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Full Length Research Paper

Technical skills and employability skills of vocational high school students in Indonesia

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The objective of this research was to determine the development of technical skills and employability skills of vocational high school students in terms of the implementation contribution of scientific approach. The research used a quantitative approach of non-experimental design with the type of survey called ex-post facto. The research population is made up of 523 students of mechanical engineering skills package with the sample of 221 students (172 males and 49 females). Data collection techniques used were a test, questionnaire, and documentation. The data were analyzed using descriptive analysis and structural equation modeling (SEM). The results showed that the implementation of scientific approach has significant contributions towards the mastery of technical skills and the impact on the employability skills of vocational students. Hence, it can be said that the technical skills and employability skills can be developed through the implementation of a scientific approach.

Key words: Scientific approach, technical skills, employability skills.

INTRODUCTION

Vocational High School (SMK) in substance is one vocational institution that is organized to prepare middle-class prospective workers. The existence of SMK is required to meet the needs of the labor market so that students are required to have the skills and attitudes of professionals in the field. This is similar to what is proposed by Clarke and Winch (2007) that vocational education is a social development effort of labor, maintenance, accelerating and improving the quality of labor in order to increase the community productivity. Law No. 20 of 2003 on National Education System of the Republic of Indonesia on Article 15 states that vocational education is secondary education that prepares students to work in a particular field.

The knowledge and skills possessed are not enough to be able to survive in the workplace. Many factors are suspected as the cause, among others, from the providers of labor (education), from the requester (industry), and also from the graduates themselves. A number of factors were identified to be a problem of those current vocational education graduates not to be absorbed in workplace, among others: (1) the information obtained was not sufficient to support employment; (2) the industry in general are looking for an experienced workforce; and (3) the complaint the industry that most graduates do not have the expected skills by the industry, especially employability to survive and stay still in a variety of situations and working conditions.

The characteristics of the work world and workforce qualification needed by industry in the era of knowledge-based economy today has been changing rapidly. One of the main characteristics of knowledge-based industry is the growing demand for generic skills attributes that must be owned by the workers (Gibb, 2004). In addition to technical skills in the field, workers must also have skills that are generic. Cairney (2000) states that the industry in the era of knowledge-based economy requires workers who are able to work independently, able to manage themselves, to work in teams, to adapt to change, to solve complex problems, and to think in a creative and innovative way.

Employability skills become very important issue in recent years. Education which is workforce oriented through the mastery of technical skills and employability

skills is needed to sustain the development of a knowledge-based economy (Esposto and Meagher, 2007). Employability skills are some of the non-technical skills which can be transferred into a variety of occupations. It is necessary to enter the workforce, to remain on the job and develop careers in the workplace, or for career development in the new workplace (Yorke and Knight, 2006). These skills include: the ability to work independently, manage yourself, work in teams, adapt to change, solve complex problems, as well as think creatively and innovatively (Hager and Holland, 2006; Tome, 2007).

Preparation of learners to have the technical skills and generic skills (employability skills) stems on the quality of the implementation of the learning program. Some research results indicate the interacting factors in the learning process among learning systems (Shyi-Huey, 2005; Robinson, 2006; Ogbeide, 2006), a learning environment that is created when the learning process (Vermeulen and Schmidt, 2008; Kember et al., 2007) is a factor contributing to the skills of learners.

The approach used in the study interacts with the learning environment. The learning environment with regard to social aspects, psychology and pedagogy may be implicated in the formation of knowledge, skills and attitudes (Vaatstra and Vries, 2007). A good learning environment affects learning achievement and boost employability skills of students through innovative instructional improvement (Harvey, 2001). Furthermore, Denton (2003) says that an optimal learning environment can help develop work-ready graduates.

The study is expected to follow up by all the parties concerned in this regard as consideration of Vocational High School stakeholders to improve the quality of organizing education so that graduates are ready to work with building technical skills and employability skills needs of the industry.

