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Work Skills Improvement of Vocational Students Through the Lean-Based Learning Model Development

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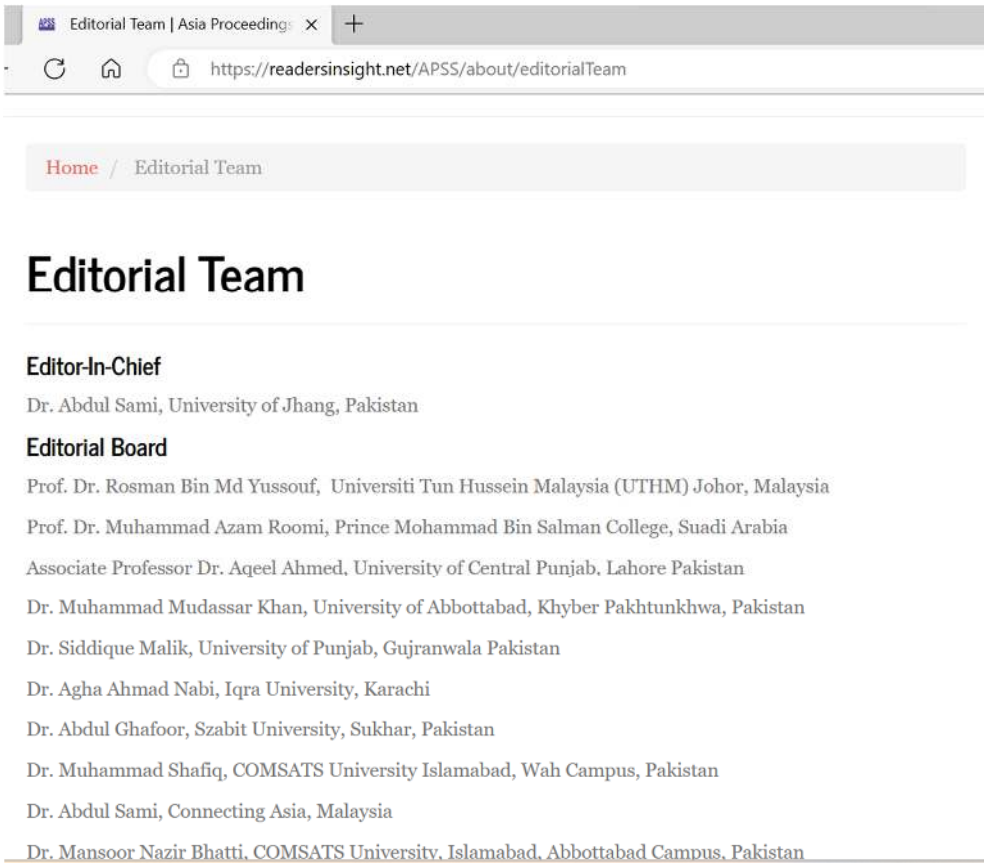
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WORK SKILLS IMPROVEMENT OF VOCATIONAL STUDENTS THROUGH THE LEAN-BASED LEARNING MODEL DEVELOPMENT

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Abstract

The low absorption of the workforce in the vocational high school graduates indicates 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. To prepare students to face the world of work should be supported with the right learning process by integrating learning with work or industry. One of the appropriate principles is the application of lean manufacturing systems in the learning process. There are 27 items of soft skills and 67 items of hard skills recommended for employments for vocational 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, i.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

1 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, 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, (Habanabakize & Pardjono, 2018), (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, (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, based on Indonesian Statistical Database, BPS. 2017. 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, 2001), (Estriyanto, 2017). The world of work integration is a form of the environment role to transform the students' competency to achieve sustainable development.

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, 2017), (Pritchard, 2013)3]. 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, 2017), (Majid et al., 2002), (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 & Fordiana, 2018). 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, (Mangala Ethaiya 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.

2 Literature Review

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, (Dillon, 1985), (Fagerlind .S et al., 2015), (Hartanto et al., 2019). Lean is a continuous effort to eliminate waste and increase value-added products for customers, (Sundar et al., 2014), (Fagerlind .S et al., 2015). It is called lean because the process must be run using less material, less investment, less inventory, less space and, fewer people, (Wilson, 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), (Feld, 2001). 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, Bruce.R; Weil.M, 2009), (Syahmaidi.E et al., 2019). The lean-based learning model provides a solution to realize work skills development among vocational high school students. 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, (Rukun, 2015), (Sousa, 2001). The effectiveness of vocational education will be achieved if the learning is done with similar condition as the actual work setting, (Hartanto et al., 2019), (Lubis, 2010), (Estriyanto, 2017).

