guidance to students so that they get used to it. At the beginning, they need sufficient guidance because they are not familiar with this learning model. Von Glasersfeld in Cakir (2008) & Sjoberg (2007) states that in the principle of constructivism, knowledge is actively built in the minds of students, not passively obtained from outside the students themselves. According to Zion & Mendelovici (2012) inquiry-based learning is compatible with constructivism theory, where knowledge is not transferred directly from educators to students, but is actively built by students.

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Meanwhile, according to Alberta (2004), inquiry is a process that starts from formulating problems, formulating hypotheses, collecting data, analyzing data and making conclusions. The guided inquiry learning model places students as important actors in the student centered learning process and plays an active role in the learning process, it is also expected to improve the learning model and strengthen students' understanding of the material being taught so as to increase student learning outcomes on the material that has been delivered.

Based on the explanation above, this research is important to study because the main problems in learning that often occur are learning objectives that are not achieved and learning models that are not suitable, as a result, students who do not understand the material presented by the teacher cannot be fully absorbed. by students. Moreover, for the SMK level whose output is prepared to go directly to the field/work, it is necessary to strengthen students' understanding of the material through effective, active, creative, and fun learning methods and in accordance with the nature of the subject matter. With this research, a solution will be given through testing the effect of the guided inquiry-based cooperative learning model in learning the basics of building construction.

II. RESEARCH METHOD

This study is a Pre-Experimental design with Intact-Group Comparison, which uses groups, one group as a research trial and one group not being treated, only as a comparison or control class. The research pattern can be described as follows:

$$
\begin{array}{ll}
X & O_1 \\
 & O_2
\end{array}
$$

Information :
O1 : The results of the measurement of one group applied by the guided inquiry learning model
O2 : The result of one group measurement which is not applied by the model
Guided inquiry learning
Effect of treatment : O1 - O2

Guided inquiry learning applied in the experimental class begins with formulating a problem, how to answer the existing problem formulation through assumptions that can be proven by means of observation, so that at the end of the lesson students are able to make conclusions.
This research is carried out online or online, it is estimated that using the zoom application during teaching practice activities in the microteaching course on Tuesday, November 2, 2021.

The subjects in this study were all undergraduate students of the Building Engineering Education Study Program, Faculty of Engineering, State University of Surabaya class of 2019 who programmed microteaching courses totaling 33 people and had been divided into 5 groups (the division of these groups was carried out by homogeneous course lecturers).

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The sample in this study used two groups taken by simple random sampling technique, later one group will become a control or comparison class where learning activities are not applied by the guided inquiry learning model and the other group will become an experimental class, namely the class that is applied to a guided inquiry learning trial. during teaching practice activities. The subjects that were sampled were students who acted as vocational students in teaching and learning activities a total of 12 people, with 6 students from each group. The objects tested in this study were the basics of construction subjects only at KD 3.5 and 4.5.

Research variable

This study aims to examine the influence as a causal relationship between the variables being studied. The variables in question are

1. Independent Variables or Independent Variables
   Is a variable that causes or influences or results in a study. In this study, the cause is a guided inquiry-based cooperative learning model.
2. Bound Variable or Dependent Variable
   Is the variable that is affected or the variable shows an effect of the independent variable. In this study, the result of the implementation of the guided inquiry-based cooperative learning model is the learning outcomes of students.

Research Instruments

Sugiyono (2017:133) states that in quantitative research, the instrument functions to collect data. The research instrument is used to measure the value of the variable under study. Thus the number of instruments to be used for research will depend on the number of variables studied. Because the research instrument will be used to make measurements with the aim of producing accurate quantitative data, each instrument must have a scale.

To obtain data, there is some information and information needed in this study, the researchers chose the instrument data collection techniques as follows:

a. Test

According to Prof. Dr. Suharsimi Arikunto (1987: 59-61) in his book Basics of Educational Evaluation states that the test is a tool or procedure used to find out and measure something in an atmosphere, by means of predetermined rules. The test that will be applied in this research is a subjective test in the form of a written essay test (available in the appendix). The use of essay tests aims to see to what extent students are able to understand the basic material of building construction which is delivered with a guided inquiry approach so that later the answers from students can be used as learning outcomes data. The test can be used as a good measuring tool if the items on the test are proven to be valid and reliable, therefore validity and reliability tests will be held.

b. Questionnaire

Questionnaire is a tool that helps determine the score of students' motivation and learning interest in learning with guided inquiry models and lectures in the form of a statement that must be filled out by participants.

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The first step is to create a grid and guidelines for scoring. The questionnaire instrument of the guided inquiry learning model has six indicators, namely: (1) checking students' understanding as the initial basis for improving the learning process, (2) stimulating and improving students' critical thinking skills, (3) training students' abilities to compose and conducting experiments, (4) motivating students to interact with each other to solve problems in experiments, (5) training students to be able to draw conclusions at the end of learning, and (6) evaluating. Data is an important asset in a study, therefore the tool used to measure it must be reliable so it must be tested first to prove it is valid and reliable. Researchers tested the validity and reliability of the questionnaire with reference to Singarimbun and Effensi (2014: 118-119) to calculate the reproducibility coefficient referring to the Nazir formula (2005:343) to calculate the scalability coefficient.

Instrument Trial

1. Validity Test

Validity is a measure that shows the level of validity or validity of an instrument. The instrument will be feasible and can truly measure the relationship between variables if the selected instrument is appropriate to use. With this type of measurement scale, there are clear answers "Yes" and "No" with a weighting of 0 = No; 1 = Yes. Meanwhile, the solution uses the Coefficient of Reproducibility and Coefficient of Scalability formulas.

$$Kr = 1 - \frac{error}{n}$$

Where :
Kr = Reproducibility Coefficient
e = Number of errors/error value
n = Number of statements times the number of respondents
The requirement for acceptance of the reproducibility coefficient value is that if the coefficient
reproducibility has a value > 0.90 (Singarimbun and Effensi, 2014: 118-119).

$$Ks = 1 - \frac{error}{x}$$

Where :
Ks = Scalability Coefficient
e = Number of errors/error value
x = 0.5 ({number of statements multiplied by number of respondents} - number of "yes" answers).

According to Nazir (2005: 343), the requirement for acceptance of the scalability coefficient value is if the scalability coefficient has a value > 0.60. The validity test using the Coefficient of Reproducibility and Coefficient of Scalability were analyzed using Microsoft Excel. If the values for these two coefficients meet the requirements, then the questions and the weighting are declared valid.

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2. Reliability Test

Instrument reliability testing is used to prove that the measuring instrument (instrument) is good, reliable, and feasible to use in collecting the required data. In this study, the formula used is the Kuder Richardson formula or commonly referred to as KR21, the formula is:

$$r11 = K/(K-1)*(1 - U*(K-U)/(K*V)).$$

With the category of reliability coefficients (Guilford, 1956: 145)
a. $0.80 < r11 \; 1.00$ very high reliability
b. $0.60 < r11 \; 0.80$ high reliability
c. $0.40 < r11 \; 0.60$ moderate reliability
d. $0.20 < r11 \; 0.40$ low reliability
e. $-1.00 < r11 \; 0.20$ very low reliability (not reliable)
 if the value of KR21 > 0.8 means that the questionnaire used in the research is reliable (reliable).

Data analysis technique

The test data on student learning outcomes that have been obtained after the research is carried out will be processed and analyzed using statistical tests. Data analysis was used to find the influence between research variables. The procedure is to describe the data and test the analysis requirements

1. Describing Data

The variable studied was a guided inquiry-based cooperative learning model (X) Student learning outcomes in the subject of Building Construction Fundamentals (Y). After the data from the two variables have been collected, several other procedures will be carried out, namely:

1.1. Tabulate the scores obtained by each student with observations regarding the implementation of the Guided Inquiry-Based Cooperative Learning Model in the learning process and written in the form of Xi. Write down students' test scores to see how far students' understanding is as a result of student learning. Students' test scores obtained from validated questions are expressed in the form of Yi.

1.2. Tabulate both data in one table looking for values of $Xi, \Sigma Xi2, \Sigma Yi, \Sigma Yi2$

1.3. Finding the mean (mean value) of the two groups

1.4. Find the standard deviation of each variable

After all the data is obtained, then data analysis is carried out.

2. Data analysis

The test will begin with a parametric statistical test (t test) using an error rate of 5%. The t-test uses a comparative test, which is to compare the learning outcomes of students.

2.1. Comparative Hypothesis Test

Comparative hypothesis testing is to test sample data in the form of comparisons. Comparative hypothesis testing also tests the average ability (significance of the results of research analysis) in the form of a comparison of two or more samples of variables. Variables in comparative hypothesis testing can be from different populations and samples or in the same population and samples but at different times. The comparison model is divided into two, namely the comparison of two samples and the comparison of more than two samples or k samples.

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The t test is to test the comparison of the average of two samples for data in the form of intervals or ratios. The steps for testing the comparative hypothesis are as follows:

  2.1.1 Determine the null and alternative hypotheses

  2.1.2. Testing homogeneity

  2.1.3. Determine the comparative test formula

  2.1.4. Determine t count and t table

  2.1.5. Draw a conclusion

Research Matrix

No	Problem Statement	Variable	Instrument	Data source	Data analysis
1	How is the influence of the guided inquiry-based cooperative learning model on the learning outcomes of class X DPIB SMK Negeri students in the subject of Building Construction Fundamentals?	Student learning outcomes	Sheet Test	Learners	Comparative Hypothesis Test
2	How do students respond to the applied learning model?	Student response	Student Response Questionnaire page	Learners	Validity Test with Reproducibility Coefficient and Scalability Coefficient

III. RESULTS AND DISCUSSION

Data Description

Based on the existing problems, namely the low learning outcomes of students in learning the subject of Building Construction Fundamentals with the lecture method, a trial research was carried out on the application of a guided inquiry-based cooperative learning model to determine the effect of the application of the experimental class on the learning outcomes obtained by students.

Therefore this research was carried out in two microteaching training trial classes with one class applying the guided inquiry learning model and the other class applying the conventional method of lectures. The data is taken from the learning outcomes of students at the end of the learning activity by working on the questions on the test sheet and reviewing the responses given by the students to the implementation of the Guided Inquiry learning model through a Guttman scale questionnaire that has been made and tested for validity. data that has been obtained are as follows:

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Learners	Experimental class (X1)	Information	Control class (X2)	Information
1	80	Complete	70	Not Completed
2	85	Complete	60	Not Completed
3	88	Complete	73	Not Completed
4	73	Not Completed	77	Complete
5	70	Not Completed	65	Not Completed
Amount	396		345	

Table 1.1 Student Learning Outcomes. Source: primary

Respondent	P1	P2	P3	P4	P5	P6	P7	P8	Yes answer	Answer no
1	1	1	1	1	1	1	1	1	8	0
2	1	1	1	1	1	1	1	1	8	0
3	1	1	1	1	1	1	1	1	8	0
4	1	1	1	1	1	1	1	1	8	0
5	1	1	1	1	1	1	1	1	8	0
correct amount										40
number of errors (errors)										0
total seluruh total all										40

Table 1.2 Experimental Class Student Questionnaire Score. Source: primary

After obtaining the two data, the researcher will analyze or process the data according to the research matrix that has been made, namely the analysis of comparative hypothesis test data for the experimental class student learning outcomes data (as a test class) and comparison class and analysis of validity test data with coefficient calculations. reproducibility and scalability coefficient for the questionnaire score data of experimental class students.