Theoritical review

Employability skill

Overtoom (2000) defines employability skills as the transferable group's core skills that describes the main functions of the knowledge, skills, and attitudes needed in the workplace of the 21st century. Employability skills is a relevant skill to a variety of occupations and professions (Cassidy, 2006). Employability skills can also be interpreted as the person’s ability to actively adjust in a particular job so that it is possible to survive and realize their chances for success in work.

According to the Secretary's on Achieving Necessary Skills (SCANS, 1991), employability skills cover workplace competencies and foundations skills. Workplace competencies consist of five skills that can be used by workers effectively in improving productivity, among others: resources, interpersonal skills, information, systems and technology. Meanwhile, the foundation skills needed to improve the performance of workers include: basic skills, thinking skills and Personal qualities.

Confederation of British Industry and the National Union of Students (CBI/NUS, 2011) states that the term of employability skills refers to a number of generic skills, including: the self-management, teamwork, business and customer awareness, solving the problem, communication, the calculating application, and the application of information technology. Meanwhile UNESCO Regional Bangkok (2012) states that employability refers to the attributes and competencies that enable job seekers to find work, including: (1) communication skills, (2) logical, analytical and problem solving skills, (3) personality, confidence, and integrity, (4) the flexibility and adaptability, (5) innovation and creativity, and (6) the spirit of the team.

Employability skills are demonstrated by three main skill elements, namely:

(1) Fundamentals skills, which include: communication skills, information management skills, mathematical skills and problem-solving skills.
(2) Personal Management Skills include: skills in a positive attitude and behavior, responsibility skills, skills in adapting, continuous learning skills and skills to work safely.
(3) Teamwork Skills include: skills to work with others in a team and skills to participate in a project or task (CBC, 2000).

Vocational competency of mechanical engineering

According to the Law of the Republic of Indonesia number 20 of 2003 on National Education System (Education Law) of Article 35, the competence of the graduates are the qualified graduate capabilities that include attitudes, knowledge, and skills in accordance with national standards that have been agreed. Meanwhile, the Law of the Republic of Indonesia number 13 of 2003 on Labor, stated that the work competency is the ability of each individual that covers aspects of knowledge, working skills and attitudes in accordance with established standards.

Earnest and de Melo (2001) revealed that an integrated demonstration of competence is defined as a group of skills, the cognitive skills and technical skills, and attitudes which were observed and measured to perform a specific job. Competence can also be defined as the ability or skill possessed by the students in the form of knowledge, understanding, skills and attitudes that can be applied in daily life. Gonsi (2004) states competence is the ability of a student to display the specific activities as a result of the combination of knowledge, skills,

dispositions and values that appear on a combination of generic and key competencies in completing a job.

Vocational competence of mechanical engineering equips students with the skills, knowledge and attitudes to be competent to:

(1) work either independently or fill the job in the corporate world and the industrial world as a middle-level manpower in the field of mechanical engineering.
(2) to choose a career, compete, and develop a professional attitude in the field of mechanical engineering.

Vocational competence in mechanical engineering vocational school based on 2013 curriculum consisted of some competence, among others: (1) do the work with a lathe; (2) do the job with milling machine; (3) did the job with a grinding machine; (4) do their work using complex lathe; (5) do their work using complex milling machine; (6) chisel grinding and cutting tools; (6) set the machine and program NC/CNC machine; (7) programming NC/CNC machine base; and (8) to operate machinery NC/CNC base.

Implementation of scientific approach

Scientific approach is a learning process guided by scientific principles. This approach is characterized by protrusion dimension of observation, reasoning, discovery, validation, and an explanation of a truth. The learning process with a scientific approach should be implemented guided by values, principles, or scientific criteria. Students in the learning process will construct scientific knowledge by asking, making observations, taking measurements, collecting data, organizing data and interpreting the data, predicting outcomes, experimenting, summarizing and communicating the result (Martin, 2006). According to Aragon (2007), the scientific method is defined as a systematic process to acquire new knowledge which uses the basic principle of deductive reasoning and to a lesser extent inductive.

