Developing Lean-Based Learning Model to Improve Work Skills of Vocational Students

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Abstract. The low absorption of the workforce in the vocational high school graduates indicate their lack of expertise and competency. It urges to improve their work skills to meet the demand of the world of work. This research aims at developing a Lean-based learning model to enhance the work skills of vocational high school students. This study can be categorized as development research using the modified Borg and Gall method. The Lean-based learning model was tested through three stages, namely its validity, effectiveness, and practicality towards students, teachers and industrial practitioners. Based on the research findings, the developed learning model can be categorized as good in case of its validity, effectiveness, and practicality. It means the lean-based learning model is valid, effective and practical as one of the alternatives to improve the competency among vocational high school students to fulfill the industrial demand.

Keywords: Work skills, lean-based learning model, vocational high school

INTRODUCTION

The low competency among vocational high students indicates that the learning process has not comprehensively met the aspects of work skills and it makes the graduates lack expertise. Basically, the learning process must be directly integrated with the work process to facilitate the students with a real experience of work setting (Lubis, 2010; Palmer, 2007; Hartanto et al, 2017). The students’ competency skills can be enhanced through the appropriate learning strategies to equip them with knowledge, attitudes, skills and work values which are needed in the real work environment, (Prosers & Quigley, 1949; Hartanto et al, 2019). The role of vocational high schools is to prepare individuals to achieve competency skills, sustain individual lives, face the world of work, and develop careers in the future (Calhoun & Finch, 1982; Hartanto et al, 2019). So, it must produce graduates who are ready to work, smart, competitive and have a strong character as professional workers.

The inadequate competency of vocational graduates can be seen from the labor absorption within the national scale (Indonesia) in which only 10.87% of vocational graduates. It is lower than other education levels, such as a public high school with 20.52%, 18.16% for junior high school and dominated by elementary level graduates with 42.23%. This gap must be solved immediately by enhancing the competency among vocational students in order to meet the industrial standard. Therefore, this study aims at developing lean-based learning models referring to industrial needs. In this model, the learning process is integrated with the world of work to present a bridge connecting the school education and the professional work in order to provide real work experience among students. The learning system that integrates the world of work provides enormous benefits in the development of vocational competence, (Blum, 2008; Sousa, 2011). The world of work integration is a form of the environment role to transform the students’ competency to achieve sustainable development.

LITERATURE REVIEW

Work skills are abilities that are needed by individuals in the workplace including hard skills and soft skills. The hard skills in vocational education must be possessed by students to achieve their competencies. It is related to technical procedures and fixed rules that can be learned through the instructional process to gain the intellectual abilities in facing the rapid advancement of information
and environment as well as to support the skills development according to the needs of industry and the world of work, (Coates, 2006; Hartanto et al., 2017; Mazoota, 2015). The improvement of hard skills must be supported by soft skills to be all-around workers. The soft skills are abilities possessed by individuals that cannot be seen but it has a big role in social and community life to support their careers and jobs. This ability is also required by companies or the world of work, (Hartanto et al., 2017; Chaturvedi et al., 2011; Robles, 2012). The adequate soft skills will be beneficial for each individual related to how to communicate, listen, make dialogue, provide feedback, work in a team and solve problems, (Chaturvedi et al., 2011; Hartanto et al., 2017). The soft skills have a significant impact on hard skills and play a crucial role for students in entering the work setting because it makes them to be more flexible and have positive thinking to fulfill the industrial expectations in global competition (Rani, 2010). It means the work skills must be owned to answer the challenges of the future work in the industry that will eliminate the low-skilled labors since the job description require skills as well as high expertise in the fields of reading, calculation, communication, and problem-solving.

The vocational education must have the transformational principle in accordance with the needs of society and technology. This is one means to prepare students to face the world of work, so this kind of education must be oriented to the future requirement. Adrian (2005), The vocational education should be able to train the students to socialize with appropriate attitudes within the world of work, adjust to the employment behavior, have an effective transition to enter the job market, possess specific skills and knowledge towards the working setting.

Figure 1. Lean-Based Learning Models

To prepare students to face the world of work, it should be supported with the right learning process by integrating learning with the world of work or industry. One of the appropriate principles is the application of lean systems. Lean manufacturing is a system used in companies and production
processes to achieve maximum profits in case of its effectiveness and productivity through continuous development (Liker and Meier, 2006; Anna et al, 2015; Hartanto et al, 2019). Lean is a continuous effort to eliminate waste and increase value-added products for customers (Gaspersz, 2007). It is called lean because the process must be run using less material, less investment, less inventory, less space, and fewer people (Lonnie, 2010). The implementation of lean manufacturing is outlined in five steps by thoroughly analyzing an entire process including value identification; value streams identification; value stream flow creation; pull system application; excellence orientation (Sundar et al, 2014).

