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Employability Skill Development of Mechanical Engineering Students Through Project Based Learning in Vocational High School in South Sulawesi

Amiruddin¹, Abdul Muis Mappalotteng², Nurlaela¹, and Sunardi¹

¹Department of Mechanical Engineering Education, State University of Makassar

²Department of Electrical Engineering Education, State University of Makassar

amiruddin@unm.ac.id

Abstract: Embedding employability skills in learning requires a learning model that allows effective in improving employability skills of students Learning model that if able to meet these expectations is project based learning. This study aims to determine the contribution of project based learning to employability skills of students of SMK Package Engineering Skills Engineering in South Sulawesi. This research uses quantitative approach with non experimental design with sample size 325 students. Data collection uses questionnaires to obtain data on project-based learning implementation and employability skills. The data of the research were analyzed by using descriptive analysis and regression analysis which previously conducted normality and linearity test. Based on the results of the research is known that the implementation of project based learning model contributes to the development of employability skill students of machining engineering SMK 59.8%.

1. Introduction

Vocational high school graduates are oriented to work so that their graduates must have competencies that are appropriate to the needs of the labor market. One of the competencies that SMK graduates must have is employability skills, consisting of: fundamental skills, personal management skills, teamwork skills, and technological skills [1]. Wagner (2008: 14) emphasizes seven survival skills, namely: (1) critical thinking skills and problem solving; (2) collaboration capability; (3) deft and able to adapt; (4) ability to take initiative and entrepreneurship; (5) effective communication skills; (6) the ability to access and analyze information; and (7) ability in imagination and imagination. When examined, then the skills are employability skills. The results showed that 77% of entrepreneurs wanted employees to have team work skills and 71% of employers looked for employees who had problem-solving skills and 86% of employers wanted to hire people who wanted to become professionals [2].

Preparation of manpower through education at Vocational High Schools within the ASEAN Economic Community in addition to the necessary technical skills are also directed to: (1) the development of skills and competence of analysis and problem solving; (2) development of skills and competencies in processing information; (3) communication skills that contribute to productive and harmonious relationships between workers and customers; (4) teamwork skills that contribute to working relationships and productive impacts; (5) initiative and enterprise skills that contribute to



innovative impacts; (6) planning and organizing skills that contribute to strategic planning; (7) self-management skills that contribute to satisfaction and performance growth; (8) learning skills contribute to sustained career development and employee expansion; (9) technology skills that contribute to effective execution in employment [3]. These aspects of technical skills are employability skills.

Employability skills are core skills groups that describe the functional nature of knowledge, skills, and attitudes needed by the workplace in the 21st century. Employability skills are a group of core skills, describing the key functions of individual knowledge, skills, and attitudes required in the workplace [4]. Employability has various characteristics: (1) job-match employability which refers to the possibility of workers to keep working on their current job at the same company; (2) firm internal employability that refers to the possibility of workers moving to other jobs within the same company; (3) external employability refers to the possibility of workers moving to other jobs in different companies [5].

According to The Conference Board of Canada [6] employability skills consist of: (1) fundamental skills, a skill required as a basis for skills development. These skills consist of communication skills, the ability to manage information, and use numbers; (2) personal management skills, ie personal skills, attitudes and behaviors that encourage a person's potential to develop. This skill consists of positive attitude and behavior, a sense of responsibility, adaptability, eagerness to keep learning, work carefully, think and solve problems; and (3) teamwork skills, which are the skills and attributes needed to improve work productivity. This skill consists of teamwork skills, and is able to participate in the work.

The effectiveness of employability skills development depends on the environment and the readiness of the students. Employability skills development can be done through four ways: (1) extra curricular activities: organizing, student creativity contest, sport, seminar; (2) home life: role in the family; and (3) classroom learning: through instructional, group work, tutoring and so on [7].

Mastery of employability skills is the essence of competence that must be mastered and measured through performance during the learning process. Learning employability skills is seen as part of the effort to establish professional attitude. Establishment of professional work attitude should be instilled from the beginning to learners through the process of work habituation developed and aligned with the needs of learning. However, the pattern of learning that occurs during this in the class more emphasis on mastery of hard skills and less on efforts to instill employability skills. With these conditions it is necessary to have a strategy that supports SMK graduates can develop aspects employability skills possessed. By that, to instill employability skills required learning that integrates aspects of employability skills on theoretical and practical learning.