Reasons of scientific approach are expected to improve motivation and student learning outcomes, namely:

(1) Carried out in groups so that students feel more confident and feel comfortable.
(2) The stage of observing and asking to make students motivated and curiosity increases.
(3) The stage of exploring/gathering information, students are more comfortable for the collection of information which can be done together, exchange ideas and experiences.
(4) Stages associate/reasoning, adding breadth and depth to the information processing that are looking for solutions from a variety of sources.
(5) Communicating stage, students are trained to be able to convey the learning outcomes that have been done in the form of a report and presentation to the class.
(6) The students' motivation in learning activities increasingly enthusiastic and learning outcomes will be increased.

According Kemdikbud (2014), scientific approach is carried out through observing, questioning, reasoning, trying and forming networks. Learning model in accordance with the scientific approach, among others: inquiry-based learning; discovery-based learning; and problem-based learning as well as project-based learning; and models and other methods that are relevant.

Vocational learning, particularly in the areas of expertise of Technology and Engineering at SMK, lay more emphasis on technical skills in the psychomotor domain. However, it does not mean that cognitive skills, especially thinking skills and scientific work becomes important in vocational learning. Many problems with settlement of vocational field work for the implementation of scientific thinking is done first before mechanically using a machine.

METHODOLOGY

This research uses a quantitative approach to design non-experimental type of survey because of the studied sample data obtained from population and using questionnaires as a data collection (Mitchell and Jolley, 2007). The population in this study consist of 523 class XII students in Mechanical Engineering skills package. The determination of sample size using tables of Issac and Michael (1984) with error level α = 5%, thus a sample of 221 students (172 male and 49 female) were obtained.

Data collection in this study uses questionnaires and tests of performance. The questionnaire is used to obtain data on the implementation of the scientific approach and employability skills while mastering the technical skills acquired through performance tests. The data were analyzed using descriptive analysis and structural equation modeling (SEM). The descriptive analysis in this study aims to investigate the characteristics of the implementation variable toward scientific approach, technical skills and employability skills. Meanwhile SEM analysis is used to look at the contribution of the scientific approach to technical implementation skills and employability skills.

RESULTS

Implementation on data description of scientific approach

Research data show that the number of minimum score is 48, the number of a maximum score of 99, the average score of 73.02, the median of 73, the mode of 77, and

Table 1. Classification criteria score implementation of scientific approach.

S/N	Category	Interval	Frequency	Percentage (%)
1	Very Poor	30.0 – 52.5	5	2.26
2	Poor	52.6 – 67.5	70	31.67
3	moderate	67.6 – 82.5	99	44.80
4	high	82.6 – 97.5	45	20.36
5	Very high	97.6 - 120	2	0.90
Total			221	100.00

Table 2. Classification criteria technical skills mastery score.

S/N	Category	Interval	Frequency	Percentage (%)
1	Very low	0.0 - 25.0	0	0.00
2	low	25.1 – 41.7	9	4.07
3	moderate	41.8 – 58.3	137	61.99
4	high	58.4 - 75,0	74	33.48
5	Very high	75.1 - 100	1	0.45
Total			221	100.00

Table 3. Classification criteria score employability skills.

S/N	Category	Interval	Frequency	Percentage (%)
1	Very low	30.0 – 52.5	0	0.00
2	low	52.6 – 67.5	3	1.36
3	moderate	67.6 – 82.5	42	19.00
4	high	82.6 – 97.5	129	58.37
5	Very high	97.6 - 120	47	21.27
Total			221	100.00

standard deviation of 11.45. Furthermore, by using average value criterion ($\bar{X}_k$=75) and standard deviation criteria (σ_k=15), classification number of scores can be arranged in five categories as shown in Table 1.

