PROCEEDINGS

International Conference
Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia (APTEKINDO) 2018

Theme:

"Revitalization of Technical and Vocational Education to Face Industrial Revolution 4.0"

Surabaya, 11-14 July 2018

Speakers:

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Minister of Education and Culture, Republic of Indonesia

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Extraordinary and Plenipotentiary Ambassador of the Federal Republic of Germany to Indonesia, ASEAN and Timor-Leste (Jerman)

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Faculty of Engineering
Universitas Negeri Surabaya
2018

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Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia (APTEKINDO) 2018

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"Revitalization of Technical and Vocational Education to Face Industrial Revolution 4.0"

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PREFACE

All praises be to Allah SWT, so that the 2018 International Conference of ***Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia*** **(APTEKINDO)** could be held in Surabaya during 11-14 July 2018. APTEKINDO International Conference isconducted biennially in which this year host is Faculty of Engineering, State University of Surabaya. Therewere sixteen colleges attending this year Conference, most of which were former Institutes of Teacher's Education (LPTK).

This year theme is *"Revitalization of Technical and Vocational Education to Face Industrial Revolution 4.0***"** aimed to respond to the development and acceleration of the industrial revolution 4.0 that has become the most discussed issues inmany countries. Industrial revolution connects machines with internet systems. In regard to facing such phenomena, Indonesian government through the Ministry of Industry has launched "Making Indonesia 4.0", of whichthe program focuses on industries that are driving the development of the industrial revolution 4.0 such as food and beverages, electronics, automotive, textiles and chemicals. To achieve better results of the program actualization, vocational education helps to prepare compatible and competitive workers for the areas of the aforementioned industries. Henceforth, numbers of Conferences, conventions, and meetings amongIndonesian practitioners in FPTK / FT-JPTK need to be held to initiate ideas in strengthening the role of LPTK within industrial revolution 4.0 era.

The Conference's proceedings contain 121 research papers and ideas that are relevant to the following nine sub-themes: *Technical and Vocational Teacher Competencies, Technical and Vocational Education Curricula, Technical and Vocational Education Models, Technical and Vocational Education Evaluation, Technical and Vocational Education Policy, Public-private Partnership in Technical and Vocational Education, Technical and Vocational Education Management, Technopreneurship*, and *Competencies Certification.*

Finally, all the committees send their gratitude to the participating speakers and all parties who support the run of the Conference. They also apologize for any inconvenience and wish a better undertaking event next year.

WELCOMING SPEECH RECTOR UNESA

Conference and Convention

Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia (Aptekindo) 2018

Rich Palace Hotel Surabaya, 11-14 Juli 2018

Assalammu'alaikum Warahmatullahi Wabarakatuh.

Respectable Head of Universities, members of APTEKINDO
Distinguished Keynote speakers
Honorable authors, and fellow participants of APTEKINDO Conference and Convention 2018

Alhamdullilah, first of all, let us express our gratitude to Allah SWT because of his grace and blessings, we are able to attend this international Conference and convention of the Indonesia Association of Technology and Vocational Education or ***Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia*(APTEKINDO)** held in Surabaya, 11-14 July 2018.

This international and national Conference is conducted biennially as a routine agenda held by Association of Technology and Vocational Educationor *Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia* (APTEKINDO), which consists of 16 different universities throughout Indonesia. We would like to thank for the opportunity given to Universitas Negeri Surabaya for hosting this year event.

In the raise of industrial revolution, Conferences, gatherings, and sharing of knowledge play an important meaning in supporting the acceleration of innovative science and technology. Therefore, this Conference's theme is ***"Revitalization ofTechnical and Vocational Education to Face Industrial Revolution 4.0".*** This is an interesting and challenging topic not only for academic researchers but also for stakeholders and industry owners.

Ladies and gentlemen,
Since 2011, the industrial sector has been integrated with the online system known as industrial revolution 4.0. The first industrial revolution was marked by the use of steam engines to replace human and animal power. The second stage of the revolution was marked by the utilization of electrical power and the concept of mass production. Furthermore, the application of automation technology brought the industrial revolution to its third stage. Tremendous revolution happened when information and communication technology was introduced and fully utilized in industrial area, of which the condition brought the world in the fourth stage of the industrial revolution. The utilization of this technology changed not only the production process, but also across the industrial chains that result in a new digital-based business model which can achieve higher efficiency and better quality in industrial products. The consequences of this revolution are the increase of production efficiency as well as changes in the employment prerequisite. There is an increasing demand for new manpower, whilst the machines are replacing the role of workers. This condition leads to the importance of a new and more advanced method of preparing human resources that are ready to compete in the industrial revolution.