Embedding employability skills in learning requires a learning model that enables effective in improving students' employability skills, so that learning outcomes have high relevance to employment needs. Learning model that if able to meet the expectation is project based learning. Siswanto [8] stated that experiential learning, context teaching and learning, work-based learning, and project based learning theory become relevant in the implementation of technology and vocational education in vocational high school.

Development of employability skills can be done through affective learning activities, application of strategy or student-centered learning model (SCL), providing learning tasks, extracurricular activities and student affairs, and industrial work practices [9]. One way of developing employability skills is through the use of learning models according to the needs and materials to be delivered as well as the goals to be achieved. To determine the model of learning that will be used, first must know what ability will be obtained by learners after attending the learning activity, both hard skills and employability skills [10]. One alternative is to develop employability skills through project based learning.

Based on research conducted by Curtis [11], it is known that project-based learning is useful in designing effective learning. Employability skills development through project based learning is done not through special subjects, but integrated in each subject. For example, if the employability skills

attribute developed is oral communication, then the learning process using presentations, discussions, group discussions becomes necessary. However, if the cooperation is to be focused, then many group assignments are given. Similarly with other aspects of employability skills. Other results indicate that project-based learning implementation is related to the acquisition of employability skills of learners [12]. In addition, the results of the study also show that there is a relationship between teacher quality, teaching methods, workshop tools, teaching materials with the acquisition of students' employability skills.

According to Leviatan [12] project-based learning is an innovative learning that emphasizes complex activities with the goal of solving problems based on inquiry activities. It is in accordance with the purpose of learning in vocational high school that students can solve problems in everyday life. Project-based learning brings together learning through experimentation and learning by doing. Project-based learning can be applied to a variety of disciplines, where students benefit from a more practical learning experience [13].

Project-based learning is a superset for individuals and collaborative problem solving [14], problem-based learning [15][16], product-based learning [17]. Problem-based and product-based learning is part of project-based learning. Project-based learning consists of conceptual thinking and teamwork skills.

According to Kurzel and Rath [18], the project-based learning phase consists of seven phases, namely: (1) good description, a phase in presenting the problem to be solved and setting goals; (2) specify criteria, phase in determining the criteria for solving the solution problem, and determine the focus to be achieved, and what ability will be achieved; (3) background knowledge, phase to determine the knowledge or concept needed, and seek information to the experts; (4) generate ideas, generalize concepts and construct hypotheses; (5) implementation solution, phase in finding and implementing solution and comparing it with other solution; (6) reflect, evaluate the entire learning process from processes, solutions, and products; and (7) generalize, the phase for conceptualising, mineralizing facts and knowledge into theory. Meanwhile, the project-based learning steps developed by The George Lucas Educational Foundation consist of: (1) asking essential questions to students; (2) design the project plan; (3) schedule activities; (4) monitoring student activities; (5) assessing student learning success; and (6) evaluating the experience of the students [19].

Based on the above description, it can be concluded that project-based learning is the appropriate learning model to be applied in SMK in order to achieve the competence of students in accordance with the needs of the world, both employability skills and hard skills because learning combines competency-based learning and production-based learning whose estuary more closer learners on real world conditions.

2. Method

This research uses quantitative approach with non experimental design of survey type because the studied are sample data obtained from the population and use questionnaires as data collectors. Population in this research is the students of class XII of Package of Mechanical Engineering Skills at vocational high school in South Sulawesi as many as 523 students. Determination of sample size using random number table from Issac and Michael [19] with the error rate $\alpha = 5\%$, so that obtained sample of 221 students.

Data collection in this study using questionnaire. Questionnaires are used to obtain data about project-based learning and employability skills. The data of the research were analyzed by using descriptive analysis and regression analysis which previously conducted normality and linearity test. Data analysis is done with the help of SPSS software version 20.0 for windows. Descriptive analysis in this study aims to determine the characteristics of project-based learning variables and employability skills. Meanwhile, regression analysis is used to view the contribution of project-based learning to employability skills.

3. Result and Discussion

3.1. Project-based learning Data Description

The data of project-based learning variables were revealed with a questionnaire consisting of 30 items of statement on a four-point scale (1-4), then the minimum score for the project-based learning variable is 30, the maximum number of scores is 120 so that the criterion 75 and standard deviation criteria of 15. The data showed that the minimum score was 48, the maximum score was 99, the mean score was 73.02, the median was 73, the mode was 77, and the standard deviation was 11.45. Description of project-based learning as in Figure 1 below.