Meanwhile, the learning model is a plan that is used to form a curriculum or long-term learning plan, design learning materials, and guide the classroom learning process (Joyce and Calhoun, 2009; Hartanto et al, 2019). The lean-based learning model provides a solution to realize work skills development among vocational high school students (seen in Figure 1). School learning must be integrated with the world of work to be able to develop knowledge, skills, and attitudes in accordance with the objectives of vocational education. Since intelligence and creativity are not genetically determined, and both can be modified by the environment and school (Hartanto et al, 2019; Sousa, 2011). The effectiveness of vocational education will be achieved if the learning is done with similar condition as the actual work setting (Prosers & Quigley, 1949; Hartanto et al, 2019).

METHODS

This research is a research development (R & D) using the modified design of Borg and Gall. It included four steps, namely: (1) analyzing the product to be developed, (2) developing the initial product, (3) expert validation and revision, and (4) field trials and products finalization. The outcomes of this research are the lean-based learning models that were tested in case of its validity, effectiveness, and practicality. The research product had been through the tests of validity, effectiveness, and practicality. The validity test used content validity with the questionnaire completed by 5 selected experts based on the relevant expertise. The results of the validity test were presented descriptively. The effectiveness test of the learning model was done with experimental study with the populations and the samples were the eleventh-grade students of mechanical engineering from the vocational high school in Kepulauan Riau. The sample was selected through the random cluster sampling technique, namely the students who were carrying out industrial practices or internship with work shadowing strategies. The practicality tests were measured by analyzing the student learning outcomes after the action process.

RESULTS AND DISCUSSIONS

Validity Test Model

Based on the results of the study, the Lean-based learning model has been tested its content validity based on 5 experts’ assessment. The model validity test referred to 3 assessment aspects, namely: (1) the supporting theory, (2) the structure of the learning model, and (3) the learning outcomes. Those three aspects were described in the following items: (1) the adequacy and accuracy of the theories to arrange the learning needs and the learning model development, (2) the concepts and teaching processes with the relevant learning strategies and techniques as the foundation of the learning models, (3) the adequacy and accuracy of the relevant theories related to learning strategies to support the learning model, (4) the background of the model development, (5) the objectives of the model development, (6) the model description, (7) the reaction principles of the learning, (8) the media system in learning, (9) the supporting systems in learning, (10) the use of learning approach, (11) the learning steps, (12) the assessment technique, (13) the evaluation of assessment results, and (14) the proposed competency. The proposed learning outcomes. Based on the analysis results, the Lean-based learning models can be included in the «valid» category.
The Effectiveness Test Model
The effectiveness of the learning model was measured based on the learning outcomes among the vocational high school students at the end of industrial practices. They implemented the internship using the work shadowing strategy. The assessment results showed that the minimum completeness criteria were 60% with the individual completeness of 75. This assessment was carried out based on the average scores from both the teachers and the industrial instructors as the field supervisors. Referring to the students’ learning outcomes, there were 80% of them who passed the completeness criteria with the category of good.

The Practicality Test Model
The practicality tests were done to the respondents consisting of the teachers who taught in mechanical engineering majors, the industrial instructors and the students who had applied the lean principles for their learning process in the industry. The practicality results were presented in the form of percentages. Based on the research, it was obtained that the teacher responses were 86%, the instructors were 80% and the students were 84% respectively. It means the results of the practicality test can be considered as good.

CONCLUSION
Based on the research results, concluded that the Lean-based learning model is considered valid, effective and practical to improve the work skills among vocational high school students.

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REFERENCES
Adrian, F. (2005). The Psychology of Behaviour at Work. the individual in the organization (2nd ed.). New York: Psychology Press.
Arifin, Z., Nurtanto, M., Priatna, A., Kholifah, N., & Fawaid, M. (2020). Technology andragogy work content knowledge model as a new framework in vocational education: Revised technology
pedagogy content knowledge model. TEM Journal, 9(2), 786–791. https://doi.org/10.18421/TEM92-48

Blum, N. (2008). Environmental education in Costa Rica: Building a framework for sustainable development?. International Journal of Educational Development, 28(3), 348-358. https://doi.org/10.1016/j.ijedudev.2007.05.008,

Brujin, E. de, Billett, S., & Onstenk, J. (n.d.). Enhancing teaching and learning in the Dutch vocational education system: reforms enacted.

Calhoun, C. C., & Finch, A. V. (1982). Vocational Education Concept and Operation. Belmont, California: Wadsworth Publishing Company. Hal 60.

Chaturvedi, A., Yadav, A., & Bajpai, S. (2011). Communicative approach to soft and Hard skills. Journal VSRD-International of bussiness & management research, 1(1), 1-6.

Coates, E.D. (2006). People Skill Training. http://www.2020insight.net/docs4/peopleskills.pdf, (2006).

Eggen. P., & Kauchak. D. (2012). Strategi dan Model Pembelajaran. Mengajarkan konten dan ketrampilan berpikir. Edisi 6. Terjemahan. Jakarta: PT. Indeks.