Ladies and gentlemen, in regard to prepare Indonesian human resource in facing the era of media convergence, there are at least two aspects that need our attention, namely the quality of human resources in accordance with the requirement of the digital-based industry and the equal distribution of qualified human resources especially in suburban and urban areas. Both aspects could be meant as a challenge and an opportunity for the higher education especially technology and vocational education to innovate and harmonize curriculum that connects with the industry. Thus, this Conferences becomes a perfect momentum for technology and vocational education to join and strengthen steps in preparing graduates that are ready to compete in the industrial revolution 4.0. Therefore, by starting with **"*Bismillahirrahmanirrahim*" The Conference and Convention of Association of Technology and Vocational Education or APTEKINDO 2018, is officially started"**

Ladies and gentlemen, we would like to thank the keynote speakers who are willing to attend and share knowledge in today's Conference:

1. Prof. Dr. Muhadjir Effendy, MAP.Minister of Education and Culture, Republic of Indonesia
2. Michael Freiherr Von Ungern–Sternberg, ***Extraordinary and Plenipotentiary Ambassador of the Federal Republic of Germany to Indonesia, ASEAN and Timor-Leste.***
3. Prof. Dr. Wenny Rahayu, *La Trobe University Victoria* **(Australia)**
4. Prof. Dr. Muchlas Samani, M.Pd., *Rector Universitas Negeri Surabaya (2010-2014).*

We also would like to thank the authors and all participants of the convention who have participated and contributed to sharing the knowledge and ideas. Hopefully, what we share and get here today can give benefits and contribute to improve a competitive atmosphere in Indonesia, Aamiin YRA.

Surabaya, July 2018
Universitas Negeri Surabaya
Rektor,

Prof. Dr. Warsono, M.S.

WELCOME SPEECH BY THE DEAN OF FACULTY OF ENGINEERING

at the International Conference and National Convention of

***AsosiasiPendidikanTeknologidanKejuruan Indonesia* (APTEKINDO) 2018**

Rich Palace Hotel, 12 July 2018

Assalamu'alaikum Warahmatullahi Wabarakatuh.

His Excellency, Rector of Universitas Negeri Surabaya
Respectable the Head of Universities asthe members of APTEKINDO
Distinguished Keynote Speakers
Honorable authors and Participants

Alhamdullilahirobbil alamiin. Thanks God. First of all, let us express our gratitude to Allah SWT because of his grace and blessings we are able to attend the 9th International Conference and convention of ***Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia* (APTEKINDO)** and the 19th workshop of the Technology and Vocational Education forFPTK/FT/FTK-JPTK in Indonesia. It is an honor for us, the Faculty of Engineering, Universitas Negeri Surabaya, to host this yearConference and convention.

On behalf of *Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia* (APTEKINDO),wewould like to welcome keynote speakers, authors, delegates and participants from technology and vocational education to the city of heroes, Surabaya.

Today, we meet in Surabaya to attend a biennial agendanamed APTEKINDO International Conference and Convention and National Workshop of the FPTK/FT/FTK-JPTK. Following the mandate from the 2016 APTEKINDO Convention in Medan, this year's Conference is held in Surabaya hosted by the Faculty of Engineering, Universitas Negeri Surabaya.

Ladies and Gentlemen, the theme of this year Conference is "*Revitalization of Technical and Vocational Education to Face Industrial Revolution 4.0*". The theme is chosen due to the fact that we have to quickly respond and act accordingly to the effects of the industrial revolution on vocational education. Well-programmed and structured effortsshould be undertaken to ensure if technology and vocational education canproduce globally competitive graduates especially for industrial revolution era.

Numbers of important topics for technology and vocational education are discussed in this Conference. Thetopics includeTechnical and Vocational Teacher Competencies, Technical and Vocational Education Curricula, Technical and Vocational Education Models, Technical and Vocational Education Evaluation, Technical and Vocational Education Policy, Public-private Partnership in Technical and Vocational Education, Technical and Vocational Education Management, Technopreneurship, and Competence Certification.

Today's Conference has several outcomes. The accepted articles will be submitted for proceeding publication indexed by Atlantic Press. Meanwhile, the rejected articles by Atlantic Press will be published in the International Proceedings with International Standard Book Number (ISBN). Moreover, the articles written in Bahasa Indonesia will be published in the National Proceedings with ISBN.

Ladies and Gentleman, this meeting must be meaningful as a venue to communicate among researchers, academics, and members of FPTK / FT / FTK-JPTK from different universities as well as from related industries. By this regular Conference and convention, we can make a strong communication network and create innovative breakthrough and substantial blueprint of different aspects such as institutional quality, field study, and curriculum. We hope that this forum plays an important role in developing technology and vocational education to face the industrial revolution 4.0.

Finally, we would like to thank the organizing committee led by Mr.Tri Wrahatnolo, M.Pd., M.T., who gave an extraordinary support. Moreover, we would like to express our appreciation and gratitude to the members of steering committee from various regions in Indonesia, delegates, SC and OC members, sponsors, as well as personal or institutional support that make this event well-organized. I apologize if there are shortcomings from my part.

Good luck with the Conference of Indonesian Association of Technology and Vocational Education, APTEKINDO 2018, and wish the best improvement for technology and vocational education in Indonesia. Thank you.