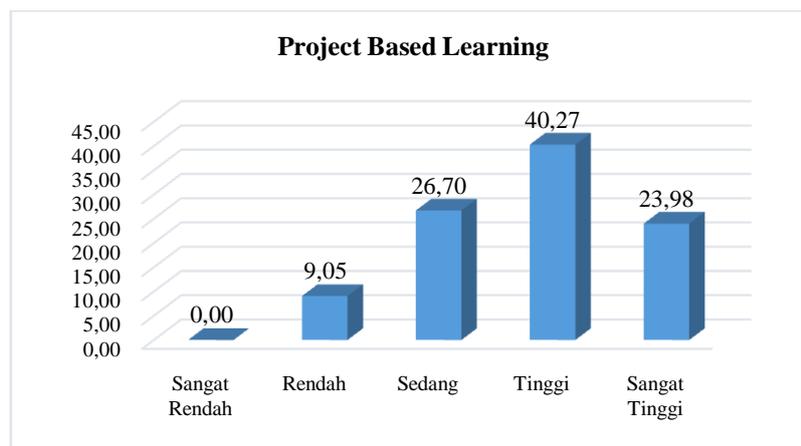


Figure 1. Project-based learning

3.2. Data Description of Employability Skills

Employability skills variable data were revealed with a questionnaire consisting of 30 items of statement on a scale of four (1-4), then the minimum score set for employability skills variable is 30, the maximum number of scores is 120 so that the criterion is 75 and standard deviation criterion of 15. Data result of research indicate that minimum score of employability skill variable is 55, maximum score 119, average score 91,43, median 92, mode 97, and standard deviation 10,58. Description of employability skills as in Figure 2 below.

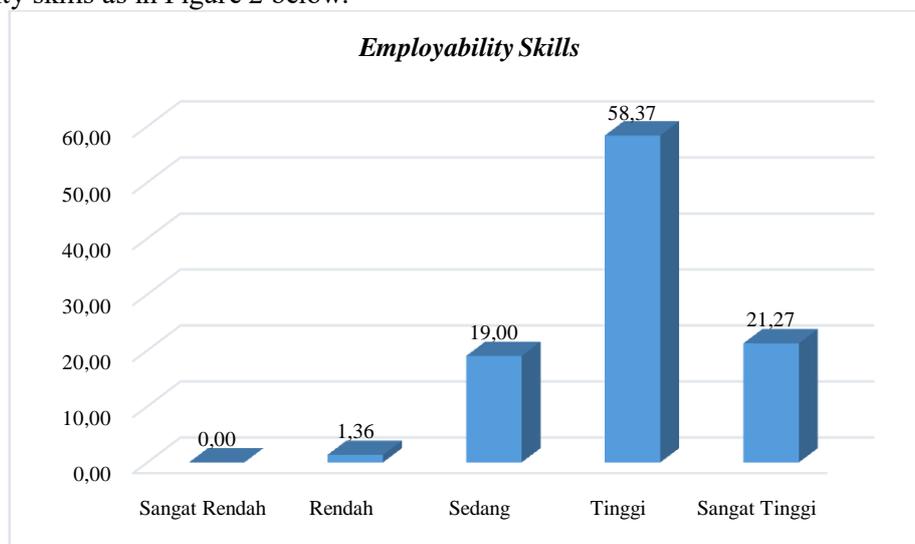


Figure 2. Employability Skills Diagram

3.3. Test Prerequisites Normality and Linearity

Normality test in this study using Kolmogorov-Smirnov because the data tested has respondents who are more than 50 people. Based on Sig value. Kolmogorov-Smirnov is greater than 0.05 ie .200 for both variables so it can be concluded that data from project-based learning and employability skill are normally distributed. While linearity test is done on every relation of independent variable with dependent variable. Linearity test in this research is done by using deviation of linearity by using Sig criteria. greater than $\alpha = 0.05$. It is known that the significance value of the deviation from linearity of 0.070 for the regression pair meets the linearity requirement (Sig.> 0.05). It is therefore possible to conclude that the regression pair satisfies the assumption of a linear relationship.

3.4. Hypothesis Testing with Regression Analysis

To know the contribution of implementation approach to employability skill, linear regression test is done. From the regression test it is known that the magnitude of R square (R^2) is 0,598. This figure means that the contribution of project-based learning to employability skills is 59.8%. Meanwhile, the remaining 40.2% is influenced by other factors. The result of significance test in ANOVA table shows Sig value. of 0,000. The value means that $0.05 \geq$ Sig value. 0.000 so H_0 is rejected and H_1 accepted, meaning that the regression coefficient is significant. Based on that, it can be concluded that project-based learning contribute significantly to employability skills.