Gaspersz, V. (2017). Lean Six Sigma for Manufacturing and Service Industries Strategi Dramatik Reduksi Cacat/Kesalahan, Biaya, Inventori, Dan Lead Time Dalam Waktu Kurang Dari 6 Bulan. Jakarta: Gramedia Pustaka Utamas.

Hartanto, S. (2017). Need and Analysis of Soft Skills for Students of the Mechanical Engineering Department of Vocational High School. International Journal of GEOMATE, 12(30), 156–159. https://doi.org/10.21660/2017.30.tvet017

Hartanto, S., Handoko, Z. A., Huda, A., Fordiana, R., & Yeni, N. (2019). Learning Material Analysis of Motorcycle Engine Tune-Up Practice Competency of Vocational High School Students. International Journal of Recent Technology and Engineering (IJRTE). ISSN, 2277-3878.

Hartanto, S., Lubis, S., & Rizal, F. (2017). Need and analysis of soft skills for students of the mechanical engineering department of vocational high school. International Journal, 12(30), 156-159

Hidayati, R. M., & Wagiran, W. (2020). Implementation of problem-based learning to improve problem-solving skills in vocational high school. Jurnal Pendidikan Vokasi, 10(2), 177–187. https://doi.org/10.21831/jpv.v10i2.31210

Jalinus, N., Nabawi, R. A., & Mardin, A. (2017). The Seven Steps of Project Based Learning Model to Enhance Productive Competences of Vocational Students. 102(Ictvt), 251–256. https://doi.org/10.2991/ictvt-17.2017.43

Joyce. B, Weil. M, & Calhoun. E. (2009). Models of Teaching, Model-model Pengajaran. Terjemahan edisi kedua. Yogyakarta: Pustaka Pelajar.

Li, C., Huang, J., Wang, J., Yang, J., & Tian, G. (2019). Study and Practice on Skills Competition Help Vocational Education Students Growing up. IOP Conference Series: Materials Science and Engineering, 573(1). https://doi.org/10.1088/1757-899X/573/1/012073

Liker, J. K., & Meier, D. The Toyota Way Fieldbook: A Practical Guide for Implementing Toyota’s 4Ps, 2006. Bok-McGrav-Hill Professional.

Lubis, S. (2010, November). Concept and implementation of vocational pedagogy in TVET teacher education. In Proceedings of the 1st International UPI conference on TVET, Bandung Indonesia (pp. 10-11).

Majid, S., Liming, Z., Tong, S., & Raihana, S. (2012). Importance of soft skills for education and career success. International Journal for Cross-Disciplinary Subjects in Education, 2(2), 1037-1042.

Martin, A., Hughes, H., & Martin, A. (2009). How to Make the Most of Work Integrated Learning: A Guide for Students. In Lecturers & Supervisors”, Massey University, Private Bag 11222 Palmerston North 5301 New Zealand.
Mazoota.A.R. (2015). “Workplace Soft Skills vs. Hard Skills – Which are More Important?”.
https://www.armazzotta.com/blog/2015/07/07/workplace-soft-skills-vs-hard-skills-which-are-more-important/.

Palmer, R. (2007). Skills for work?: From skills development to decent livelihoods in Ghana’s rural informal economy. International journal of educational development, 27(4), 397-420. DOI:10.1016/j.ijedudev.2006.10.003.

Proser, C.A & T. Quigley. (1949). Vocational education in a democracy, American Technical society, Chicago. http://www.morgancc.edu/.../prossers.

Rani, E., & Mangala, S. (2010). Need and importance of soft skills in students. Journal of Literature, culture and Media studies, 2(3).

Robles, M. Marcel, 2012, “Executive Perceptions of the Top 10 Soft Skills Needed in Today’s Workplace” in. Business Communication Quarterly, 75(4), 453-465.

Sa-Nguanmanasak, T., & Khampirat, B. (2019). Comparing employability skills of technical and vocational education students of Thailand and Malaysia: A case study of international industrial work-integrated learning. Journal of Technical Education and Training, 11(3), 94–109. https://doi.org/10.30880/jtet.2019.11.03.012

Sari, Y. I. H., Soelistiyowati, E., & Yuanti, E. E. (2020). Work ethics profile of vocational college students in Indonesia. Jurnal Pendidikan Vokasi, 10(3), 260–269. https://doi.org/10.21831/jpv.v10i3.33809

Sousa, D. A. (2011). Commentary: Mind, brain, and education: The impact of educational neuroscience on the science of teaching. Learning landscapes, 5(1), 37-43

Ståhl, A. C. F., Gustavsson, M., Karlsson, N., Johansson, G., & Ekberg, K. (2015). Lean production tools and decision latitude enable conditions for innovative decisionative learning in organizations: A multilevel analysis. Applied Ergonomics, 47, 285-291. https://doi.org/10.1016/j.apergo.2014.10.013.

Sundar, R., Balaji, A. N., & Kumar, R. S. (2014). A review on lean manufacturing implementation techniques. Procedia Engineering, 97, 1875-1885.

Wilson, L. (2010). How to implement lean manufacturing. McGraw-Hill Education.