Wassalammu'alaikum Warahmatullahi Wabarakatuh

CHAIRMAN'S SPEECH

at the International Conference and National Convention of

***Asosiasi Pendidikan Teknologi dan Kejuruan Indonesia* (APTEKINDO) 2018**

Rich Palace Hotel, 11-14 July 2018

Assalammu'alaikum Warahmatullahi Wabarakatuh.

His Excellency, Rector of Universitas Negeri Surabaya,
Respectable the Head of Universities, members of Aptekindo, Keynote speakers, Authors, and fellow participants of Aptekindo Conference and convention 2018.

Alhamdulillah, no words could represent the feelings but the gratitude of the presence of Allah SWT, for His blessings, so that we can attend APTEKINDO Conference with the theme "*Revitalization ofTechnical and Vocational Education to Face Industrial Revolution 4.0"*.

In this pleased occasion, we would like to welcome all keynote speakers, authors, and participants of the Conference to this city of heroes, the city of heroic histories, Surabaya. We would like also to welcome to APTEKINDO 2018 Conference and convention held at the Rich Palace Hotel Surabaya, 11-14 July 2018.

The theme of this year Conference is "*Revitalization of Technical and Vocational Education to Face Industrial Revolution 4.0*.". This theme is chosen to respond to the development and acceleration of industrial revolution 4.0 that has been impactful in various countries. This industrial revolution has connected the utilization of machines to an internet system. To face such phenomena, Indonesian government through the Ministry of Industryhas launched a program called "Making Indonesia 4.0". Currently, the government is focusing on industries that support the development of the industrial revolution such as food and beverage, electronics industry, automotive, textile and clothing, and chemical industries.

In addition, vocational education plays an important role in preparing competent and competitive human resources. That is, Faculty of Technical and Vocational Education or *Fakultas Pendidikan Teknik dan Kejuruan* (FPTK) in Indonesia aims to compile excellent ideas and vision, which later could be shared through Conferences, conventions or meetings, and also be useful to encounter industrial revolution 4.0.

Today's Conference will present competent keynote speakers in the field of technology and vocational education, who are:

1. Prof. Dr. Muhadjir Effendy, MAP. Minister of Education and Culture, Republic of Indonesia
2. Michael Freiherr Von Ungern–Sternberg, Extraordinary and Plenipotentiary Ambassador of the Federal Republic of Germany to Indonesia, ASEAN and Timor-Leste.
2. Prof. Dr. Wenny Rahayu, La Trobe University Victoria (Australia)
3. Prof. Dr. Muchlas Samani, M.Pd., Rector of Universitas Negeri Surabaya (2010-2014).

In addition, I would like to point out that there are 602 participants from 17 different universities participating in today's Conference involving:

1. Universitas Palangka Raya
2. Universitas Gorontalo
3. Universitas Islam Negeri Ar Raniry Aceh
4. Universitas Negeri Solo
5. Universitas Negeri Menado
6. Universitas Pendidikan Ganesha
7. Universitas Nusa Cendana
8. Universitas Malang
9. Universitas Negeri Jakarta
10. Universitas Negeri Padang
11. Universitas Negeri Yogyakarta
12. Universitas Pendidikan Indonesia
13. Universitas Negeri Makassar
14. Universitas Negeri Semarang
15. Universitas Negeri Medan
16. Universitas Negeri Surabaya
17. Universitas PGRI Adi Buana Surabaya

There are 491 articles submitted to this Conferences covering papers and posters. 76 articles were accepted to Atlantic Press, 156 articles published in international proceedings with ISBN, dan 129 articles published in the national proceedings with ISBN. All articles will be available for an online access through the Atlantis Press official website and through APTEKINDO 2018 website.

Today's Conference isactually held with the helps and good cooperation of various parties. Therefore, we would like to express our gratitude to the Minister of Research, Technology and Higher Education, Rector of Universitas Negeri Surabaya, keynote speakers, participants, sponsors, and other stakeholders for the supports. We also send our highest appreciation to the committees who have worked hard to succeed this Conference.

At last, we hope that all participants get benefitsand knowledge that can contribute to reinforce vocational education and technology in facing the industrial revolution 4.0. WELCOME TO APTEKINDO CONFERENCE AND CONVENTION 2018, Thank you.

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***Abstract* - This study aims to determine the influence of work-based learning integrated in Peer-Assisted Learning (PAL) towards Pneumatic and Hydraulic course in Mechanical Engineering Department, Faculty of Engineering in State University of Makassar. This research involves 56 students majoring Mechanical Engineering Education. The data collection techniques used questionnaires, knowledge test and documentation. Instrument validity was tested using Product Moment correlation and the reliability was tested using Alpha cronbach formula. The obtained data were analyzed using descriptive statistic, statistical assumption tests and regression analysis with Statistical Product and Service Solution (SPSS version 20 for Windows). Based on the results of the study, it is concluded that there is a significant positive influence between work-based Peer-Assisted Learning towards students' learning outcomes majoring Mechanical Engineering in State University of Makassar with sig. 0.00 <0.05. The result of regression analysis shows that peer-assisted learning with working environment affect the learning outcome of 45.6%.**

Keywords: Peer-Assisted Learning; work-based learning, learning outcome

I. INTRODUCTION

Education is one of the most important areas and requires special attention from society, not just governments, but educators, parents and learners must take the responsibility. The vocational educators is facilitators and mediators to help the students to learn well. The functions of educators as facilitators and mediators are to; (1) provide learning experience that allows learners to be responsible for designing and processing; (2) stimulate learners' curiosity and help them to express their ideas and to think productively; (3) monitoring, evaluating how far the students' intelligence have developed.