According to table 1.1, the total score is 396 for the class that applies the guided inquiry learning model (experiment class) and 345 for the comparison class that applies the conventional learning model with lectures. The mean (\bar{x}) value of student learning outcomes in the experimental class is 79.2 and the control class is 69. Completeness of student learning outcomes in the class with KKM = 75 in the experimental class = 3 /5 x 100% = 60% while the completeness of student learning outcomes in the control class = 1 /5 x 100% = 20%. While the standard deviation with the formula

$$S^2 = \frac{n\Sigma fi.Xi^2 - (\Sigma fi.Xi)^2}{n\,(n-1)}$$

is 5.975 for the experimental class and 5.22 for the control class. This standard deviation value will later become the variance for the homogeneity test on student learning outcomes data obtained after learning activities.

Data Analysis

2.1 Data Analysis of Student Learning Outcomes

Comparative hypothesis testing is to test sample data in the form of comparisons. Comparative hypothesis testing also tests the average ability (significance of the results of research analysis) in the form of a comparison of two or more variables.

This study uses a comparison of two variables, namely the value of student learning outcomes in the experimental class (X1) and the value of learning outcomes of students in the control class (X2). Variables obtained from different samples, different times but in the same population. The data analysis of this research will use the t-test.

2.1.1. Determine the null and alternative hypotheses

Research hypothesis

Ho = Student learning outcomes in the research class with the control class not there is a difference

Ha = Student learning outcomes in the research class with the control class

there is a difference

Statistical Hypothesis

$\mu 1 = \mu 2$

$\mu 1 \neq \mu 2$

2.1.2. Homogeneity Test

The homogeneity test serves to select the comparative test formula, that is, the calculated F values and the F tables obtained are compared.

N	5	5
rata2	79,2	69
S	5,975	5,22
S²	35,703	27,25

F count = largest variance : smallest variance

= 35,703 : 5,22

= 6.84

F table

dk (number) = n-1 = 5-1 = 4

dk (denominator) = n-1 = 5-1 = 4

significant level (α) = 5% = 0.05 from the F-table, the F value is 6.39

Because the calculated F value is greater than the table F value (6.84 > 6.39), the variance is not homogeneous. The number of respondents (n) in the two classes is the same, namely 5, so n1=n2 and the variance is not homogeneous, so it can use the separated variance formula or the polled variant formula with dk = n1-1 or n2-2.

2.1.3. Determine the value of t count and t table

The researcher chose the formula separated variance to determine the value of t count

$$t\ count = \frac{X_1 - X_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = \frac{79,2 - 69}{\sqrt{\frac{35,703}{5} + \frac{27,25}{5}}} = \frac{10,2}{3,548} = 2,874$$

t table

dk = n-1 = 5-1 = 4

significant level (α) = 5% = 0.05, the t table value is 2.776

2.1.4. Draw a conclusion

Because the value of t table < t count, then Ha is accepted and Ho is rejected. So the hypothesis which states "There are differences in student learning outcomes in

class with control class" is acceptable. Based on the test of learning outcomes in the experimental class with the control class, it can be seen that there is a significant difference in the students' learning outcomes. The mastery of learning in the research class (as an experiment class) is 60% while the control class is 20%, meaning that there is a difference of 40% in the mastery of learning outcomes, the research class applied to students has higher results than the class that only applies the conventional model.

After analyzing the data by testing the comparative hypothesis, the t-test results show tcount > ttable (2.874 > 2.776), so H0 is rejected and H1 is accepted. That is, the learning outcomes of students between the research class/experiment class that uses the guided inquiry model and the control class that only applies the conventional method, namely lectures, have differences. This is because the class that applies the guided inquiry model, namely the research class, has the opportunity to involve students directly in learning, so that students will be more motivated, enthusiastic and participate when learning takes place. Because the learning process is student centered, students better understand the concept of learning, students get their own experiences attached to themselves that can help understanding during the learning process and afterward.

Besides that, it can also encourage students to be more active in asking, answering, and looking for relevant problems around us. All students are encouraged to be ready and alert in dealing with and solving existing problems, not independently (individually) but together through discussion forums, so that students will be more skilled and become independent individuals. The physical and mental activities contained in this learning can increase the cognitive learning outcomes of students. This learning model can encourage students to dig deeper into their own knowledge to make students more independent, active, and skilled in solving problems according to available information. In accordance with cognitive learning outcomes, students are able to understand, remember, apply, analyze, and create.

The procedure for implementing the guided inquiry model in learning activities begins with formulating a problem, followed by tips for answering the problem formulation with a hypothesis or provisional statement that needs to be proven, therefore observations are made to find out whether the hypothesis can be accepted or not. If the observations obtained are able to prove that the hypothesis can be accepted, the last step that needs to be done is to draw conclusions from the entire procedure that has been carried out. With the formulation of the problem, students are taught to be more open by making observations, making predictions so that students are able to remember and understand so that they can apply them in daily activities as necessities of life. Before testing hypotheses, students are also taught to analyze in this study, namely in making hypotheses, so that students' analytical skills can increase. And in the process of solving these problems, it is hoped that the ability to create or create that students have can be improved.

Based on the results of research, the use of guided inquiry models makes students more active, which is evidenced by students who dare to ask questions, answers given by students, as well as responses that are occasionally delivered. Although the explanation has explained the many advantages

of learning this inquiry model, this inquiry model also has drawbacks. Among them is if in the learning process followed by many people.

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Because basically every student has their own character and personality so that in the delivery of various teachers it will be difficult to give an assessment, it takes quite a lot of time because students have their own opinions and are negligent that the lesson is over. At the beginning of the teaching and learning process carried out in the control class using conventional learning in the form of lectures, students felt enthusiastic and listened to what the teacher said, but after a few minutes later many turned off the camera and their attention to the material presented by the teacher decreased. Based on the results of data analysis, the students' learning outcomes have increased, this is indicated by the higher mastery of students in the research class, besides that, it also shows the addition of critical thinking skills that are better than the control class with conventional learning. These results are in accordance with research published by Liliasari and Tanwil, Subarkah.

Differences in the final results of students' learning mastery and improvement of critical thinking skills can occur because of differences in teaching methods, where learning in research classes prioritizes students. So that it encourages students to think, argue, and act in solving problems. Through this, students' thinking abilities can be developed by trying to solve problems. Students who are involved in research classes in full learning have the opportunity to search, collect, analyze, and investigate phenomena systematically, critically, and logically to solve the problems they get. This learning is a learning that also applies constructivism where through this learning trains students to build on the knowledge that has been obtained.

In addition, this inquiry learning provides opportunities for students to discuss and work together in teams. Students are accustomed to interacting and communicating with each other in problem solving so that students have a learning experience that makes it easier for them to learn the concepts they are studying. So that the knowledge gained is more attached. In contrast to conventional learning classes, students are not given the opportunity to analyze and conclude, the explanation of the material is given

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directly by the teacher and students only listen. Based on the results of the analysis, critical thinking has an effect on positive learning outcomes. With positive thinking students have cognitive abilities to analyze, evaluate, synthesize. In addition, the application of the guided inquiry learning model in learning will be able to create a sense of kinship, by collaborating through group discussions.

2.2. Data Analysis of Student Responses to the Guided Inquiry Learning Model

The response of students in learning is one of the data that can show whether or not a variable has an effect on other variables during the activity. In this study, the student response data was obtained from the answers on the questionnaire sheet distributed by the researcher via google form after learning in the experimental class. The questionnaire sheet can be said to be valid as a tool or instrument if it is proven valid to be able to measure research variables, in this study the variables of the application of the guided inquiry learning model. The researcher chose a guttman or binary scale questionnaire, which is a questionnaire that contains questions and can only be answered by respondents with a choice of "yes" or "no". The questionnaire data that has been filled in by the respondents will be analyzed by researchers with validity tests with the procedure of calculating the reproducibility coefficient (Singarimbun and Effensi, 2014: 118-119) and the scalability coefficient (Nazir, 2005: 343) if the coefficient value is more than the specified value, the questionnaire that has been made can be said to be valid.

Based on table 1.2, namely the score of the student questionnaire, the number of correct answers is 40 and the number of errors is 0. The total value of correct answers and incorrect answers is 40. The reproducibility coefficient can be calculated by the formula:

$Kr = 1 - \frac{error}{n}$ = 1-$\frac{0}{40}$ = $1 - 0 = 1$ Obtained a value of 1, then Kr = 1 > 0.9 can meet t   he value of the reproducibility coefficient. After getting the value of Kr, the researcher determines the value of the scalability coefficient by using the formula $Ks = 1 - \frac{error}{x} = 1 - \frac{0}{(8 \times 5) - 40} = 1$ value indicates the number of questions times the number of respondents minus the number of "yes" answers. Ks = 1 means more than the value of the provisions, namely > 0.60 then it meets the scalability coefficient. Because the calculation of the reproducibility coefficient and the scalability coefficient meet the requirements, it can be stated that the questionnaire is valid and can be a component to measure students' responses to the implementation of the guided inquiry learning model in the subject of building construction basics.

In addition to the validity test, in this study the questionnaire was also tested for reliability, in order to find out that the questionnaire that had been made by the researcher could be reused for the second, third, fourth, etc. at least to the same respondent and still produced consistent data.

The reliability test for the Guttman scale questionnaire uses the Kuder-Richardson 21 formula or often referred to as KR 21. This is because the formula is dichotomous ("yes" or "no"). The formula is:

r11 = K/(K-1)*(1 − U*(K-U)/(K*V)).
With the information
r11 = instrument reliability
K = number of items or questions
U = average total score
V = total variance.

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The processing is as follows: $r_{11} = 8/(8-1)*(1 − 8*(8-8)/(8*32)) = 1.142$ when viewed according to the reliability coefficient category (Guilford, 1956: 145) then including the category of very high reliability so that the questionnaire can be relied on in research.

Because the questionnaire has been proven valid and reliable (reliable) then the responses of students as respondents can be used as measurable data. According to the data in table 1.2 all students are willing to answer "yes" which means they agree with the questions asked, namely: (a) The application of guided inquiry learning is proven to be able to make students understand the content of the material better, (b) Students feel active when learning, (c) The application of this learning is able to increase the learning interest of the students, (d) Students are motivated to learn by applying this inquiry learning model, (e) The application of this learning model is able to increase cooperation with groups, (f) The application of guided inquiry learning can make students' interest in learning higher, (g) students feel the difference with other learning models, and (h) the application of guided inquiry learning does not make students feel bored during learning.

IV.CONCLUSION

According to the data analysis and discussion above regarding the research that has been carried out, it was found that guided inquiry learning has a positive influence on students towards learning, among others, namely being able to increase the final learning outcomes of students so that it will automatically increase the mastery of learning outcomes, increase students' critical thinking skills. If, judging from the responses given by students during learning, it indicates that the application of this learning is suitable to be applied because it makes it easier for students to understand the material, makes students more active during learning by working together in groups, increases interest and motivates students to learn until following the next lesson and students are not easily bored during class hours.