4. Discussion

Based on the result of regression analysis it is known that the contribution of project-based learning to employability skills is significant that is equal to 59,8%. This shows that there is a significant contribution of project-based learning to the employability skills of SMK students. These results are supported by research conducted by Shyi-Huey [21] indicating that the learning system has a significant influence on the employability skill of engineering students at several universities in Taiwan. This is in line with Harvey's [22] opinion that employability skills grow as a result of a good learning system. According to Cleary, et al [23] employability skills can be developed through academic tasks, work practices, industry-based learning, and cooperative learning integrated with work. In addition, it can also be done in various activities such as work experience, problem-based learning, and project-based learning [24].

Aspects of employability skills can be taught in the classroom environment through appropriate learning approaches. Collaborative learning enables students not only academic learning but also to develop the interpersonal and group skills necessary for teamwork, developing leadership skills and improving communication skills [25]. Project-based learning is a learner-centered learning that enables students to achieve achieving generic skills or employability skills.

Learning model that can help students to have creativity, interaction and help in the investigation that leads to real problem solving is project-based learning [26]. Project-based learning is one of the models or learning approaches that emphasizes the improvement of analytical and critical thinking skills of students, explorative, team work and communication skills into the foundation for the development of both skills. Thomas [26] states that the positive impact of project-based learning for students is the development of positive attitudes toward learning, work routines, problem-solving skills, and self-esteem. PjBL is a comprehensive model for teaching and learning designed to enable learners to research real problems [27].

Project-based learning provides benefits, including: (1) preparing students for real world; (2) increase the motivation of learners, and encourage the ability to perform important work; (3) linking learning in schools with the real world; (4) forming the work attitude of learners; (5) improving communication and social skills; (6) improve problem solving abilities; (7) improving the skills of learners to use information with their own discipline; (8) increase students' self-confidence; and (9) improving the ability of learners using technology in learning [28]. According to Sudjimat [29], project-based learning is appropriately applied in vocational schools that not only implement

competency based training but also production based training. Through project work learning, creativity and motivation of learners will increase (Clegg, 2001; Clegg & Bearh, 2001).

The results revealed that if project-based learning is well managed it can assist students in achieving skill attributes in this case employability skills [30]. PjBL can be used by educators in helping students improve the skills needed by the world of work [2]. The project-based learning model allows students to solve authentic problems and work in teams to find effective solutions to problems. Student reflection in research shows that improvement of various aspects of learning through PBL impact on the mastery of various types of skills. This proves that learning through PBL can improve generic skills and contribute to the development of employability skills [31].

The results of Martin, et.al., [32] which revealed that students feel the benefits of PBL because given the opportunity to work in teams. It was further disclosed that a short course of PBL was successful in developing learning independence and employability skills.

5. Conclusion

Based on the discussion of research results can be concluded that the implementation of project based learning contribute to the development of employability skill students of machining engineering SMK 59.8%. So it can be said that developing employability skill SMK graduates can be done through the implementation of project based learning. This result is expected to be an input for all stakeholders of SMK to improve the quality of learning so that graduates have employability skills skill according to industry demand.