The old paradigm in teaching and learning activities states that educators provide knowledge to passive learners. Today, it has changed a lot because of the demands of this globalization era. Currently, the new paradigm begins to develop active learning strategies for learners. Schools and universities as educational institutions should be able to play a role in the educational process (educational process that emphasizes the activities of educating and teaching), the process of socialization (the process of socialization, especially for students), and the process of transformation or change process behavior toward a better (Maryani, 2010). Therefore, in the process of learning is expected to occur the activities of learners, and is expected also learners are able to interact with others positively, for example between learners with students themselves and between learners with educators if there are difficulties associated with the subject matter.

Nowadays, the world of vocational education is starting to become a priority for the government. The formal institutions are expected and developed to provide a ready-to-work graduate. The main problem facing education in Indonesia is the problems related to the quality of education is still low. The low quality of education is seen from the achievement of students' absorption of the subject matter is also still low. Improving skills and skills for the young generation of prospective workers is the responsibility of education, both formal and non formal education. Thus the quality of Human Resources (HR) is one of the most important determinants in achieving the success of the development program. HR problems can not be separated from labor problems. Central Bureau of Statistics (BPS) in May 2016 announced the unemployment rate in Indonesia decreased when compared to February 2015, which reached 7.56 million people (5.81%). In August 2015, the highest unemployment rate reached 7.56% of the soul score (6.18). The highest unemployment rate is graduated from Sekolan Menengah Kejuruan with 9.84% percentage increase from 9.05%. And the percentage of diploma I, II, III education decreased, but the unemployment rate of university graduates increased from 5.34 to 6.22%. (Tempo.com 2016).

In line with Law No. 20 of 2003, UNESCO has established four main pillars of education for the 21st century: (1) learning to know, learners have sufficient understanding and reasoning that can be applied in everyday life; (2) learning to do, providing opportunities for learners to have adequate skills and can spur intellectual improvement; (3) learning to be, learners are expected to understand and appreciate the values in the learning process; and (4) learning to live together in peace and harmony, students are expected to be able to socialize and communicate. The four pillars are not a sequence but complement each other (Poulo Freire, 2001).

The practicum is one of the subjects that must be registered by all the students especially the Department of Mechanical Engineering. It is possible that they will have difficulty in starting the practice, where they must really understand the concept gradually and the process must be running step by step. While the course of practice itself is a course that requires a deep understanding and skill and the process gradually. students will be faced with problems that require an understanding of lengthy procedures / steps of completion, complex and complex calculations and they are not sufficiently understood by theory alone. Pneumatic and hydraulic course is one of the compulsory subjects in the fourth semester for Bachelor's degree at Department of Mechanical Engineering, Faculty of Engineering in State University of Makassar. The course has 3 credits consisting of theory and practice. However, there are still many students who have difficulties in understanding the material in the pneumatic and hydraulic courses, especially on symbol and how the pneumatic valve works. This is because the symbol and the workings of the pneumatic valve requires a high level of understanding in learning.

The working environment is everything that is around the practice participants that can affect the implementation of a process of practical work. The working environment is the whole facility and the work infrastructure that is around the students who are implementing the prkatek which can affect the implementation of practical work including workplace, facilities, cleanliness, lighting, as well as the working relationship between the people in that place. Work environment is a place where learners practice every day. A conducive working environment provides a sense of security and allows learners to work more optimally, the work environment can affect the participants emotionally. If the learner enjoys the work environment in which he practices, then the participant will feel at his workplace or in the workshop in doing his activities so that the working time is used effectively. Productivity will be high and automaticaly the students' work performance are also high, the work environment that includes the working relationship between educators and fellow learners and superiors and the physical environment where the practice activities in the workshop. Sihombing (2004) states that: The Work Environment is the factors outside the human both physical and non physical in an organization. Physical factors include work equipment, workplace temperature, tightness and density, noise, workplace space while non-physical includes the working relationship formed in the agency between superiors and subordinates and between fellow participants.

Sutrisno (2009), suggests that the work environment is work infrastructure that is around employees who are doing work that can affect the implementation of work include workplace, facilities, cleanliness, lighting, as well as working relationships between people who are in the place. Students will carry out their activities properly, if the element is supported by the condition of a good working environment. Therefore, the work environment factors in a labolatorium must be considered by an institution so that the learners can work optimally, comfortably, safely, and have high motivation to work more productively for the achievement of agency goals.