REFERENCE

Alberta Learning Catalog. 2004. Focus on Inquiry: A Teacher's Guide to Implementing Inquiry-Based Learning. Canada: Alberta Learning.

Arikunto, Surharsimi. 2013. Basics of Educational Evaluation. Jakarta: Bumi Aksara.

Budiman, A & Jailani. 2014. Development of Higher Order Thinking Skills (HOTS) Assessment Instruments in Mathematics Subjects for SMP Class VIII Semester 1. Journal of Mathematics Education Research Volume 1-Number 2, (online) (http://journal.uny.ac.id/index.php/jrpm/article/viewFile/2671/2224), accessed March 21, 2021

Cakir, Mustafa. 2008. Constructivist Approaches to Learning in Science and Their Implications for Science Pedagogy: A Literature Review. International Journal of Environmental & Science Education, 3(4): 193-206.

Dimyati. 2013. Learning and Learning. Jakarta: PT Rineka Cipta.

Guilford, J.P. 1956. Fundamental Statistics in Psychology and Education. 3rd Ed. New York: McGraw-Hill Book Company, Inc.

Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems

Nazir. Moh. 2005. Research Methods. Jakarta: Ghalila Indonesia

Rohman, A. (2009). Understanding Education and Educational Science. Yogyakarta: LaksBang Mediatama.

Singarimbun, M & Effendi, S. 2014. Survey Research Methods. Jakarta: LP3S.

Sugiyono. 2017. Quantitative, Qualitative, and R&D Research Methods. Bandung: Alfabeta, CV.

Zion Michal and Mendelovici Ruthy. 2012. Moving from Structured to Open Inquiry: Challenges and Limits. Science Educational International, 23(4): 383-399.

Study Of Learning Motivation And Students' Learning Achievement At Online Learning During Covid-19

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This research was motivated by changes in learning methods during the Covid-19 pandemic. Based on the Semester Achievement Index of students in online learning, it can be seen that there is a decrease in the percentage from the period before going online. This study aims to describe student learning motivation and describe student learning achievement in online learning the Covid-19 pandemic at the PKK Study Program Concentration of Cullinary. This type of research is quantitative with a correlational approach. The population of this research is the students of the Culinary Concentration PKK Study Program who take online lectures totaling 383 people. The sampling technique used is proportional random sampling totaling 80 people. The data was collected by using a questionnaire via google form using a Likert scale that has been tested for validity and reliability. Data were analyzed by descriptive. The results showed that overall student learning motivation was in the moderate category with a percentage of 42.2%, student achievement was in the medium category with a percentage of 36.2%. The results of study can be concluded that learning motivation and learning achievement students in online learning during the Covid-19 pandemic at the Culinary Concentration PKK Study Program in the medium category

Keywords: Learning Motivation, Learning Achievement, Online Learning, Covid-19

1. PRELIMINARY

The global epidemic that occurred in early 2020 in Indonesia is known as Covid-19. Covid-19 is a disease caused by the Severe Acute Respiratory Syndrome Corona Virus or SARS-CoV-2 (Matdio Siahaan, 2019). The current Covid-19 pandemic has forced the government to set several new policies on education in Indonesia. One of the policies made by Indonesia Ministry of Education and Culture contain in the circular letter number 4, 2020 is the implementation of online learning in all educational institutions in Indonesia. The Rector of Universitas Negeri Padang issued a circular letter number 1593/UN35/AK/2020 relating to campus activities in the context of the Covid-19 pandemic alertness. The letter contains thirteen policy points including the policy for implementing lectures at http://elearning.unp.ac.id platform and other online platforms.

Online learning is conducted without face to face between lecturers and students with internet network support (Asmuni, 2020: 56). Online learning process at Cullinary major, PKK Study Program, Universitas Negeri Padang consist of theoretical and practical lectures. In the implementation of online lectures, in general, lecturers provide material on applications or e-learning platforms provided by university. In addition, online lectures are also carried out with applications such as whats app group, google classroom, and direct interaction with lecturers through zoom meetings or google meet. Giving assignments on

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theoretical lectures are papers, research proposals, journal reviews, and making resumes. On practical lectures are in video plan and practice, design draw, learning video, and any others.

According to Sumadi Suryabrata (2007: 297) learning achievement is value which is the final formulation that can be given by teacher regarding the progress of learning achievement during certain period. It is in line as what Winkel in Noor Komari Pratiwi (2015:81) states that "Learning achievement is the result of learning that has been achieved or the result of expertise in academic work assessed by teachers or lecturers, through tests carried out or through a combination of the two things."

Based on data obtained from the Administration of the Social Welfare department, the achievement index of GPA of PKK Study Program students after carrying out online learning in 2017-2019 period decreased if compared before pandemic. GPA category above 3.50 experienced a decrease in percentage for three batches, while GPA below 3.00 increased slightly. For 2020 students who carry out online lectures completely from the beginning of the lecture, it can be clearly seen at GPA. In the class of 2020, achieving 65% of students whose GPA more than 3.50, 26% whose less than 3.50 and nearly 9% whose less than 3.00. Based on this categorization, it can be clearly seen that not all students achieved more than 3.50 and some achieved less than 3.00.

There are some factors in the achievement index of GPA during online learning as explained by Nana Sudjana (2011:39). Two main factors such as internal factors (intelligence, interests, talents, motivation, creativity, attitude, personality, values/achievements, hobbies, feelings, experiences, knowledge and skills) and external factors (community environment, school environment, learning facilities and learning methods/timing). The low student achievement was influenced by several internal and external factors. The dominant factor here is internal factors specifically psychology point as self-motivation (Elida et al, 2016:1). Learning motivation can affect the learning process and achievement. Learning motivation is one of the success factors of students in achieving maximum learning achievement. Motivation according to Hamzah B. Uno (2019: 23) is a person's encouragement to change behavior in a better direction to achieve his goals. There are basically two learning motivations, namely intrinsic motivation and extrinsic motivation. Based on preliminary study on some lecturers of the Family Welfare Education Study Program with Cullinary expertise, some lecturers said that in general students were less enthusiastic in carrying out online lectures, were not punctual and not serious in doing assignments, and internet network issues.

While preliminary study with the distribution of online questionnaires conducted on students from Class of 2017, 2018, 2019, and 2020 in the Culinary Concentration PKK Study Program, the results of the questionnaire collected by 45 people showed that 68.6% students did not repeat the learning material given by the lecturer, 87% students did not understand the material in online lectures, 58.3% did not fill in the absences on time, 96.6% students stated that direct lectures were more interesting than online lectures, 62.1% students did not complete and submit assignments on time, it is because 72 ,4% students stated that they did not have supporting practice facilities and equipment. In addition to facilities, 51.7 students also stated that they had internet connection problems, where 75.9% stated they had problems with internet quota.

Based preliminary results, it can be concluded that the lack of student learning motivation was seen from the intrinsic factors of several indicators. In addition, motivation was also influenced by extrinsic motivation in the form of learning environment, the result also showed that the lack of support for the student learning environment that affected student learning motivation.

I. METHOD

Type of the study is descriptive quantitative research. This research was carried out by the Department of Family Welfare, Faculty of Tourism and Hospitality, Universitas Negeri Padang which was be held in October 2021. The research variables in this study consisted of two variables such as student learning motivation in Online Learning (X) and Learning Achievement (Y). The population in this study were students who had attended online lectures as PKK students on Cullinary Concentration class of 2017, 2018, 2019, and 2020 comprising 383 students. The sample of this study was taken using a proportional random sampling technique with total of 80 students. The data collection technique was done by using a questionnaire in the form of a google form. The compiled questionnaire was scored using a Likert scale.

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II. STUDY RESULTS

A. Learning Motivation on Online Learning at PKK Study Program – Cullinary Consentration

Histogram of Student Learning Motivation in Online Learning During the Covid-19 Pandemic in the PKK Study Program Concentrates on Cullinary Administration

	Overall, learning motivation	Overall, Intrinsic Learning Motivation	Overall, extrinsic learning motivation.	There is a drive to achieve, as well.	There is a need and encouragement in learning	The existence of hope and ideals for the future	There is Reward in Learning	There are Interesting Activities in Learning	There is a Conducive Learning Environment
■ Very High	5	3	4	2	5	2	1	5	4
■ High	20	17	19	16	15	17	25	15	20
■ Currently	34	39	28	37	29	29	18	28	28
■ Low	16	14	24	16	23	24	29	24	21
■ Very Low	5	7	5	9	8	8	7	8	7

■ Very High　■ High　■ Currently　■ Low　■ Very Low

Figure 1. Histogram Classification Categorization of Student Learning Motivation Data on Online Learning in PKK Study Program, Cullinary Concentration

Based on Figure 1, it can be seen that students' learning motivation in online learning at PKK Study Program, Cullinary concentration achieved 6.2% respondents at very high category, 25% at high category, 42.5% at medium category, 20% of respondents at low category, and 6.2% at very low category. Based on this data, it can be concluded that students' learning motivation in online learning at this major is at medium category, achieving 42.5%.

Intrinsic learning motivation of students on online learning achieved 3.8% respondents are at very high category, 21.2% at high category, 48.8% at medium category, 17.5% at low category, and 8.8% at very low category. Based on this data, it can be concluded that the students' intrinsic learning motivation on online learning is at medium category, nearly 48.8%. While the extrinsic learning motivation of students achieved 5% at very high category, 23.8% high category, 35% medium category, 30% low category, and 6, 2% very low category. Based on this, it can be concluded that the extrinsic learning motivation of students in online learning at medium category achieving 35%.

Student learning motivation of students with desire to study achieved 2.5% at very high category, 20% high category, 46.2% medium category, 20% low category, and 11.2% very low category. Based on this number, it can be concluded that students' learning motivation with desire category achieved medium category nearly 46.2%.

Student learning motivation at online learning with indicator of needs and encouragements in learning achieved 6.2% at very high category, 18.8% at high category, 36.2% at medium category, 28 ,8% at low category, and 10% at very low category. Based on this data, it can be concluded that students' learning motivation in online learning process with needs and encouragement components is at medium category nearly 36.2%.

Student learning motivation with indicator of future hope and aspirations 2.5% at very high category, 21.2% at high category, 36.2% at medium category, 30% of respondents at low category, and 10% at very low category. Based on this data, it can be concluded that students' learning motivation with indicator of future hope and aspiration is at medium category, nearly 36.2%.

Student learning motivation in online learning at learning rewards achieved 1.2% at very high category, 31.2% at high category, 22.5% at medium category, 36.2% at low category, and 8.8% at very low category. Based on this data, it can be concluded that students' learning motivation in online learning with indicator of appreciation in learning are at low category nearly at 36.2%.

Student learning motivation in online learning with interesting activities achieved 6.2% at very high category, 18.7% at high category, 35% at medium category, 30% at high category low, and 10% at very low category. Based on this data, it can be concluded that students' learning motivation in online learning with indicator of interesting activities in learning achieved medium category nearly 35%.

Student learning motivation in online learning with conducive learning environment achieved 8.8% at very high category, 26.2% at high category, 35% at medium category, 25% at low, and 5% at very low category. Based on this, it can be concluded that students' learning motivation in online learning with conducive learning environment achieved at medium category, nearly at 35%.