The lean manufacturing-based learning model is a system used in industry or production processes to achieve maximum benefits through effective and productive working performance with sustainable improvement, (Fagerlind .S et al., 2015)[9], (Sundar et al., 2014) [28]. Lean is a continuous effort to eliminate waste and increase the added value of a certain product to customers, (Bill Carreira, 2005) [1], (Wilson, 2010). It is called Lean because, the process can be run using less material, small investment, very minimal inventory, uses minimal space and, does not require a lot of labor (Wilson, 2010)30]. Implementation of lean manufacturing is outlined in five steps that thoroughly analyze an entire process, i.e. identify value, identify value streams, make the value stream flow, establish pull, and achieve perfection, (Sundar et al., 2014)[28]. The learning model is a structured guide used in the learning process to achieve effective, practical, and efficient learning objectives that bridge students in the active and interactive learning process to achieve optimal abilities based on their competencies. It is important to pay close attention to the dynamic changes in the industrial world so that a learning process can accommodate industrial standards Hartanto et al.[16]. Vocational education in producing a competent workforce must meet these standards. The most appropriate learning is the integration with the industrial world. The main principle implemented in the industry is to achieve high efficiency and productivity by applying Lean. Lean Manufacturing as a reliable method in the production process to achieve effectiveness and efficiency has been adopted in vocational learning. The concept of lean manufacturing learning model is created to meet the achievements of vocational work skills. This learning model has been measured to achieve the learning objectives of vocational education. Lean manufacturing learning model has been declared valid to improve vocational students' work skills that are supported by the syntax of (1) stimulus, (2) identification, (3) reflective observation, (4) monitoring, (5) proof, (6) assessment and (7) reflection, Hartanto et al.[16].

3 Methodology/Materials

This research is a research development (R & D) using the modified design of Borg and Gall. It included four steps, i.e. 1) analyzing the product to be developed, 2) developing the initial product, 3) expert validation and revision, 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 tested 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 conducted 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. Indonesia. The sample was selected through the random cluster sampling technique, i.e. 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.

4 Results And Findings

Based on the initial development research methodology, a product analysis is carried out which will be developed by conducting a need analysis of work skills for vocational students who are needed in the world of work. This analysis was performed using the Dacum method. Based on the results of the needs analysis, work skills are divided into two parts, namely soft skills and hard skills Hartanto[16], which are written in the following table**:**

Soft Skills recommended

Table 1. General soft skills category.

No	General soft skills category of machining jobs
1	Demonstrating a willingness to develop a career
2	Showing ethics of communication
3	Showing the relationship among individuals
4	Showing good cooperation
5	Showing a high work ethic
6	Showing the action to solve the problem
7	Maintaining a presence on time
8	Indicating high initiative
9	Demonstrating honesty
10	Obeying all the rules work
11	Showing a responsible attitude
12	Showing a good adaptation in working

Table 2. Special soft skills.

No	Special soft skills in machining jobs
1	Complying with the work process in accordance with the plans and design drawings
2	Adhering to the quotas for production
3	Showing the attitude of loyalty to the company
4	Motivated for training and teaching work processes
5	Showing the planning and operations according to the specifications of products
6	Demonstrating warming up the engine
7	Showing the readiness of operational equipment
8	Showing the check engine units
9	Setting the machine according to product specifications
10	Demonstrating material handling right
11	Demonstrating health and safety at work
12	Suggesting caution in operating the machinery
13	Indicating maintenance and engine maintenance
14	Demonstrating checking the work according to standards of quality
15	Demonstrating off the machine according to the procedure

Hard Skills recommended

Table 3. Hard skills – manufacture drawing.