One of the effective learning methods in learning pneumatic and hydraulic is Peer-Assisted Learning (PAL). Learning together in groups with peer is one of the characteristics of competency-based learning, through interaction and communication activities, learners become actively learning, they become effective. Cooperation in groups with peer can be linked to values, so their cooperation becomes more intensive and eventually they can reach their targeted competences. Viewed from the level of active participation of learners, the benefits of learning in groups with peer tutors have a higher level of active participation of learners. According to Thomson, the learning process should not come from the teacher to the learners, but can also learners teach each other fellow learners. Glynn, et.al (2006) states that PAL and peer tutoring programes have a positive correlation with examination performance and have led to a reduction of stress and enhancement of course satisfaction among students. The benefits of PAL do not appear to be restricted to the tutees as findings affirmed the benefits to peer tutors, particularly in terms of skills improvement and strengthening of positive attitudes towards future social responsibilities (Hodgson et al., 2014).

According to Mel Silbermen (2001), Peer-Assisted Learning is one of learning strategy based on active learning. Some experts believe that one lesson can be completely mastered only when learners are able to teach other learners. Peer-Assisted Learning (PAL) provides opportunities and encourages learners to learn something well, and at the same time it becomes a resource for others. Peer-Assisted Learning (PAL) is an effective way to produce peer teaching skills. Meanwhile, according to Chan, et. Al (2016) PAL is also known as 'peer tutoring', used as an instructional or learning support strategy that utilises students to help or support other students that are struggle in academic. Students from the same classes or older students are paired with younger struggling students. The tutoring is in small groups or through one-on-one interactions and in some cases, students rotate between the role of tutor and tutee.

With this peer tutor method, it is expected that learning difficulties can be overcome, because with peer tutor in conveying information more easily understood by tutee (friend who taught) because the same language with peers, learners in expressing difficulties to the tutor more open because the theme itself, the atmosphere relaxed learning can eliminate fear, strengthen friendship, there is attention to differences in characteristics, concepts easy to understand, learners are interested to be responsible that is to learn self-learning.

II. METHOD

A. Types of Research

Referring to the previous description, the design of this study using quantitative approach method with survey method, where researchers describe quantitatively, trends, behavior or opinions of a population by examining the sample population (Creswell, 2013). The variables in this study consisted of

independent variables of peer-based learning based on work environment (X) and the results of pneumatic and hydraulic (Y) work.

B. Population and Sample

The population in this study is an active student majoring in mechanical engineering who programmed the work of penumatic and hydraulic subjects with the number of 76 active students in the academic year 2016/2017. The sampling technique used in this study is proportional random sampling, this sampling technique is an extension of stratified random sampling (Lohr, 2008). The sample of the respondent group is allocated proportionally to each strata or group of population. The total sample in this research is obtained using Taro Yamane formula (in Riduwan, 2007) with the level of precision specified (error rate, α = 5%) obtained sample number 56.

C. Data Collection Techniques

Research data obtained by using documentation, questionnaire and test. The instrument used in the form of a questionnaire with a closed questionnaire type is a questionnaire whose answers have been prepared so that the respondents just choose the answer. In accordance with the study of theory, the compilation of peer tutor instruments based on factors that mempegaruhinya the environmental factors of physical work and non physical environment. The statement in the questionnaire is guided by the indicator of the research variables described in several items. The questionnaire used refers to the Likert Scale using an alternate four-scale answer, so the data is generated in the form of intervals whereas the test used is a series of questions to measure skills, knowledge of intelligence, abilities or talents possessed by individuals or groups. Usually, method used in data collection is to measure the presence or absence and the amount of basic ability or achievement as a subject in the study. The formulation of the statements in the questionnaire and the test is based on the indicators of the research variables used.

D. Research Instruments

The test of the instruments performed in this study includes the validity and reliability test. Validity test consists of two test pilot test of construct validity and validity test item item questionnaire. The test results of the validity of item questionnaire items on the variables of peer-based tutors based on work environment (X) is 39 items from 45 items.Through validity test conducted to 20 students majoring in PTM FT-UNM, 6 items declared unvalid and 39 statements declared valid. Instrument of learning result variable amounted to 33 items, which originally amounted to 40 items. Through validity test conducted to 20 students of Department of Mechanical Engineering, 7 statement items are declared unvalid and 33 items of statement declared valid, so the item that is not valid removed from questionnaire. The results of the reliability test of each variable are: (1) the value of cronbach's alpha for peer tutor variables of work environment (X) is 0.827 and (2) the cronbach's alpha value for the pneumatic and hydraulic learning result variable of 0.897. Alpha value of all variables is valued > 0.700 so it can be concluded that the questionnaire instrument for all variables is reliable, so it is appropriate to be used to retrieve research data.