B. Learning Achievements at Online Learning During Covid-19 Pandemic
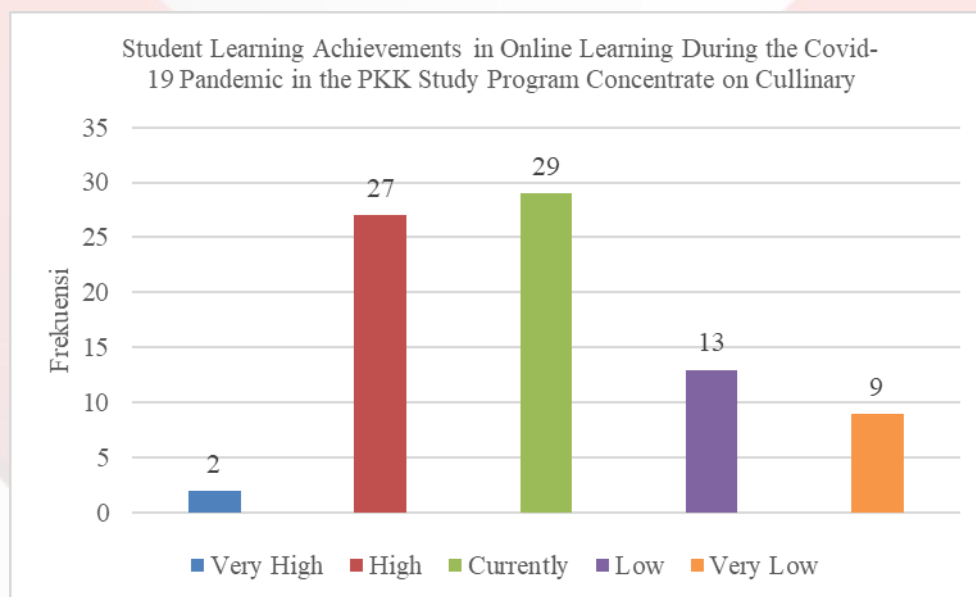
Figure 2. Histogram Classification of Student Achievement Data Categorization at Online Learning During the Covid-19 Pandemic

Based on Figure 2, it can be seen that student learning achievements at online learning achieved 2.5% at very high category, 33.8% high category, 36.2% medium category, 16.2% low category, and 11.2% very low category. Based on this data, it can be concluded that student learning achievement at online learning achieved medium category, nearly 35%.

III.   DISCUSSION

A.   Student Learning Motivation at Online Learning During Covid-19 Pandemic

Based on study result, it can be explained that 80 respondents learning motivation variable achieved medium category, which category explains that students had moderate motivation at online recovery during Covid-19 pandemic. Motivation is divided into two including intrinsic and extrinsic motivation. Intrinsic motivation was at medium category and extrinsic motivation was at medium category. The following is a description of study results as follow (1) The existence of desire and desire to succeed, (2) Available interesting activities, (3) Hope and aspiration for the future, (4) Available interesting activities in learning and (5) the existence of conducive environment. Five indicators of learning motivation achieved at medium category. (6) The existence of appreciation in learning was at low category. It can be concluded that overall 34 respondents (42.4%) were at medium category. Although online learning, students still had motivation to learn. According to Sardiman (2014), motivation grows within the individual. Motivation

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functions as a driving force in learning activities, ensures the continuity of learning activities, and provides direction to learning activities, as a result goals desired by someone can be achieved. Learning motivation is very crucial in self-development. Motivation can be increased by changing habits, as getting used to online learning system so student's motivation even though it is done without face to face, student learning motivation is similar.

B. Student Learning Achievements at Online Learning During Covid-19 Pandemic

Student achievement can be seen from students' GPA at online learning semester, it can be seen from 80 respondents: 2.5% at very high category, 33.8% at high category, 36.2% at medium category, 16.2% at low category, and 11.2% at very low category. Based on this data, it can be concluded that student learning achievement in online learning achieved at medium category, nearly 35%. One indicator of successful learning or not is proven by learning achievement. Learning achievement is a parameter that can be used in determining the success or failure of the educational goals implemented.

Academic achievement during pandemic was not only influenced by learning motivation, but can be influenced by several factors such as learning media, learning process, learning atmosphere, parental support and any others. According to Riyani in MTD Hasibuan, et al (2020:390), some factors that affect learning achievement as follow: 1) Factors from within personal consisting of physiological factors. Physiological factors are physical conditions and five senses. While the psychological factors are talent, interest, intelligence, motivation and cognitive ability. 2) Factors from outside personal, consisting of environmental factors and instrumental factors. Environmental factors are social and natural. While the instrumental factors are curriculum, materials, teachers, facilities, administration, and management. The efforts made by educational institutions as the spearhead in carrying out the educational process have been optimum. Covid-19 as a non-natural disaster is a new problem for the world of education, such as the enactment of online learning rules. This is done by the government hopefully that the virus will not spread wider and healing efforts can run optimally.

IV. CONCLUSION

Students' learning motivation at online learning during Covid-19 pandemic at PKK Study Program with Cullinary Concentration was at medium category. Learning achievements in the form of semester GPA in online learning achieved compliment category.

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REFERENCES

Asmuni, A. 2020. "Problematics of Online Learning in the Covid-19 Pandemic Period and Solutions to Solve it". Journal of Pedagogy, 7(4): 281-288.

Ahmad Susanto. 2015. Theory of Learning and Learning in Elementary Schools. Jakarta: Prenada Mulia.

Bilfaqih, Y., and Qomarudin, MN, 2015. The Essence of Preparation of Online Materials for Education and Training. Yogyakarta: DeePublish.

Cahyani, A., Listiana, ID, & Larasati. 2020. "High School Student Learning Motivation in Online Learning in the Covid-19 Pandemic Period". IQ (Science of the Qur'an): Journal of Islamic Education, 3(01): 123-140.

Denni Huang. 2020. "Motivation for Online Lectures During the Corona Virus Disease (Covid-19) Pandemic for Stmb Students

Multi-Smart Medan". Smart Scientific Journal, 4(2): 107-117

Desy Ayu Nurmala., Tripalupi, LE, & Suharsono, N. 2014. "The Influence of Learning Motivation and Learning Activities on Learning Outcomes Accountancy". Journal of Economic Education Undiksha, 4(1).

Dimyati and Mudjiono. 2013a. Study And Learning. Jakarta: Rineka Cipta.

_____ 2009b. Study And Learning. Jakarta: Rineka Cipta.

Elida, Marisa Ayu Saputri, Lucy Fridayati. 2016. "The Relationship between Learning Motivation and Pastry and Art Learning Outcomes for Students of the Padang State University Family Welfare Education Study Program". Journal of Home Economics and Tourism, 11 (1)

Hamzah B. Uno. 2019 . Motivation Theory and Its Measurement. Jakarta : PT. Script Earth Herliandry, LD, Nurhasanah, N., Suban, ME, & Kuswanto, H. 2020. "Learning During the Covid-19 Pandemic". JTP-Journal Education technology, 22(1): 65-70.

La Hadisi and Wa Muna. 2015. "Information Technology Management in Creating Learning Innovation Models (E-Learning)" Journal of Al-Ta'dib, 8(1).

Muhammad Taufik Daniel, Hendry. K.M, Harsudianto. S, Yusrial Tarihoran. "The relationship between learning motivation and academic achievement"

For Students Undergoing Online Learning During the Covid-19 Pandemic". Journal of Indonesian Trust Health. 3(2)

Matdio Siahaan. 2020. "Impact of the Covid-19 pandemic on the World of Education". Journal of Scientific Studies (JKI), 1(1): 1-3

Mustofa, MI, Chodzirin, M., & Sayekti, L. 2019. "Formulation of Online Lecture Models as an Effort to Suppress Quality Disparities

College". Walisongo Journal of Information and Technology, 1(2): 154.

Nana, Sudjana. 2006a. Assessment of Teaching and Learning Results. Bandung: PT. Youth Rosda Karya.

_____ 2011b. Assessment of the Results of the Teaching and Learning Process. Bandung: PT Pemuda Rosdakarya.

Strengthening Technology
and Vocational Competence
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Nasrah and Muafiah, AMA 2020. "Analysis of Student Motivation and Online Learning Outcomes During the Covid-19 Pandemic 19". JRPD (Journal of Basic Education Research), 3(2): 207-213.

Ni Komang Suni Astuni. 2020. "Utilization of Information Technology in Elementary School Level Learning during the Pandemic Period Covid-19". Lampuhyang Journal, 11(2):1-3.

Oemar, Hamalik. 2013. Teaching and Learning Process. Jakarta : PT. Bumi Aksara

Permendikbud. 2020a. Circular Letter Number 4 of 2020 concerning Prevention of Corona Virus Disease (COVID-19) in Education Units.

_____2013 b. Circular Letter Number 109 of 2020 concerning Regulation of the Minister of Education and Culture concerning Implementation of Higher Education.

Priansa, Donni Juni. 2017. Development of Learning Strategies and Models. Bandung: CV Pustaka Setia.

Pusviyta Sari. 2015. "Motivating Learning Using E-learning. Ummul Quro, 6(2): 20-35

Rahmayuni, NA, & Sobri, M. (2021). Student Motivation in Online Learning Arabic Subjects at Al Islamic High School Al- Jambi City. Journal of Arabic Language Education and Islamic Culture, 2(01), 25-38.

Rusman. 2017. Learning and Learning Oriented Educational Process Standards. Jakarta: Kencana

Riduwan. 2015. Easy Learning Research For Employee Teachers and Beginner Researchers. Bandung: Alphabeta

Seno Abi Yodha, Zainal Abidian, Eka Pramono Adi. 2019. "Student Perceptions of the Implementation of E-Learning in Courses" Information System Management Student Department of Educational Technology, State University of Malang. JKTP Journal of Technology Studies Education, 2(3): 181-187

Slameto . 2010. Learning and Influencing Factors. Jakarta : Rineka Create

Sardiman. 2018. Teaching and Learning Interaction and Motivation. Jakarta : PT. Rajagrafindo Persada

Sugiyono. 2016. Quantitative, Qualitative and R&D Research Methods. Bandung: Alphabeta.

Suharsimi Arikunto. 2014. Research Procedure A Practical Approach. Jakarta: Rineka Cipta

Syarifudin, A. 2020. "Implementation of Online Learning to Improve Education Quality as the Impact of Implementing Social Distancing". Journal of Indonesian Language and Literature Education, 5(1): 31-34

Syafrida and Ralang Hartati. 2020. "Together Against the Covid-19 Virus in Indonesia". Social and Cultural Journal Syar-I FSH UIN Syarif Hidayatullah Jakarta 7(6): 495-508.

Shandyastini, NM, and Novianti, KDP 2016. "E-Learning Analysis of Stikom Bali Using the Techonology Acceptance Model". TechnoIf Journal, 4(2).