Data description of technical skills mastery

Research data shows that the number of variables minimum score is 36.69 mastery of technical skills, the amount of a maximum score of 75.18, the mean score of 55.51, the median of 55.32, mode of 53.48, and a standard deviation of 7.30. Furthermore, by using average value criterion ($\bar{X}_k$= 50) and standard deviation criteria (σ_k= 16,67), then the classification of the number of variables mastery of technical skills scores can be compiled in five categories as shown in Table 2.

Description data of employability skills

Research data shows that the number of variables employability skills minimum score is 55, the number of a maximum score of 119, the average score of 91.43, the median of 92, the mode of 97, and a standard deviation of 10.58. Furthermore, by using average value criterion ($\bar{X}_k$=75) and standard deviation criteria (σ_k=15), the arranged classification of the total score for employability skills variable can be arranged in five categories as shown in Table 3.

Analysis of structural model

The suitability test of overall model aims to evaluate the degree of suitability or goodness of fit (GOF) between the data model. The analysis of the suitability test the entire model uses seven criteria of goodness of fit. Results of analysis using these five criteria are presented in Table 4.

Evaluation of a causal relationship between the latent variables is done by using the path coefficient (γ or β) and value-t (T-value). The relationship between the two variables was significant when the value of the latent-t load factor is greater than or equal to 1.96. The

Table 4. Goodness of fit statistics.

GOF Indeks	Grade	Criteria	Resume
GFI	0.92	≥ 0.90 : good fit	Good fit
RMSEA	0.09	0.08 – 0.10 : marginal fit	Marginal fit
NFI	0.95	≥ 0.90 : good fit	Good fit
AGFI	0.87	0.80 – 0.90 : marginal fit	Marginal fit
RFI	0.93	≥ 0.90 : good fit	Good fit
IFI	0.97	≥ 0.90 : good fit	Good fit
CFI	0.97	≥ 0.90 : good fit	Good fit

Table 5. Evaluation of coefficient line.

Hipotesis	Hubungan (Jalur)	Path Coeffience	Grade T-Value	Significance Resume (T ≥ 1,96)
1	PS → KK	0.490	8.14	Significant
3	KK → ES	0.206	2.75	Significant
4	PS → ES	0.337	3.03	Significant

significance criteria can also be seen in the track diagram of the basic model with a T-value estimate, in which the track is not significantly displayed with a red t values. Path coefficient value and the value of T-value from existing relationships as previously hypothesized are summarized in Table 5.

The first hypothesis states that there are significant contributions to the implementation of the scientific approach (PS) to the mastery of technical skills (KK) to produce the value of T-value 8.14 which means greater than 1.96; so it can be concluded that the implementation of the approach path coefficient relationship scientific and mastery of technical skills of 0.490 is significant.

The second hypothesis states that there is a significant contribution mastery of technical skills (KK) on employability skills (ES) and generate value T-value of 2.75, which means greater than 1.96; so it can be concluded that the path coefficient relationships technical mastery of skills to employability skills of 0.206 is significant.

The third hypothesis stating that there are significant contributions to the implementation of the scientific approach (PS) on employability skills (ES) generate value T-value of 3.03, which means greater than 1.96; so it can be concluded that the implementation of the relationship path coefficient scientific approach to employability skills of 0.337 is significant.

DISCUSSION

Contributions implementation approach against scientific technical skills mastery

Results of the evaluation of the path coefficients on the structural analysis (SEM) showed that the implementation of the path coefficients of scientific approach to the mastery of technical skills is significant. It shows that there is a significant contribution of the scientific approach variable toward the mastery of vocational competence. The significant contribution is due to the implementation of the scientific approach which is able to place students as a learning center that provides a high chance to improve the mastery of vocational competence (Marjan, 2014).

The findings are consistent with the results of research conducted by Hidayati and Edriansyah (2014) which shows that the scientific approach can improve student learning outcomes. From this research, it is also known that applying scientific study makes students more interested in the material being taught, it's easier to understand the subject matter, classroom conditions more conducive and more confident students to conduct experiments in the workshop.