E. Data Analysis Techniques

Data analysis conducted in the research consist of analysis that is (1) inferential descriptive statistic. Descriptive statistical analysis is used to describe data based on central tendency and dispersion. Central tendencies are mean, median, minimum value, and maximum value; (2) The prerequisite analysis test is performed with the aim to fulfill the requirement of hypothesis test which includes normality test and linearity test, and (3) Hypothesis test using simple regression analysis technique on functional or causal relationship of one independent variable with one dependent variable using SPSS 20 with 5% significance level guidance to see how much contribution given by independent variable to dependent variable.

III. RESULTS AND DISCUSSION

The results of the study described data descriptions of each variable, prerequisite test, and hypothesis testing. The following is a description of the research results.

A. Data Description

Description of the data presented using descriptive statistical techniques that aim focus on the depiction of data. The data descriptions for each variable include: average (M), standard deviation (SD), median (Me), mode (Mo), and frequency distribution histogram. For the Work-based Peer-Assisted Learning (X) variable. Based on the results of analysis conducted using Statistical Product and Service Solution (IBM SPSS Statistics 20), it can be presented the results of analysis as in Table 1 below.

TABLE I. DESCRIPTIVE STATISTIC OF WORK-BASED PEER ASSISTED LEARNING (PAL)

N	**Valid**	**56**
	Missing	***0***
Mean		108,6429
Median		111,0000
Mode		114,00[a]
Std. Deviation		18,14430
Range		69,00
Minimum		70,00
Maximum		139,00

a. Multiple modes exist. The smallest value is shown

It is known that the peer-assisted learning has a Mean = 108.64 Standard Deviation = 18.14, Median = 111, Mode = 114, Maximum Value = 139 and Minimum Value = 70.

TABLE II. PERCENTAGE WORK-BASED PEER ASSISTED LEARNING VARIABLE

No	Category	Interval	Frequency	Percentage
1.	Very High	> 121,65	12	21,43%
2.	High	104,6 – 121,75	27	48,21%
3.	Low	87,26 – 104,5	7	12,5%
4.	Very Low	< 87,25	10	17,86%
Total			56	100%

Based on the data percentage of work-based peer assisted learning score can be described in Figure 1.

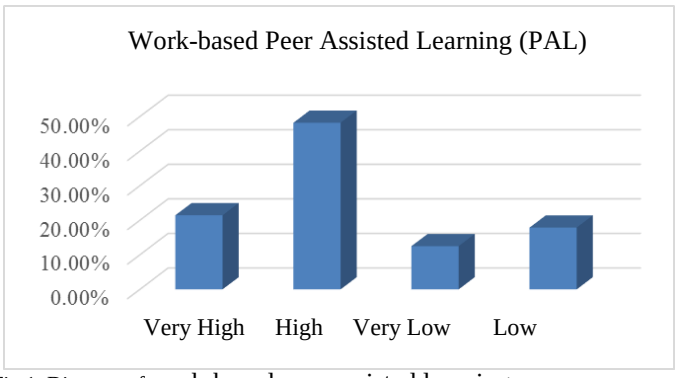

Fig 1. Diagram of work-based peer assisted learning

Based on the above standard score can be seen 12 people (21.43%) are in very high category, 27 people are in high category (48.21%), 7 people are in low category (12.50%) and 10 people is in very low category (17.86%). So it can be concluded that the large respondents have the proportion of peer-based tutors are in the high category that is as much as 48.21%. For variables of pneumatic and hydraulic learning result (Y), showing the result of analysis performed using IBM SPSS Statistics 20. hence can be presented result of analysis like as follows.

TABLE III. DESCRIPTIVE STATISTIC OF LEARNING OUTCOME (LO)

N	**Valid**	**56**
	Missing	***0***
Mean		77,9475
Median		78,0682
Mode		77,32[a]
Std. Deviation		5,69014
Range		27,77
Minimum		60,65
Maximum		88,42

a. Multiple modes exist. The smallest value is shown

It is known that student learning result variable has Mean = 77,95, Standard Deviation = 5,69, Median = 78,07 Mode = 77,32, Max Value = 88,42 and Minimum Value = 60,65.

TABLE IV. PERCENTAGE OF LEARNING OUTCOME (LO)

No	Category	Interval	Frequency	Percentage
1.	Very High	> 81,5	14	25%
2.	High	74,6%-81,5	26	46,43%
3.	Low	67,7-74,5	13	23,21%
4.	Very Low	< 67,6	3	5,36%
Total			56	100%

Based on the proportion of scores of learning results can be described diagram as follows.