Sri Gusty et al,. 2020. Independent Learning: Online learning in the midst of the Covid-19 Pandemic. Our foundation writes

Padang State University. 2020a.Circular Letter Number 1593/UN35/AK/2020 Regarding Campus Activities in the Context of Vigilance
Covid-19 pandemic

_____2019b. Padang State University Academic Manual

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and Vocational Competence
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MANAGEMENT OF LABORATORY WITH INDUSTRIAL CULTURE TO SUPPORT THE TEACHING FACTORY AND QUALITY OF VOCATIONAL SCHOOL GRADUATE BASED ON THE NEEDS OF THE MARKET

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ABSTRACT

The purpose of this study is to formulate and test the effect of management of laboratory with industrial culture to support teaching factory and the quality of vocational school graduates according to the needs of the market. This study used a quantitative approach with a non–experimental survey design. The data were gathered using questionnaires, interviews, observation, tests, and documentation. The research instrument development was initiated by writing test specification based on the focus of the problems and research questions which were elaborated on the objectives and indicators of the research. multiple linear regression was used to analyse the data. Results of the study revealed that there is a strong influence either partially or simultaneously between the management of laboratory with industrial cultural to support teaching factory and the quality of vocational school graduates according to market needs , with the contribution of 91.2%.

Keywords: Management of the laboratory; Industrial culture; Supporting teaching factory; Graduates.

INTRODUCTION

The Indonesian government has tried to maximize human resource development through the education sector, including in Vocational High Schools (SMK). It is indicated in the vision of Vocational High School which are Vocational high schools with quality, evenly excellent, skilled, with character and competitive in work. Based on this vision, ideally graduates of vocational have strong competitiveness, and excellence in the world of work. However, based on data from the Central Statistics Agency (BPS), Indonesia released the Open Unemployment Rate (TPT) figure for August 2019 for vocational school graduates at the highest level at 10.42 %. Therefore, the position of Resident Representative of UNDP Christophe Bahuat states the Human Development Index (HDI) of Indonesia in 2019 was 0.707 and was at 111th rank in the world (http://hdr.undp.org/en/2019-report). The data shows the position Indonesia's competitiveness compared with the other ASEAN and ASIA countries is still relatively low.

Various efforts from Indonesian Government to improve and realize the vision of vocational education are performed through teaching factory and technopark programs. The implementation of teaching factory in Indonesia was introduced in vocational high schools since 2000 in the development of production unit, then in 2005, it became an industry -based vocational schools development model in the form of a factory as a place of learning known as the teaching factory. The factory in this case cannot be assumed as an actual factory in hardware. The term 'factory' means the learning process which is conducted directly on the location of the practice. The teaching factory concept is based on supporting the triangle of knowledge; research, education, and innovation in learning involving academia and industry (Chryssolouris et al., 2006; Mavrikios et all,. 2011). Practical learning is carried out production-oriented like in real industries. The operation of this model completely combines learning process and work, no longer

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separates the place for the delivery of theory and practice.

The laboratory as a place for learning theory and practice is a central point in the implementation of the teaching factory in SMK. In the implementation of the teaching factory, the laboratory must be able to adapt and manage itself according to needs of the industry. The results showed that the implementation of laboratories in supporting the success of teaching factory still experienced many obstacles such as limited equipment; low availability of practicum costs (Hadromi et al., 2015); learning environment that is not relevant with the needs of the industry (Hadromi, 2018); low support of information technology (IT); the quality of teacher resources and school policies in implementing teaching factory have not been well identified (Hadromi et al., 2019; Natalia, 2020). Based on the results of this study, data as a reference in developing a vocational school laboratory according to industrial culture and its influence on the teaching factory are required. Data can become a source in the developing laboratory policies that have an impact on supporting the quality of graduates of vocational based on the needs of the market.

The objective of this research is to find a formulation and test the effect of management of laboratory with industrial culture to support the teaching factory and the quality of vocational school graduates according to market needs.

LITERATURE REVIEW

The effectiveness of the vocational education system depends on the quality of teaching and learning in classrooms, workshops, laboratories, (Lucas, Spencer, and Claxton, 2012; Boahin & Hofman, 2014). Vocational schools needs to collaborate with industry to bridge the gap in graduate skills according to industry needs (Oviawe, Uwameiye, and Uddin, 2017). Inadequate laboratory conditions are one of the triggers for the lack of skills, curiosity and student work orientation (Syafrudie, 2016). Skills improvement in laboratories or workshops for students must be relevant to industry needs. Anindo, Mugambi, and Matula (2016) state that the relevance of training equipment affects the acquisition of employable skills. Supporting the relevance of graduates according to market needs can be improved through the teaching factory approach.

The organization of teaching factory in vocational schools based on the importance of; (1) increasing the competence of teachers and students; (2) encouraging the creation of a quality culture in schools; (3) creating an industrial culture in schools; (4) diversifying school financial resources; (5) a means for creativity and innovation for students and teachers; (6)) a means of the development of entrepreneurship in schools; (7) internship and working practice who have not found a job in industry or business (Wijaya, 2013). The organization of teaching factory needs to be supported laboratory, both in the complete practicum equipment, and the laboratory management.

The teaching factory in an industrial context provides direct manufacturing experience to students in problem solving techniques (Unipart, 2010). The teaching factory concept is based on the idea of a triangle of knowledge (figure 1). Research, education and innovation are three strong drivers of knowledge – based interdependence in the teaching factory. The application of the knowledge triangle becomes a new paradigm in academic and industrial learning (Chryssolouris et al., 2006; Tittagala et al., 2008). The aim is to effectively integrate educational, research and innovation activities into one initiative involving industry and academia (Rentzos et al., 2014; Chryssolouris et al., 2014).

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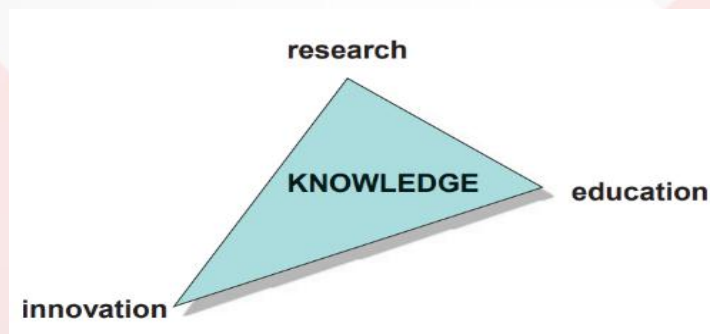
Figure 2.

The laboratory management at the vocational school with industrial culture (Susanto, 2014)

Furthermore, Kuswantoro (2014) states that the teaching factory is a concept for implementing competencies given the actual conditions in the industry. Therefore, the teaching factory can bridge the competencies given at vocational schools with the needs of the industry (figure 2).
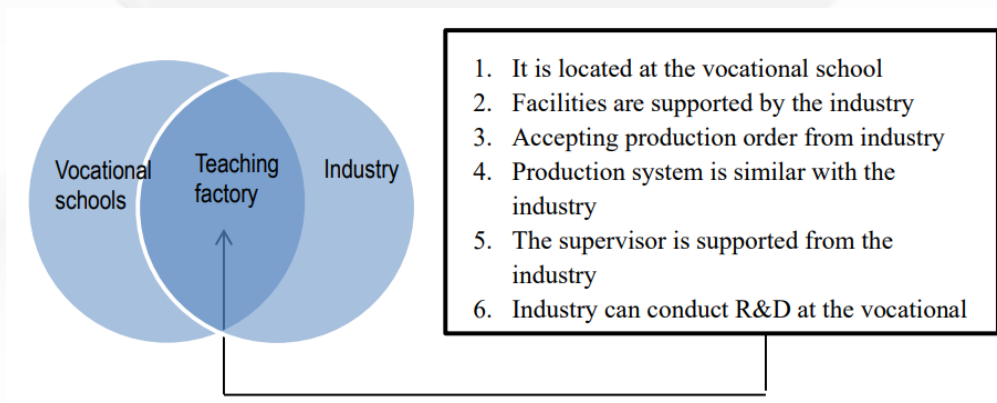
Figure 3.

Teaching factory

The Teaching factory is an intersection between SMK and industry (figure 3). The location of the teaching factory is in vocational schools and the production facilities can be supported by industry. The production system must always be adjusted to the industry, so that the competencies obtained by students are relevant to industry needs.

MATERIALS AND METHODS

Research design

This study used a quantitative approach with a non-experimental survey design. The choice of this approach was because the study processed sample data from the population and samples using a questionnaire as a data collection tool (Mitchell & Jolley, 2012).

The non-experimental survey design consisted of (1) field surveys to obtain data on (a) a description of the laboratory management with industrial culture, (b) the formulation of management's efforts at vocational school in the implementation of the laboratory management with industrial culture to support

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the teaching factory at the vocational school to produce graduates based on the market needs, (c) inhibiting factors and efforts to overcome the management of laboratories with industrial culture to support the teaching factory as an effort to produce graduates according to market needs , then (2) analyse (a) whether there is a simultaneous significant influence between the general conditions of laboratory management with industrial culture , (b) school management efforts in implementing laboratory management with the industrial culture to support the teaching factory for the quality of graduates according to market needs.

Population and samples

The population and samples of this research consisted of 43 teachers in 6 State Vocational Schools in Semarang in the city of Semarang on the competence of Automotive Engineering and Management Competence. Because the number of teachers was only 43 people, this study used saturated sampling, in which all teachers were involved as the research sample. Of the 43 samples, 20 questionnaires were returned, so that 20 of these data were analysed in this study.

The location of this research performed on the competence of Automotive Engineering and Management Competence in 6 State Vocational Schools in Semarang.

Research instruments and data analysis

The first step of research instrument development was writing instrument specifications based on the focus of the research problem and questions, they were then translated into goals and indicators of the research. The instrument specification is shown on Table 1. The research data were tabulated with descriptive statistics. Then the test was carried out using multiple regression techniques.

Table 1.
Research Instrument Specification

Variable	Sub-Variable	). Instrument
Laboratory Management with Industrial Culture to Support teaching factory at Vocational Schools	Sanitation Lab Teaching Factory (TEFA) (X-1)	1, 2, 3, 4 and 5
	Types, space requirements and descriptions of Teaching Factory Laboratory (X-2)	6, 7, 8, 9, 10, 11, 12
	Equipment and materials of Teaching Factory Laboratory (X-3)	13, 14, 15, 16
	Teaching Factory Laboratory (X-4)	17, 18, 19, 20, 21
	Supporting facilities outside the Teaching Factory Laboratory/class (X-5)	22, 23, 24
	The efforts of Teaching Factory Laboratory management with Industrial Culture at Vocational School (X-6)	25, 26, 27, 28, 29, 30, 31, 32, 33
Graduates According to Market Needs	Graduates based on the Needs of the Market (Y)	34, 35, 36, 37, 38, 39

RESULTS

Description of Research Results

The description of the research results is shown in table 2.

The coefficient of determination (R ^{2}), and Correlation coefficient (R)

Simultaneous Correlation value (R) between the variables of Teaching factory Lab Sanitation (X1), Type of Space Needs / Unit and Description of Teaching factory Lab (X2), Teaching factory Lab Equipment and Materials (X3), Teaching factory Lab Building (X4), Supporting Facilities Outside the Teaching factory Lab (X5), and School management efforts for the laboratory management with Industrial culture (X6) on the Quality of Graduates according to Market Needs (Y) is r = 0.955. The contribution given by the six independent variables to the dependent variable (Y), KP = $(r_{x1, x2, x3, x4, x5, x6,Y})^2$ x 100%, = $(0,955)^2$ x 100% = 91,2% . Therefore, the contribution laboratory management with industrial culture to support teaching factory at vocational schools to produce graduates according to market needs is 91, 2 %, while the rest influenced by other variables.