Implementation of the scientific approach in Vocational high school mechanical engineering is implemented through problem-based learning (PBL) and project-based learning (PjBL). The learning will make more effective and efficient learning process in increasing the mastery of vocational competence. This is consistent with research from González and Batanero (2016) which shows that implementing PBL will make learning effective and more efficient. Students who study with PBL tend to show greater creativity in solving problems and impact on learning outcomes.

The results of the research by Celik et al. (2011) suggests that PBL is more effective than traditional teaching methods to improve learning achievement. This is because the PBL is a student-centered learning so as

to assist in building the information and to perform meaningful learning. Moreover, PBL can also facilitate students' problem-solving abilities. It is not only general education but also encourages problem solving to vocational students, where knowledge and practical skills are more emphasized on vocational schools (Chiang and Lee, 2016).

Meanwhile, the application of model-based project (PjBL) in the learning of science has high efficiency and effectiveness. Students who learn to use project-based learning have high academic achievement and science process skills and the ability to think analytically (Panasan and Nuangchalem, 2010). Similar to the results of research conducted by Hung et al. (2012), it shows that an effective project-based learning can improve student learning, motivation to learn, problem-solving competence, and learning achievement.

Contributions toward the mastery of technical skills and employability skills

Results of the evaluation of the path coefficients on the structural analysis (SEM) showed that the path coefficient mastery of technical skills to employability skills is significant. It shows that there is a significant contribution of the mastery of vocational competence toward the emplyability skill of the vocational students. The significant contribution is due to the mastery of technical skills which has an impact on employability skills as an indicator of the readiness of the student's work.

Vocational learning achievement in the form of vocational competence mastery plays a role in shaping the student job readiness. A student who will graduate is faced with a problem in the form of knowledge and skills learned in vocational whether it has been fulfilled or not to ready to work. For a student who wants to work, the mastery of cognitive competencies and skills is not enough yet what is really needed is employability skills.

The results showed that the learning outcomes of partially productive subjects have positive effect on job readiness of vocational students. High learning results indicate that students understand and have the ability to master the subjects which had been given so that students who have a high learning outcomes will have the competencies expected to compete in the workforce (Noviana, 2014). Other studies concluded that there is significant basic vocational learning achievement toward job readiness at SMK Electronics Engineering study program in Sleman (Baiti and Munadi, 2014).

The current market is increasingly worried about globalization and the rapid changes in technology and very intense and competitive industries. As a result, employers now are more concerned to find employees who fit not only with technical skills but also have employability skills to adapt to the rapid changes in the industry (John et al., 2013; Fong et al., 2014). The industry requires the mastery of employability skills as a major capital of employees to achieve satisfactory performance. Dimensions employability skills were found to be predictors of job performance, namely communication skills, personal qualities, teamwork skills, critical thinking skills, problem-solving skills, technology skills, organizational skills, and learning skills (Rahmat et al., 2016).

Currently, DU/DI want graduates who have high competence. The graduate competency is technical skills or hard skills and employability skills. Competencies that must be owned by prospective migrant workers, namely: (1) specific competence or hard skills, the competence areas of expertise; and (2) the generic competencies or employability skills, namely general competencies for prospective workers (Agung, 2009). According to Sudjimat (2013), the candidate needed by DU/DI is a candidate who has a comprehensive competence, namely a blend of hard skills competence and soft skills or employability skills.

Implementation contribution of scientific approach toward the employability skills

Results of the evaluation of the path coefficients on the structural analysis (SEM) showed that the path coefficient scientific approach to the implementation of employability skills is significant. It shows that there is a significant contribution to the implementation of the scientific approach to the vocational student’s employability skills. The contribution is due to the implementation of the scientific approach as a learning system to foster employability skills (Harvey, 2001).

Aspects of employability skills can be taught in a classroom environment through appropriate learning approaches. As research conducted by Lane found that collaborative learning allows students not only academic learning but also to develop interpersonal and group skills needed for teamwork, develop leadership skills and improve their communication skills (Lane, 2016).