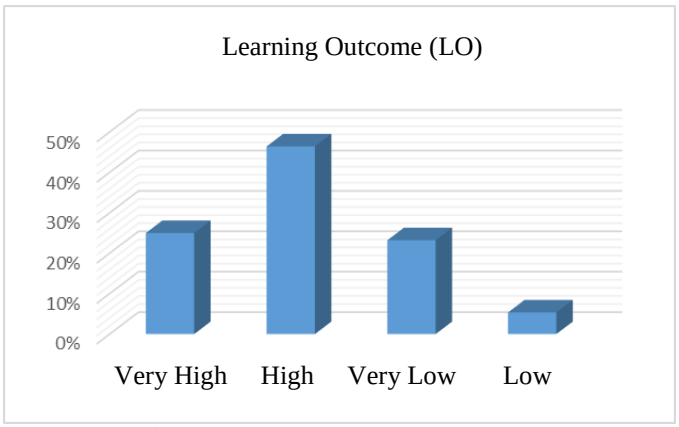

Fig 2. Diagram of Pneumatic and Hydraulic Learning Outcome

Based on the standard score above it shows that 14 students (25%) are in very high category, 26 students are in high category (46.43%), 13 students are in low category (23.21%) and 3 students are in very low category (5.36%). Therefore, it is concluded that the majority of the students (46.43%) are in the high category of learning outcome.

B. Fulfillment of Statistical Assumption

Prior to hypothesis testing, statistical assupmtion need to be fulfilled since it will determine the hypothesis testing. There are two testing, they are normality testing and liarity testing. The results of these testing will provide information to decide whether using parametric or non-parametric analysis.

Normality testing aims to know wheter the collected data were normally distributed or not. Besides, the result will provide the information whether the hypothesis should be analyzed using parametric or non-parametric. Normality testing using One-Sample Kolmogorov-Smirnov with SPSS. Data is normal when the significance value (Asymp.sig)>0,05.

TABLE V. NORMALITY TESTING ON WORK-BASED PEER ASSISTED LEARNING

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	***df***	***Sig.***	***Statistic***	***df***	***Sig.***
Peer-Assisted Learning	,117	56	,055	,947	56	,016

a. Lilliefors Significance Correction

TABLE VI. NORMALITY TESTING ON LEARNING OUTCOME

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Learning Outcome	,074	56	,200	,971	56	,204

a. Lilliefors Significance Correction

The result of normality tests show that: (1) Value of work-based peer assisted learning t is 0,55 and; (2) learning outcome is 0,200, where the significance value of each variable is more than 0,05 so it can be concluded that the data of the research results for each variable is normally distributed.

TABLE VII. LINEARITY ANOVA

			Sum Squares	ofDf	Mean Square	F	Sig.
PAL LO *	Between Groups	(Combined)	1457,330	37	39,387	2,192	,039
		Linearity	811,263	1	811,263	45,148	,000
		Deviation from Linearity	646,068	36	17,946	,999	,519
	Within Groups		323,442	18	17,969		
	Total		1780,772	55			

Linearity testing is used to know wheter the relationship between exogenous and endogenous variables are linear. This research used linearity testing with *Test for Linearity* in SPSS, where the probability value (Asymp.sig) < 0,05 therefore the distributed data is linear. The result of linearity testing shows that significance value of each variable: (1) work-based peer assisted learning on pneumatic and hydraulic is 0,00. The result of linearity test of the variables is less than 0,05 so it can be concluded that data between two variables (exogenous and endogenous variables) have a linear relationship.

C. Hypothesis Testing

Hypothesis testing is conducted to know the influence of the exogenous variable to the endogenous variable, both partially and simultaneously. The testing uses SPSS with simple linear regression.

TABLE VIII. REGRESSION ANALYSIS OF THE CORRELATION BETWEEN VARIABLES

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	811,263	1	811,263	45,186	,000[b]
	Residual	969,509	54	17,954		
	Total	1780,772	55			

a. Dependent Variable: Hasil Belajar

b. Predictors: (Constant), Tutor Sebaya

The result of the simple regression analysis shows that R=0.675 means the value of the correlation coefficient of 0.675, R Square (R^2) multiplied 100%= 0.456x100% = 45.6%. These numbers means that the work-based peer assisted learning has an influence 45.6% to the learning outcomes while 54.4% is influenced by other variables that not mentioned in the study.

TABLE IX. COEFFICIENT DETERMINATION ANOVA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,675[a]	,456	,445	4,23720

a. Predictors: (Constant), Tutor Sebaya

b. Dependent Variable: Hasil Belajar

The result of coefficient analysis of determination test shows that the value of F_{count} is 45.186 with Sig = 0.000. Therefore the value of sig. <0,05 then H_0 is rejected which means the work-based peer assisted learning has significant effect to pneumatic and hydraulic learning result.

TABEL X. COEFFICIENTS EFFECTS SIGNIFICANCE OF VARIABEL X TOWARDS VARIABLE Y

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	54,951	3,468		15,847	,000
	PAL	,212	,031	,675	6,722	,000

a. Dependent Variable: LO

The result of coefficient analysis of determination test shows that the value of F_{count} is 45.186 with Sig = 0.000. Therefore the value of sig. <0,05 then H_0 is rejected which means the work-based peer assisted learning has significant effect to pneumatic and hydraulic learning result.