F test (model fit test)

The prediction on the level of contribution laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs is shown on Table 5. The decision criteria are based on the comparison between F $_{statistics}$ and F$_{critical}$. F $_{statistics}$ is calculated from the table Anova at 22.578, while the value of F $_{critical}$ of Table F = 2 , 79 , the decision that the model of multiple linear regression can be used to predict contribution laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs. Based on the value of probability, then the probability of the value of Anova table (sig) = 0,00 and the value of the significance level α = 0.05, or 0.00 <0.05 then the alternative hypothesis is rejected.

Table 2.
Descriptive Statistics

	Mean	Std. Deviation	N
Quality of graduates according to market needs	68.80	11,058	20
Sanitation of the Teaching Factory Lab (TEFA) (X-1)	76.00	2,052	20
Types of space requirement and the descriptions of tefa lab (X-2)	90.55	9,633	20
Equipment and materials of Teaching Factory Laboratory	91.50	10,650	20
Teaching Factory Laboratory	87.25	8,347	20
Supporting facilities outside the Teaching Factory Laboratory/class	87.95	12,211	20
The efforts of Teaching Factory Laboratory management with Industrial Culture at Vocational School	89.65	9,832	20

Coefficients

Furthermore, table 3 Coefficients [a], shows that the multiple linear regression equation model to estimate contribution laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs is: Y = 206,242 + 2,915X$_1$ + 0,143X$_2$ + 0,925X$_3$ + 0,486X$_4$ - 1,646 X$_5$+ 0,650X$_6$

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Table 3.
Correlations

		Quality of Graduates According to Market Needs	Sanitation of Tefa Lab	Types of Space Needs / Units and Description of Tefa Lab	Tefa Lab Equipment and Materials	Tefa Lab Building	Supporting Facilities Outside the Tefa Lab	School management efforts for the lab management with Industrial culture
Pearson Correlation	Quality of graduates according to market needs	1,000	.357	-146	-.020	.276	-.245	.360
	Sanitation of Tefa Lab	.357	1,000	-.056	.048	.323	.254	.214
	Types of Space Needs / Units and Description of Tefa Lab	-146	-.056	1,000	.818	.612	.837	.566
	Tefa Lab Equipment and Materials	-.020	.048	.818	1,000	.523	.846	.533
	Tefa Lab Building	.276	.323	.612	.523	1,000	.626	.571
	Supporting Facilities Outside the Tefa Lab	-.245	.254	.837	.846	.626	1,000	.599
	School management efforts for the lab management with Industrial culture	.360	.214	.566	.533	.571	.599	1,000

DISCUSSION

Percentage of sub-variables on laboratory management formulations with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs follows figure 4, with the contribution = 91.2 %.

Figure 4.

Percentage of sub-variables on laboratory management

Factors that influence laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs consist of (1) Sanitation at the teaching factory laboratory, (2) Type Space Needs / Unit and Descriptions of teaching factory laboratory, (3) Teaching factory laboratory equipment and materials , (4) Teaching factory laboratory building , (5) Supporting facilities outside the teaching factory laboratory , and (6) School management efforts to manage teaching factory laboratory with industrial culture.

Sanitation at the teaching factory laboratory consists of these following components (1) the availability of fresh water for all activities at the teaching factory laboratory, (2) the sewage water flow smoothly, and well, drain of wastewater disposal is closed, (3) the availability of toilet in clean conditions with a supply of clean water in sufficient quantities, (4) trash can, the trashes are discarded every 24 hours, and (5) hand washing facilities are provided. A laboratory with adequate water, sanitation and hygiene facilities is if it has a running water system that is smooth, safe and adequate, especially for washing hands and drinking, sufficient number of toilets for students and teachers, safe, clean , and culturally and gender-appropriate (McMichael, 2019; Morgan, 2017). The inadequate condition of water facilities in the laboratory will be detrimental to the health of the students (Jasper, 2012). In general, the school – based teaching factory laboratory sanitation facilities aim to; (1) reduce the occurrence of disease related to hygiene; (2) support school promotion, increase student enrolment interest in school, school performance, and attendance (McMichael, 2019)

Other factors that affect the laboratory management with industrial culture to support the teaching factory and the quality of vocational school graduates according to the market needs is the type of space needs / unit and the description of the teaching factory laboratory which consists of; (1) automotive electricity practicum has met the standards; (2) the engine practicum has met the standards; (3) the chassis and drive train practicum has met the standards ; (4) the theory room is well organized; (5) the room to change clothes is well organized; (6) teacher/instructor's room is well – organized; and (7) the room of technician is well-organized.

Equipment and Materials at the teaching factory laboratory cover the aspects; (1) the adequacy of the equipment for practicum based on the competency of the curriculum, (2) the condition of the equipment is ready to be operated for practicum, (3) the guarantee of safety is available, (4) the adequacy of the materials has met the standards of practicum according to competencies in the curriculum. Some of the weaknesses are the insufficient equipment and materials that are suitable for competencies in the curriculum. Chryssolouris et al., 2013; Dinkelmann et. all. 2012; Tisch, et. all. 2013; and Wagner et all. 2012 corroborate that the weakness of the teaching factory approach is the limited facilities and specific equipment which is already outdated, it could lead to the narrower scope of learning (Chryssolouris et al., 2016).

Furthermore, related to the teaching factory laboratory building, then teaching factory include, (1) construction of building is durable, (2) Floor is watertight, flat, no cracks, no slippery, the slope / flatness is enough and easy to clean, (3) The door can be opened outward and can close itself (self-closing), (4) The intensity of lighting is sufficient, (5) There is adequate ventilation and air circulation

Supporting facilities outside the teaching factory laboratory include (1) Gazebo is available, and it can function properly, (2) There is a wireless internet network (wi-fi) available, and functions properly, and (3) There is an electric plug available, and it functions well

In connection with a wireless internet network (wi-fi), good supervision is needed. Various conditions, such as social, cultural, and institutional faced by wireless technology need attention and need to protect the privacy and security of wireless networks (Lu, 2006). Many teachers concern about the misuse wi-fi such as, (a) it could potentially disturb the learning process due to the use of mobile devices to access social web Facebook, Twitter, YouTube and Google instead of the instructional material (Nyakudya, 2012), (b) Bandwidth associated with wireless systems usually operate at a distance between 100 to 500 feet, and wireless local area networks are more effective when within this range (Yen and Chou, 2001), generally the bandwidth on wireless LANs is more limited when compared to traditional wired LANs (Malhotra et al., 2010) (c) Protection of risks and technical challenges, this is as a result of possible abuse of resource-based networks, including access to the Internet, fax servers, and disk storage (Turab & Moldoveanu, 2009).

Whatever the obstacles, the development of mobile wireless technology in education is the latest trend, and now the technology is important to be used in education (Levine, 2002; McGhee & Kozma, 2007; McKenzie, 2001).

The laboratory management with industrial culture at teaching factory laboratory has good impacts on vocational schools such as; (1) Teaching factory can improve the competence of teachers as needed by the industry; (2) Teaching factory supports the improvement of the competence of learners as needed by the industry; (3) Teaching factory in schools encourages the creation of a quality culture in schools according to industrial needs; (4) Teaching factory in schools creates industrial culture in schools; (5) teaching factory in schools as a means for the creativity and innovation of students; (6) Teaching factory in schools as a means to nurture teachers' creativity and innovation; (7) Teaching factory in schools as a means of developing entrepreneurship in schools; (8) Teaching factory in the school has become an internship for prospective graduates; and (9) Teaching factories in schools could hire graduates who have not been employed in the industry.

Supporting teaching factory in vocational schools has beneficial impacts for students / graduates in which more candidates suit market needs, (McGrath & Powell, 2016). based on these following aspect: (1) the increasing percentage of students were already employed by the industry before they graduate; (2) the decreasing percentage of students who have difficulty finding a job; (3) an improvement in the technique of employing prospective graduates / graduates in partner industries through partnership, and (4) some of the problems for students who have not been employed by the industry can be recognized earlier. Therefore, vocational schools can anticipate and overcome the problems.

Supporting the learning process through teaching factory is a cycle as a process of knowledge transfer at the students as illustrated. The teaching factory at vocational schools should ideally be conducted through industrial project which are handled through the weekly sessions, which consists of supporting classes, project work and direct interaction with the factory. Each workstation is characterized by direct interaction with the factory. This interaction includes discussion, sharing of presentations, live video of the production process, and other knowledge sharing mechanisms depending on the content of the matter. The students can carry out the project work, which may involve experimentation or analysis of data to get a conclusion and new solutions. Support classes are moderated by an academic supervisor, who is also responsible for guiding discussion and providing guidance in finding solutions.

CONCLUSIONS

Based on the results of data analysis can be concluded that; (1) the formulation of laboratory management with industrial culture to support the teaching factory at vocational school as an effort to produce graduates according to market needs follows the equation $Y = 206,242 + 2,915X_1 + 0,143X_2 + 0,925X_3 + 0,486X_4 - 1,646 X_5 + 0,650X_6$; (2) There is a strong influence both partially and simultaneously between the management of laboratory with industrial culture to support the teaching factory at vocational schools as an effort to produce graduates according to market needs. The contribution of the laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs is 91 , 2 %, while the rest influenced by other factors. Suggestions are given as efforts to support the management of laboratory with industrial culture to support the teaching factory at vocational schools to produce graduates according to market needs, it is advisable at vocational schools to strengthen these three variables; (1) type of space / unit needs and the teaching factory laboratory description ; (2) laboratory equipment and materials; and (3) supporting facilities outside the teaching factory laboratory. Strengthening this variable is aligned with the culture of the business world and the industrial world in the era of 4.0.

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DISCUSSION

Percentage of sub-variables on laboratory management formulations with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs follows figure 4, with the contribution = 91.2 %.

Figure 4.
Percentage of sub-variables on laboratory management

Factors that influence laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs consist of (1) Sanitation at the teaching factory laboratory, (2) Type Space Needs / Unit and Descriptions of teaching factory laboratory, (3) Teaching factory laboratory equipment and materials , (4) Teaching factory laboratory building , (5) Supporting facilities outside the teaching factory laboratory , and (6) School management efforts to manage teaching factory laboratory with industrial culture.

Sanitation at the teaching factory laboratory consists of these following components (1) the availability of fresh water for all activities at the teaching factory laboratory, (2) the sewage water flow smoothly, and well, drain of wastewater disposal is closed, (3) the availability of toilet in clean conditions with a supply of clean water in sufficient quantities, (4) trash can, the trashes are discarded every 24 hours, and (5) hand washing facilities are provided. A laboratory with adequate water, sanitation and hygiene facilities is if it has a running water system that is smooth, safe and adequate, especially for washing hands and drinking, sufficient number of toilets for students and teachers, safe, clean , and culturally and gender-appropriate (McMichael, 2019; Morgan, 2017). The inadequate condition of water facilities in the laboratory will be detrimental to the health of the students (Jasper, 2012).