Implementation of scientific approaches in Vocational high school in mechanical engineering is implemented using problem based learning (PBL) and project-based learning (PjBL). Both learning models are centered learning that enables learners to assist students in acquiring and achieving the generic skills or employability skills because PBL and PjBL provide contextual environment that makes learning interesting and relevant. PBL and PjBL is a systematic method that engages students to learn essential knowledge and different types of skills.

The results showed that the PjBL if managed properly, can help students in higher education institutions in achieving attribute; in this case, employability skills (Moalosi et al., 2012). Other research results concluded that the human factor or the attitude of educators and

students is directly involved to ensure the success of the PjBL that will make the students see, understand and be confident to apply the knowledge. It will benefit students before entering the workplace after graduation because they can have a lot of employability skills. For that reason, PjBL can be used by educators in helping students improve various skills required in workforce (Jamaludin and Sahibudin, 2012).

Research results of Baharom and Palaniandy (2013) reveals that in order to improve learning outcomes and develop generic skills, it is required the active participation of students in the process of PBL. The model of PBL allows students to solve authentic problems and work in teams to find an effective solution to the problem. Reflection of students in the study indicate that the improvement of various aspects of learning through PBL has an impact on the mastery of different types of skills. This proves that learning through PBL can improve generic skills and contribute to the development of employability skills.

Other studies reveal the students' perception of satisfaction and importance of PBL approach in facilitating the work skills. Results of the study revealed that all of the students reported that PBL could facilitate employability skills. Thus, it is concluded that PBL is eligible to facilitate the learning skills of the students' work (Smith et al., 2013). These results are also supported by the results of research by Martin et al. (2008), which revealed that students benefit from the PBL because they are given the opportunity to work in teams. He further disclosed that a short course of PBL succeeded in developing learning independence and employability skills.

Other research also showed that PBL is more effective to equip students with skills associated with the boss in the workplace such as teamwork and effective communication. The learning process which is oriented to develop content knowledge and employability skills should also be considered (Glover et al., 2002). PBL does offer more to students of knowledge content through the development of various competencies critical reasoning, teamwork and problem solving skills (Martin et al., 2008).

Conclusion

Based on the deliberations of the research results, it can be concluded that the implementation of a scientific approach contributes significantly to technical skills and employability skills of the students in Vocational High School Mechanical Engineering Package. Therefore, it can be said that the implementation of a scientific approach can develop technical skills and employability skills of Vocational High School students. The result is expected to follow up by all the parties concerned in this regard as consideration of Vocational High School stakeholders to improve the quality of organizing education so that graduates are ready to work with building technical skills and employability skills needs by the industry.

REFERENCES

Agung YA (2009). Analysis of Results of DUDI Needs Assessments and Vocational Graduation Tracking Study (Analisis Hasil Needs Assessments DUDI dan Studi Pelacakan Tamatan SMK). Yogyakarta: PPs Universitas Negeri Yogyakarta.

Aragon A (2007). Girth Control: The Science of Fat Loss and Muscle Gain. Aragon Publishing.

Baharom S, Palaniandy B (2013). Problem-based learning: A process for the acquisition of learning and generic skills. International Research Symposium on Problem-Based Learning, pp. 47-55.

Baiti AA, Munadi S (2014). Effect of Practice Experience, Basic Vocational Learning Achievement and Parents Support to Vocational Students Readiness (Pengaruh Pengalaman Praktik, Prestasi Belajar Dasar Kejuruan dan Dukungan Orang Tua terhadap Kesiapan Kerja Siswa SMK). Jurnal Pendidikan Vokasi, 4(2):164-180.

Cairney T (2000). The knowledge based economy: implications for vocational education and training. Centre for Regional Research & Innovation University of Western Sydney. Accessed from http://trevorcairney.com/file/uploads/cgilib.22733.1.VETLit Rview.pdf

Cassidy S (2006). Developing employability skill: peer assessment in higher education. Educ. Train. 48(7):508-517.