Based on the coefficients table the influence of Sig. variable X towards variable Y, then obtained formula

$$\hat{Y} = a + bx \qquad (1)$$

Regression equation $\hat{Y}$ = 54,951 + 0,212 X states that if there is no increase on variable X, the variable value is 54,951. Regression coefficient of 0.212 states that any change (because the + sign) of one value on the variable X will increase to 0.212. The beta value shows the effect of variable X towards variabel Y, where in the table beta value is 0.675. The Sig value is 0.000, it indicates that there is a significant influence of the variable X to Y because 0,000 <0.05, where 0.05 is the Significant level.

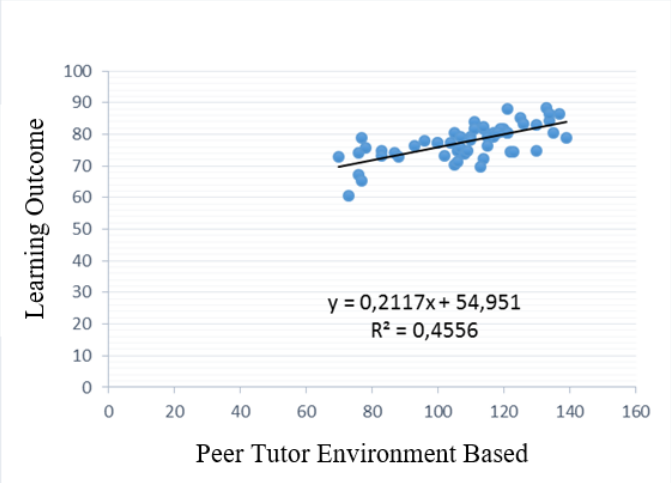

Fig 3. THE COEFFICIENT DIAGRAM ON THE INFLUENCE OF VARIABLE X TOWARDS VARIABLE Y

The result of the significance test in ANOVA table shows Sig. value is 0,000. Compared to value $\alpha = 0.05$, the Sig. value is smaller than α (Sig. $\leq \alpha$) which is $0.000 \leq 0.05$. This means that H_o is rejected and H_a is accepted, then there is a significant influence between the work-based peer assisted learning towards learning outcomes. Based on the influence of work-based peer assisted learning on learning outcomes it can be seen by looking at the value of R2 in the Summary Model table. The obtained interpretation is R Square (R^2) value= 0,456 = 45,6%. This value indicates that the effect of variable X to variable Y is 45.6% and the influence of other variables is 54.4%.

DISCUSSION

The result of regression analysis showed that work-based peer assisted learning has 45.6% effect on the learning result. It is because in conveying the information it is more easily understood by tutee (friend taught) since they are in the same language, learners are more open in expressing difficulties because they are friends, relaxing learning atmosphere can eliminate fear, strengthen friendship, concepts are easy to be understood, learners are interested to be responsible which is to be an independent learning. Teaching peers provides opportunities and encourages learners to learn something well, and at the same time it becomes a resource for others.

Some experts believe that one lesson is completely mastered only when learners are able to teach other learners. According to Mel Silbermen (2001), Peer-Assisted Learning is one of learning strategy based on active learning. Some experts believe that one lesson can be completely mastered only when learners are able to teach other learners. Peer-Assisted Learning (PAL) provides opportunities and encourages learners to learn something well, and at the same time it becomes a resource for others. Peer-Assisted Learning (PAL) is an effective way to produce peer teaching skills. Meanwhile, according to Chan, et. Al (2016) Peer-Assisted Learning is also known as 'peer tutoring', used as an instructional or learning support strategy that utilises students to help or support other students that are struggle in academic. These studies are in-line with the research conducted by Fuchs, et.al (1999) about effects of PALS on high school students with serious reading problems. The result showed PALS students grew more on reading comprehension and reported more positive beliefs about working hard to improve reading.

Similarly, research by Comfort, P., & James McMahon, J. (2014) about the he effects of peer tutoring on both the tutors and tutees, in a Sports Science. The results show a significantly greater academic achievement in the peer tutoring group (73.64±10.26 per cent) compared to students that were not peer tutored (46.20±20.27,$p=0.003$) and compared to the previous years' cohort that were not peer tutored (56.83±19.18,$p<0.001$). Moreover, tutors also demonstrated significantly ($p<0.001$) higher grades (82.00±11.01 per cent) compared to the students that did not act as peer tutors (64.88±8.82 per cent).

IV. CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that there is a significant positive influence between work-based peer assised learning on students' learning outcomes majoring Mechanical Engineering State University of Makassar. The result of regression analysis showed that peer-based peer tutor had an influence on learning result of $\hat{Y} = 0,212 + 54,951$ with R Square 0,456 or 45,6%.

The result of the research on the influence of work-based peer assised learning towards the learning outcome of Pneumatic and Hydraulic course has some limitations, so the authors propose some suggestions as follows: (1) need to do a relatively long and gradual research to obtain the objective data; (2) need special guidance for a tutor to be able to guide peers for the attainment of learning objectives and; (3) conduct an observation after the implementation of the learning process to know whether the peer-assisted learning method has increased or vice versa.

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