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In general, the school – based teaching factory laboratory sanitation facilities aim to; (1) reduce the occurrence of disease related to hygiene; (2) support school promotion, increase student enrolment interest in school, school performance, and attendance (McMichael, 2019)

Other factors that affect the laboratory management with industrial culture to support the teaching factory and the quality of vocational school graduates according to the market needs is the type of space needs / unit and the description of the teaching factory laboratory which consists of; (1) automotive electricity practicum has met the standards; (2) the engine practicum has met the standards; (3) the chassis and drive train practicum has met the standards ; (4) the theory room is well organized; (5) the room to change clothes is well organized; (6) teacher/instructor's room is well – organized; and (7) the room of technician is well-organized.

Equipment and Materials at the teaching factory laboratory cover the aspects; (1) the adequacy of the equipment for practicum based on the competency of the curriculum, (2) the condition of the equipment is ready to be operated for practicum, (3) the guarantee of safety is available, (4) the adequacy of the materials has met the standards of practicum according to competencies in the curriculum. Some of the weaknesses are the insufficient equipment and materials that are suitable for competencies in the curriculum. Chryssolouris et al., 2013; Dinkelmann et. all. 2012; Tisch, et. all. 2013; and Wagner et all. 2012 corroborate that the weakness of the teaching factory approach is the limited facilities and specific equipment which is already outdated, it could lead to the narrower scope of learning (Chryssolouris et al., 2016).

Furthermore, related to the teaching factory laboratory building, then teaching factory include, (1) construction of building is durable, (2) Floor is watertight, flat, no cracks, no slippery, the slope / flatness is enough and easy to clean, (3) The door can be opened outward and can close itself (self-closing), (4) The intensity of lighting is sufficient, (5) There is adequate ventilation and air circulation Supporting facilities outside the teaching factory laboratory include (1) Gazebo is available, and it can function properly, (2) There is a wireless internet network (wi-fi) available, and functions properly, and (3) There is an electric plug available, and it functions well

In connection with a wireless internet network (wi-fi), good supervision is needed. Various conditions, such as social, cultural, and institutional faced by wireless technology need attention and need to protect the privacy and security of wireless networks (Lu, 2006). Many teachers concern about the misuse wi-fi such as, (a) it could potentially disturb the learning process due to the use of mobile devices to access social web Facebook, Twitter, YouTube and Google instead of the instructional material (Nyakudya, 2012), (b) Bandwidth associated with wireless systems usually operate at a distance between 100 to 500 feet, and wireless local area networks are more effective when within this range (Yen and Chou, 2001), generally the bandwidth on wireless LANs is more limited when compared to traditional wired LANs (Malhotra et al., 2010) (c) Protection of risks and technical challenges, this is as a result of possible abuse of resource-based networks, including access to the Internet, fax servers, and disk storage (Turab & Moldoveanu, 2009).

Whatever the obstacles, the development of mobile wireless technology in education is the latest trend, and now the technology is important to be used in education (Levine, 2002; McGhee & Kozma, 2007; McKenzie, 2001).

The laboratory management with industrial culture at teaching factory laboratory has good impacts on vocational schools such as; (1) Teaching factory can improve the competence of teachers as needed by the industry; (2) Teaching factory supports the improvement of the competence of learners as needed by the industry; (3) Teaching factory in schools encourages the creation of a quality culture in schools according to industrial needs; (4) Teaching factory in schools creates industrial culture in schools;

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(5) teaching factory in schools as a means for the creativity and innovation of students; (6) Teaching factory in schools as a means to nurture teachers' creativity and innovation; (7) Teaching factory in schools as a means of developing entrepreneurship in schools; (8) Teaching factory in the school has become an internship for prospective graduates; and (9) Teaching factories in schools could hire graduates who have not been employed in the industry.

Supporting teaching factory in vocational schools has beneficial impacts for students / graduates in which more candidates suit market needs, (McGrath & Powell, 2016). based on these following aspect: (1) the increasing percentage of students were already employed by the industry before they graduate; (2) the decreasing percentage of students who have difficulty finding a job; (3) an improvement in the technique of employing prospective graduates / graduates in partner industries through partnership, and (4) some of the problems for students who have not been employed by the industry can be recognized earlier. Therefore, vocational schools can anticipate and overcome the problems.

Supporting the learning process through teaching factory is a cycle as a process of knowledge transfer at the students as illustrated. The teaching factory at vocational schools should ideally be conducted through industrial project which are handled through the weekly sessions, which consists of supporting classes, project work and direct interaction with the factory. Each workstation is characterized by direct interaction with the factory. This interaction includes discussion, sharing of presentations, live video of the production process, and other knowledge sharing mechanisms depending on the content of the matter. The students can carry out the project work, which may involve experimentation or analysis of data to get a conclusion and new solutions. Support classes are moderated by an academic supervisor, who is also responsible for guiding discussion and providing guidance in finding solutions.

CONCLUSIONS

Based on the results of data analysis can be concluded that; (1) the formulation of laboratory management with industrial culture to support the teaching factory at vocational school as an effort to produce graduates according to market needs follows the equation $Y = 206,242 + 2,915X_1 + 0,143X_2 + 0,925X_3 + 0,486X_4 - 1,646 X_5 + 0,650X_6$; (2) There is a strong influence both partially and simultaneously between the management of laboratory with industrial culture to support the teaching factory at vocational schools as an effort to produce graduates according to market needs. The contribution of the laboratory management with industrial culture to support the teaching factory at vocational schools in an effort to produce graduates according to market needs is 91 , 2 %, while the rest influenced by other factors. Suggestions are given as efforts to support the management of laboratory with industrial culture to support the teaching factory at vocational schools to produce graduates according to market needs, it is advisable at vocational schools to strengthen these three variables; (1) type of space / unit needs and the teaching factory laboratory description ; (2) laboratory equipment and materials; and (3) supporting facilities outside the teaching factory laboratory. Strengthening this variable is aligned with the culture of the business world and the industrial world in the era of 4.0.

CONFLICT OF INTERESTS
The authors declare no conflict of interest.

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REFERENCES

Alptekin, S. E., Pouraghabagher, R., McQuaid, P., & Waldorf, D. (2001). Teaching factory. *Industrial and Manufacturing Engineering*, 17.

Boahin, P., & Hofman, W. A. (2014). Perceived effects of competency-based training on the acquisition of professional skills. *International Journal of Educational Development*, *36*, 81-89. https://doi.org/10.1016/j.ijedudev.2013.11.003.

Chryssolouris, G., Mavrikios, D., Papakostas, N., & Mourtzis, D. (2006, August). Education in manufacturing technology & science: A view on future challenges & goals. In *Proceedings of the International Conference on Manufacturing Science and Technology Inaugural Keynote, Melaka, Malaysia*.

Chryssolorous, G., Mavrikos, D., & Retzos, L. (2014). On a new educational paradigm for manufacturing: The Teaching factory. In *Proceedings of the Wiener Produktionstechnik Kongress Vienna* (pp. 7-8).

Chryssolouris, G., Mavrikios, D., & Mourtzis, D. (2013). Manufacturing systems: skills & competencies for the future. *Procedia CIRp*, *7*(2013), 17-24. DOI: 10.1016/j.procir.2013.05.004

Chryssolouris, G., Mavrikios, D., & Rentzos, L. (2016). The teaching factory: a manufacturing education paradigm. *Procedia Cirp*, *57*, 44-48. https://doi.org/10.1016/j.procir.2016.11.009

Dizon, D. P. (2000, August). Making social sciences relevant to engineering students: The greenfield coalition experience. In *Proceedings of the International Conference on Engineering Education (ICEE). Taipei, Taiwan*.

Dinkelmann, M., Riffelmacher, P., & Westkämper, E. (2012). Training concept and structure of the Learning Factory advanced Industrial Engineering. In *Enabling Manufacturing Competitiveness and Economic Sustainability* (pp. 623-629). Springer, Berlin, Heidelberg.

ElMaraghy, H., AlGeddawy, T., Azab, A., & ElMaraghy, W. (2012). Change in manufacturing–research and industrial challenges. In *Enabling manufacturing competitiveness and economic sustainability* (pp. 2-9). Springer, Berlin, Heidelberg.

Hadromi, Rachman, M., Soesanto, & Kartana, TJ (2015). The Development of Productivity Practical Management Model at Automotive Mechanical Technology Skill Program in Semarang Vocational Schools, Indonesia. *International Education Studies*, *8* (5), 101. DOI: 10.5539/ies.v8n5p101

Hadromi. (2018). A model for a vocational school-corporate/industry partnership to improve students' technical skills. *World Trans. on Engng. and Technol. Educ*, *16*(1), 89-94.

Hadromi, Sudarman, Yudiono, H & Budiman, F.A. (2019, November). The Optimization of the Vocational School Teacher Candidates' Employability Skills. In *Journal of Physics: Conference Series* (Vol. 1273, No. 1, p. 012001). IOP Publishing. DOI: 10.1088/1742-6596/1273/1/012001

IMF (International Monetary Fund) (2013). World Economic Outlook - Hopes, Realities, Risks, World Economic and Financial Survey. *International Monetary Fund*.

Jasper, C., Le, T. T., & Bartram, J. (2012). Water and sanitation in schools: a systematic review of the health and educational outcomes. *International journal of environmental research and public health*, *9*(8), 2772-2787. DOI: 10.3390/ijerph9082772

Kuswantoro, H., & Zubaidah, S. (2014). Decreasing grain size caused declining grain yield of CpMMV-resistant soybean lines grown in Ultisols. *Journal of Biological Sciences*, *14*(8), 508-514. DOI: 10.3923/jbs.2014.508.514

Levine, L. M. (2002). Campus-wide mobile wireless: Mobility and convergence. *Syllabus. ACM*.

Malhotra, R., Gupta, V., & Bansal, R. K. (2010). Performance Analysis of Wired and Wireless LAN Using Soft Computing Techniques-A Review. *Global Journal of Computer Science and Technology, GJCST*, *10*(8), 67-71.

Mavrikios, D., Papakostas, N., Mourtzis, D., & Chryssolouris, G. (2013). On industrial learning and training for the factories of the future: a conceptual, cognitive and technology framework. *Journal of Intelligent Manufacturing*, *24*(3), 473-485. DOI: 10.1007/s10845-011-0590-9

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McMichael, C. (2019). Water, sanitation and hygiene (WASH) in schools in low-income countries: A review of evidence of impact. *International journal of environmental research and public health*, *16*(3), 359. DOI: 10.3390/ijerph16030359

McGhee, R., & Kozma, R. (2007). New teacher and student roles in the technology-supported classroom.

McKenzie, J. (2001). The unwired classroom: Wireless computers come of age. *Educational Technology*, *10*(4), 19-28.

McMichael, C. (2019). Water, sanitation and hygiene (WASH) in schools in low-income countries: A review of evidence of impact. *International journal of environmental research and public health*, *16*(3), 359. DOI: 10.3390/ijerph16030359

McGrath, S., & Powell, L. (2016). Skills for sustainable development: Transforming vocational education and training beyond 2015. *International Journal of Educational Development*, *50*, 12-19.

Mitchell, M. L., & Jolley, J. M. (2012). *Research design explained*. Nelson Education.