Reference

- [1] Sumarno. 2015. Employability Skill pada Era ASEAN Economic Community (Bahan Kajian untuk Pengembangan Pendidikan Vokasi). Disampaikan pada Seminar Nasional Pendidikan Vokasi dalam Rangka Dies Natalis Ke-54 FT UNY, tanggal 5 Februari.
- [2] Jamaludin, N.A.A., & Sahibuddin, S. 2012. Challenges of Project-Based Learning Towards Requirement Engineering. *International Journal of Computer Applications*, 50 (3): 1-5.
- [3] ACCI. 2002. Employability Skills for the Future. A Report by the Australian Chamber of Commerce and Industry (ACCI) and the Business Council of Australia (BCA) for the Department of Education, Science and Training, Canberra.
- [4] Overtoom, C. 2000. Employability Skills: An Update. Clearinghouse on Adult, Career, and Vocational Education. (Online), 5 Nopember 2015.
- [5] Sanders & Grip. 2003. Training, Task Flexibility and Low-Skilled Workers' Employability. Maastricht: Research Centre for Education and the Labour Markaet, Faculty of Economics and Business Administration.
- [6] Conference Board of Canada (CBC). 2000. Employability Skill 2000+. (Online), 6 Nopember 2015.
- [7] Jobs, S. 2014. Developing Employability Skills in Creers and Employability Service, Uni. Of Kent. (Online) 21 Maret 2016.
- [8] Siswanto, B.T. 2011. Model Penyelenggaraan Work-Based Learning Pada Pendidikan Teknologi dan Kejuruan Diploma III Otomotif. Yogyakarta: Program Pascasarjana Universitas Negeri Yogyakarta.
- [9] Sudjimat, D.A. 2010. Pengembangan Model Pendidikan Soft Skill melalui Pembelajaran pada Program Studi Pendidikan Teknik Mesin FT UM, *Teknologi dan Kejuruan*, 33 (2): 133-142.
- [10] Sailah, I. 2008. Pengembangan Soft Skills di Perguruan Tinggi. (Online), 17 April 2016.
- [11] Curtis, D. 2005. Start With Pyramid. (Online) 10 April 2016.
- [12] Udofia, A.E., Ekpo, A.B., Nsa, E.O., & Akpan, E.O. 2012. Instructional Variables and Students' Acquisition of Employable Skills in Vocational Education in Nigerian Technical Colleges. *Scholarly Journal of Education*, 1 (2): 13-19.
- [13] Leviatan, T. 2008. Innovative Teaching and Assessment Method: QBI and Project Based Learning. *Mathematics Education Research Journal*, 10 (2): 105-116.

- [14] Whatley, J. 2012. Evaluation of a Team Project Based Learning Module for Developing Employability Skills. *Issues in Informing Science and Information Technology*, 9 (1): 75-89.
- [15] Frezza, S., & Cannell, J. 2009. Product-Based Learning in Software Engineering Education. *Frontiers in Education Conference*.
- [16] Azer, S. A. 2009. Interactions Between Students and Tutor in Problem-Based Learning: The Significance of Deep Learning. *The Kaohsiung Journal of Medical Sciences*, 25 (5): 240-249.
- [17] Ragan, E. D., Frezza, S., & Cannell, J. 2009. Product-Based Learning in Software Engineering Education.
- [18] Kurzel, F., & Rath, M. 2003. Project Based Learning and Learning Enviroments. University of South Australia: Informing Science Institute.
- [19] Nurohman, S. 2007. Pendekatan Project Based Learning Sebagai Upaya Internalisasi Scientific Method bagi Mahasiswa Calon Guru Fisika. (Online) 10 Februari 2016.
- [20] Issac, S. & Michael W.B. 1984. *Handbook in Research and Evaluation*. California: EdITS Publishers.
- [21] Shyi-Huey Wu. 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.
- [22] Harvey, L. 2001. Defining and Measuring Employability. *Quality in Higher Education*, 7 (2): 97-109.
- [23] Cleary, M., Flynn, R., Thomasson, S., Alexander, R., & McDonald, B. 2007. Graduate Employability Skills: Prepared for the Bussines, Industry and Higher Education Collaboration. Melbourne: Precision Conculatancy.
- [24] Smith, E & Comyn, P. 2003. The Development Employability Skill in Novice Workers. Adelaide, Australia: National Centre for Vocational Education Research.
- [25] Lane, S. 2016. Developing Employability Skills by Using Blended Learning. *American Journal of Educational Research*, 4 (1): 47-53.
- [26] Thomas, J. W. 2000. A Review of Research on Project-Based Learning. (Online) 4 Mei 2015.
- [27] Grant, M. M. 2002. Getting A Grip on Project Based-Learning: Theory, Cases and Rekomandations. *Meredian A middle School Computer Technologies Journal*, 5 (1): 1-3.
- [28] Railsback, J. 2002. Project-based instruction: Creating excitement for learning. Portland, OR: Northwest Regional Educational Laboratory.
- [29] Sudjimat, D.A. 2014. *Perencanaan pembelajaran Kejuruan, dari Kajian Empirik Dikembangkan sesuai Kurikulum 2013 untuk Pembelajaran Abad XXI*. Malang: UM Press.
- [30] Moalosi, R., Molokwane, S., & Mothibedi, G. 2012. Using a Design-orientated Project to Attain Graduate Attributes. *Design and Technology Education: An International Journal*, 17 (1): 30-43.
- [31] 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.
- [32] Martin, L., West, J., & Bill, K. 2008. Incorporating Problem-Based Learning Strategies to Develop Learner Autonomy and Employability Skills in Sports Science Undergraduates. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 7 (1): 18-30.