CBI & NUS (Confederation of British Industry and National Union of Students) (2011). Working towards your future: making the most of your time in higher education. Diakses 24 Oktober 2015 dari http://www.cbi.org.uk/pdf/ cbi-nus-employability-report.pdf.

Celik P, Onder F, Silay I (2011). The effects of problem-based learning on the students' success in Physics Course. Procedia-Soc. Behav. Sci. 28(1):656-660.

Chiang CL, Lee H (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. Int. J. Inf. Educ. Technol. 6(9):709-712.

Clarke L, Winch C (2007). Vocational education international approach, development and system. New York: Routledge.

Conference Board of Canada (CBC) (2000). Employability skill 2000+. (Online), (http:// www.conferenceboard.ca/ Libraries), diakses 6 November 2015.

Denton R (2003). Assessment: Assessing the Key Competencies in the Electronics and Information Technology Program at Torrens Valley TAFE. Adelade, Australia: National Centre for Vocational Education Research.

Earnest J, de Melo (2001). Competency-based engineering curricula: an innovative approach. International Conference on Engineering Education, Oslo Norway, August 6-10.

Esposto A, Meagher GA (2007). The future demand for employability skills and the implications for the VET System. Accessed from http://www.avetra.org.au/publications/12-Esposto.pdf

Fong LL, Sidhu GK, Fook CY (2014). Exploring 21st Century skills among postgraduates in Malaysia. Procedia-Soc. Behav. Sci. 123(1):130-138.

Gibb J (2004). Generic skills in vocational education and training. Adelaide SA: National Centre for Vocational Education Research Ltd.

Glover D, Law S, Youngman A (2002). Graduateness and Employability: Student Perceptions of the Personal Outcomes of University Education. Res. Post-Compulsory Educ. 7(3): 293-306.

Gonsi A (2004). The New Professional and Vocational Education. Crow Nest NSW: Allen and Unwin.

González R, Batanero F (2016). A review of problem-based learning applied to engineering. Int. J. Adv. Educ. Res. 3(1):14-31.

Hager P, Holland S (2006). Graduate Attributes, Learning, and Employability. The Netherlands: Springer.

Harvey L (2001). Defining and measuring employability. Qual. High. Educ. 7(2):97-109.

Hidayati N, Edriansyah (2014). The Effect of Using Scientific Approach

in Learning to Student Results on Competency Standards Operating Electromagnetic Control System (Pengaruh Penggunaan Pendekatan Ilmiah dalam Pembelajaran terhadap Hasil Belajar Standar Kompetensi Mengoperasikan Sistem Kendali Elektromagnetik). Jurnal Pendidikan Teknik Elektro, 3 (2): 25-29.

Hung CM, Hwang GJ, Huang I (2012). Project-based digital storytelling approach for improving students' learning motivation, problem-solving competence and learning achievement. Educ. Technol. Soc. 15(4): 368-379.

Issac S, Michael WB (1984). Handbook in Research and Evaluation. California: EdITS Publishers.

Jamaludin NA, Sahibuddin S (2012). Challenges of project-based learning towards requirement engineering. Int. J. Comput. Appl. 50(3):1-5.

John W, Bhatti MI, Hannan MA, Feinberg M (2004). Using an inquiry approach to teach science to secondary school science teachers. J. Phys. Educ. 39(5):1-6.

Kember D, Leung DYP, Ma RSF (2007). Characterizing learning environments capable of nurturing generic capabilities in higher education. Res. High. Educ. 45(8):609-632.

Kemdikbud (2014). Permendikbud Nomor 103 tahun 2014 tentang Pembelajaran Pada Pendidikan Dasar dan Pendidikan Menengah. Jakarta: Kementerian Pendidikan dan Kebudayaan.

Lane S (2016). Developing employability skills by using blended learning. Am. J. Educ. Res. 4(1):47-53.