Morgan, C., Bowling, M., Bartram, J., & Kayser, G. L. (2017). Water, sanitation, and hygiene in schools: Status and implications of low coverage in Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia. *International journal of hygiene and environmental health*, *220*(6), 950-959. DOI: 10.1016/j.ijheh.2017.03.015

Natalia, L., Amina, P., & Anna, O. (2020). The role of students'life course conception in their self-development. *International Journal of Cognitive Research in Science, Engineering and Education*, *8*(1), 37-48. DOI: 10.5937/IJCRSEE2001037L

Nyakudya, M. N.(2012). Wireless Technology Diffusion within Higher Education Institutions: Determining the Levels of Student Satisfaction. *International Journal of Engineering and Management Sciences*, *3*(1), 13-23.

Rentzos, L., Doukas, M., Mavrikios, D., Mourtzis, D., & Chryssolouris, G. (2014). Integrating manufacturing education with industrial practice using teaching factory paradigm: A construction equipment application. *Procedia CiRP*, *17*, 189-194.

Tittagala, R., Bramhall, M., & Pettigrew, M. (2008). Teaching engineering in a simulated industrial learning environment: A case study in manufacturing engineering. *Proceedings of Engineering Education*.

Tisch, M., Hertle, C., Cachay, J., Abele, E., Metternich, J., & Tenberg, R. (2013). A systematic approach on developing action-oriented, competency-based Learning Factories. *Procedia CIRP*, *7*(0), 580-585. DOI: 10.1016/j.procir.2013.06.036

Turab, N., & Moldoveanu, F. (2009). A comparison between wireless LAN security protocols. *Universitatea Politehnica Bucuresti Scientific Bulletin*, 61-80.

UNICEF. Raising Even More Clean Hands; UNICEF: New York, NY, USA, 2012.

Unipart Eberspacher Exhaust Systems. (2010). Teaching factory. http://www.uees.co.uk/teachingFactory.html.

Wagner, U., AlGeddawy, T., ElMaraghy, H., & MŸller, E. (2012). The state-of-the-art and prospects of learning factories. *Procedia CiRP*, *3*, 109-114. DOI: 10.1016/j.procir.2012.07.020

Wijaya, M. B. R. (2013). Management model for vocational high school teaching factory. *Journal of Educational Research*, 30 (2).

World Economic Forum. (2016, January). The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. In *Global challenge insight report. Geneva: World Economic Forum*.

World Economic Forum. (2016, January). The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. In *Global challenge insight report. Geneva: World Economic Forum*.

Yen, D. C., & Chou, D. C. (2001). Wireless communication: the next wave of Internet technology. *Technology in Society*, *23*(2), 217-226. DOI: 10.1016/S0160-791X(01)00010-0

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POSTER

Strengthening Technology and Vocational Competence Era Though Digital Ecosystems

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MANADO STATE UNIVERSITY, NOVEMBER 25th, 2021

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Dr. Eddy D. R. Kembuan, M.Pd
NIP. 1962072919880310011

*Strengthening Technology
and Vocational Competence
Era Though Digital Ecosystems*

PICTURE

Gambar 1. Penjemputan Peserta

Gambar 2. Rektor Unima, Rektor UNP, Rektor UNM bersama Dekan dan Pengurus Paptekindo

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GAMBAR 3. WELCOME DINNER

GAMBAR 4. WELCOME DINNER

GAMBAR 5. PEMBUKAAN OLEH REKTOR UNIMA

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GAMBAR 6. SAMBUTAN KETUA PAPTEKINDO

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GAMBAR 7. MOU ANTAR MEMBER PAPTEKINDO

GAMBAR 8. SEMINAR INTERNASIONAL

GAMBAR 9. NARASUMBER

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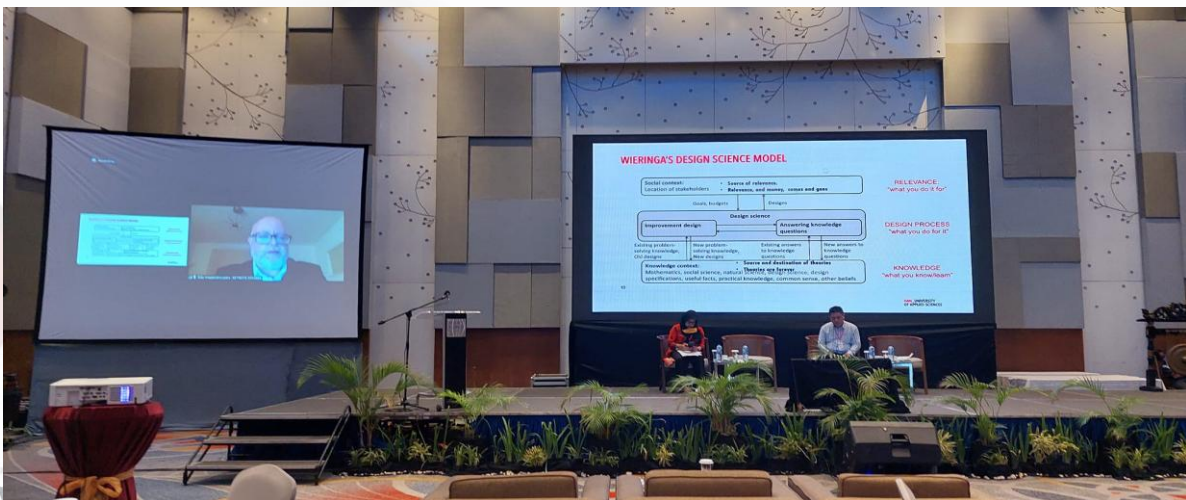
GAMBAR *10.* NARASUMBER

GAMBAR *11.* NARASUMBER

GAMBAR *12.* NARASUMBER

GAMBAR *13.* KONVENSI

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GAMBAR *14*. PESERTA

GAMBAR *15*. PESERTA

GAMBAR *16*. PESERTA

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GAMBAR *17*. PESERTA

GAMBAR *18*. TOUR BUNAKEN

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KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
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UNIVERSITAS NEGERI MANADO
Alamat : Kampus UNIMA di Tondano 95618
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Website: www.paptekindo2020.conference.unima.ac.id email:paptekindo2020.unima.ac.id

Tondano, 3 November 2021

Nomor : 2/PanPel/XI-2021
Hal : UNDANGAN

Yang terhormat:
Para Pimpinan dan Dekan LPTK Member Paptekindo
Di Tempat

Sehubungan akan dilaksanakan kegiatan Seminar Internasional dan Konvensi Nasional Perkumpulan Ahli Pendidikan Teknologi dan Kejuruan Indonesia dan Temu Karya XXI FT/FPTK se Indonesia di Fakultas Teknik Universitas Negeri Manado dengan tema **"Strengthening Technology and Vocational Competence on Pandemic Era Through Digital Ecosystems".**

Kegiatan ini akan dilaksanakan pada **Kamis – Sabtu 25, 26, 27 November 2021, Di Hotel Fourpoints Manado.** Untuk itu kami sampaikan Undangan kegiatan tersebut.

Demikian atas perhatian, kami sampaikan terima kasih

Panitia Pelaksana

Felly Ferol Warouw
Ketua

Vivi Peggie Rantung
Sekretaris

Mengetahui
D e k a n,

Dr. Eddy D. R. Kembuan, M.Pd
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Tembusan Yth.:
1. Rektor (sebagai laporan)
2. Pimpinan PAPTEKINDO
6. Arsip

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KEPUTUSAN
REKTOR UNIVERSITAS NEGERI MANADO
NOMOR 914/UN41/HK/2021

TENTANG

PANITIA SEMINAR INTERNASIONAL DAN KONVENSI NASIONAL PERKUMPULAN AHLI PENDIDIKAN TEKNOLOGI DAN KEJURUAN INDONESIA DAN TEMU KARYA XI FT/FPTK SE INDONESIA DI FAKULTAS TEKNIK UNIVERSITAS NEGERI MANADO TAHUN 2021

REKTOR UNIVERSITAS NEGERI MANADO

Menimbang : a. bahwa sehubungan dengan pelaksanaan kegiatan Seminar Internasional dan Konvensi Nasional Perkumpulan Ahli Pendidikan Teknologi dan Kejuruan Indonesia dan Temu Karya XI FT/FPTK se Indonesia di Fakultas Teknik Universitas Negeri Manado tahun 2021, maka perlu mengangkat Panitianya;

b. bahwa sehubungan dengan maksud tersebut pada huruf a, maka perlu menerbitkan Surat Keputusannya.

Mengingat : 1. Undang-Undang RI Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional;

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7. Keputusan Mendiknas RI Nomor 018/O/2005 tentang Perubahan Keputusan Mendiknas Nomor 109/O/2001 tentang; Organisasi dan Tata Kerja Unima;

8. Keputusan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 75037/MPK/RHS/KP/2020 tanggal 1 September 2020 tentang Pengangkatan Rektor Universitas Negeri Manado periode tahun 2020-2024.

Hukum Tata Laksana

Memperhatikan : Usul Dekan Fakultas Teknik Universitas Negeri Manado Nomor 2622/UN41.2/TU/2021 tanggal 26 Agustus 2021.

MEMUTUSKAN:

Menetapkan : KEPUTUSAN REKTOR UNIVERSITAS NEGERI MANADO TENTANG PANITIA SEMINAR INTERNASIONAL DAN KONVENSI NASIONAL PERKUMPULAN AHLI PENDIDIKAN TEKNOLOGI DAN KEJURUAN INDONESIA DAN TEMU KARYA XI FT/FPTK SE INDONESIA DI FAKULTAS TEKNIK UNIVERSITAS NEGERI MANADO TAHUN 2021.

KESATU : Mengangkat Panitia Seminar Internasional dan Konvensi Nasional Perkumpulan Ahli Pendidikan Teknologi dan Kejuruan Indonesia dan Temu Karya XI FT/FPTK se Indonesia di Fakultas Teknik Universitas Negeri Manado tahun 2021, sebagaimana tersebut pada lampiran Surat Keputusan ini,

KEDUA : Biaya yang timbul akibat dikeluarkan Surat Keputusan ini dibebankan pada dana yang sesuai untuk itu.

KETIGA : Keputusan ini berlaku sejak tanggal ditetapkan dan apabila terdapat kekeliruan akan diperbaiki sebagaimana mestinya.

Ditetapkan di Tondano
Pada tanggal 6 September 2021

REKTOR,

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Tembusan Yth. :
1. Para Pembantu Rektor Unima di Tondano
2. Para Dekan Fakultas Unima di Tondano dan Tomohon,
3. Para Direktur Unima di Tondano dan Tomohon,
4. Para Ketua Lembaga Unima di Tondano,
5. Para Kepala Biro Unima di Tondano,
6. Para Kepala UPT Unima di Tondano,
7. Yang bersangkutan untuk diketahui dan dilaksanakan.

Hukum Tata Laksana

LAMPIRAN
KEPUTUSAN REKTOR UNIVERSITAS NEGERI MANADO
NOMOR   914/UN41/HK/2021
TANGGAL   6 SEPTEMBER 2021
TENTANG
PANITIA SEMINAR INTERNASIONAL DAN KONVENSI NASIONAL PERKUMPULAN AHLI PENDIDIKAN TEKNOLOGI DAN KEJURUAN INDONESIA DAN TEMU KARYA XI FT/FPTK SE INDONESIA DI FAKULTAS TEKNIK UNIVERSITAS NEGERI MANADO TAHUN 2021

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	Alfrina Mewengkang, S.Kom., M.Eng (IKU)
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Koordinator : Dr. Dra. Christine T. M. Manoppo, MAP

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