Marjan J (2014). The Influence of Learning of the Scientific Approach to Learning Outcomes of Biology and Skills of Science Process Students MA Mu'allimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat (Pengaruh Pembelajaran Pendekatan Saintifik terhadap Hasil Belajar Biologi dan Keterampilan Proses Sains Siswa MA Mu'allimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat). E-Journal Program Pascasarjana Universitas Pendidikan Ganesha 4(1):1-12.

Martin DJ (2006). Elementary Science Methods: A Constructivist Approach, Fourth Edition. USA: Thomson Wadsworth.

Martin L, West J, Bill K (2008). Incorporating problem-based learning strategies to develop learner autonomy and employability skills in sports science undergraduates. J. Hosp. Leisure Sport Tour. Educ. 7(1):18-30.

Mitchell ML, Jolley JM (2007). Research Design Explained. Belmont: Thompson Wadsworth.

Moalosi R, Molokwane S, Mothibedi G (2012). Using a design-orientated project to attain graduate attributes. Design and Technology Education: Int. J. 17(1):30-43.

Noviana (2014). Effect of Learning Outcomes Productive Subject of Accounting, Industrial Practice Program and Self Efficacy to Readiness Work (Pengaruh Hasil Belajar Mata Pelajaran Produktif Akuntansi, Program Praktik Kerja Industri dan Self Efficacy terhadap Kesiapan Kerja). Econom. Educ. Anal. J. 3(1):182-190.

Ogbeide GCA (2006). Employability skills and students' self-perceived competence for careers in the hospitality industry. Doctoral Dissertation (unpublished). Columbia: University of Missouri.

Overtoom C (2000). Employability Skills: An Update. Clearing house on Adult, Career, and Vocational Education (http://www.calpro-online.org), diakses 5 November 2015.

Panasan, Nuangchalerm P (2010). Learning outcomes of project-based and inquiry-based learning activities. J. Soc. Sci. 6(2):252-255.

Rahmat N, Ayub AR, Buntat Y (2016). Employability skills Constructs as Job Performance Predictors for Malaysian Polytechnic Graduates: A Qualitative Study. Malays. J. Soc. Space 12(3):154-167.

Robinson JS (2006). Graduates' and Employers' Perceptions of Entry-Level Employability Skill Needed by Agricultural, Food and Natural Resources Graduates. Doctoral Dissertation Unpublished. Colombia: University of Missouri.

Secretary's Commission on Achieving Necessary Skills (SCANS). What Works Requires of Schools: A SCANS Report for America 2000. Washington, D.C: Department of Labor.

Shyi-Huey W (2005). Employability and effective learning systems in higher education. Ninth Quality in Higher Education International Seminar in Collaboration with ESECT and the Independent. Birmingham 27th-28th January.

Smith M, Duncan M, Cook K (2013). Graduate Employability: Student Perceptions of PBL and its Effectiveness in Facilitating their Employability Skills. Pract. Evid. Scholarsh. Teach. Learn. High. Educ. 8(3):217-240.

Sudjimat DA (2013). Development of employment skills to improve the quality of superior human resource 21st Century (Pengembangan Kecakapan Kemampukerjaan untuk Meningkatkan Kualitas SDM Unggul Abad XXI). Malang: UM Press.

Tome E (2007). Employability, Skills and Training in Portugal (1988-2000): Evidence from Official Data. J. Eur. Ind. Train. 31(5):336-357.

UNESCO Bangkok (2012). Graduate Employability in Asia. Accessed from http://unesdoc.unesco. org/images/0021/002157/ 215706E.pdf.

Vaastra R, Vries RD (2007). The Effect of the Learning Environment on Competences and Training for Workplace According to Graduates. High. Educ. 53(1):335-357.

Vermeulen L, Schmidt HG (2008). Learning Environment, Learning Process, Academic Outcomes and Career Success of University Graduates. Stud. High. Educ. 33(4):431-451. Labor Standards Act: Legislative Yuan Amended Labor Standards Act on 6 December 2016.

Yorke M, Knight PT (2006). Embedding employability into the curriculum. United Kingdom: The Higher Education Academy.