No	Hard skills in machining jobs – manufacture drawing
1	Understanding and applying the rules engine drawing techniques and workmanship mark
2	Understanding and demonstrating basic concepts and the command functions of Computer Aided Design (CAD)
3	Understanding and presenting detailed picture making, with etiquette of machine components with CAD drawings in accordance with International Standards Organization (ISO)

4	Analyzing and demonstrating the manufacture of engine components detailed images (projected images, image pieces and giving the size, tolerance, adjusting, a sign of craftsmanship and surface roughness value) with 2D/3D CAD

Table 4. Hard skills – lathe machining.

No	Hard skills in machining jobs – lathe machining
1	Understanding and identifying the parts of a lathe by their type and function
2	Understanding, analyzing and identifying the suitability of the cutting tool lathe machines
3	Implementing and presenting procedures of eccentric turning technique
4	Evaluating and determining the procedure for turning technique eccentric
5	Analyzing and determining the making workpiece by using a faceplate
6	Implementing and making the technical procedure of making the workpiece assemblies, using various ways

Table 5. Hard skills – milling machine.

No	Hard skills in machining jobs – milling machine
1	Understanding and identifying the parts of the milling machine based on their type and function
2	Analyzing and identifying the use of cutting tools on milling machines
3	Evaluating and using a milling machine cutting parameters for different types of work
4	Implementing and using the standard operating procedure of fraising technique in all forms of the workpiece

Table 6 .Hard skills machining – grinding machine.

No	Hard skills in machining jobs – grinding machine
1	Understanding and identifying the grinding machines for various kinds of work
2	Implementing and operating engineering machining surface grinders for various types of work
3	Choose and use cutting parameters of grinding machines for various kinds of work
4	Evaluating and using grinding machining techniques on various types of work

Table 7. Hard skills machining – NC/CNC and CAM machining.

No	Hard skills in machining jobs – NC/CNC and Computer Aided Manufacturing (CAM) machining
1	Understand and identify the parameters and parts on a lathe and CNC milling
2	Implementing and operating all the procedures at each work machining lathe and milling CNC
3	Evaluating and repairing the failure of the work of a lathe and milling CNC
4	Analyzing and demonstrating CAM 2D and 3D for the process milling, lathe facing and drilling
5	Evaluating the use of CAM program through the simulation process on all machining jobs

NC/CNC: Numerical Control/ Computer Numerical Control
CAM : Computer Aided Manufacturing

Table 8.Hard skills machining – industrial mechanical engineering.

No	Hard skills in machining jobs – industrial mechanical engineering
1	Understanding the concept and adhere to the appropriate maintenance manual/surgery
2	Understanding the types, functions and demonstrating major maintenance tools, mechanical and electrical
3	Understanding and classifying the types of disorders of the mechanical components of industrial machinery
4	Analyzing the damage and performing minor repairs of industrial machinery mechanical components

5	Implementing and performing maintenance procedures / mechanical repair industry engine (compressor, pump, and motor gasoline)
6	Analyzing and demonstrating preventive maintenance in the mechanical industry
7	Analyzing and showing the reactive maintenance (reactive maintenance) in industrial machinery
8	Implementing and demonstrating a final check of mechanical and electrical components in industrial machinery
9	Implementing and demonstrating management workshop manufacturing jobs

Table 9.Hard skills machining – pneumatic and hydraulic systems.

No	Hard skills in machining jobs – pneumatic and hydraulic systems
1	Analyzing disruption, damage and demonstrated improvements to components of pneumatic / hydraulic machinery industry
2	Understanding and demonstrating various types and concepts of fluid in the system of pneumatic / hydraulic to mechanical industry

Table 10. Hard skills machining – industrial machinery electrical system.

No	Hard skills in machining jobs – industrial machinery electrical system
1	Understanding the concept and demonstrating the working principles of electrical symbols and diagrams on a production machine
2	Analyzing and demonstrating the maintenance work/disruption in the electrical circuit system of machine tools/production
3	Implementing and practicing the principles of electro-pneumatic circuit maintenance and electro-hydraulic

Table 11.Hard skills machining – design and drawing machine.

No	Hard skills in machining jobs – design and drawing machine
1	Implementing and demonstrating the rules of drawing on machine construction drawing work
2	Analyzing and showing the results of analysis on engineering construction drawing machines
3	Evaluating and designing construction drawing machines with various types of connections
4	Analyzing and demonstrating the rules sign workmanship and price roughness on the picture detail of engine components
5	Applying and implementing rules engine component tolerances in the figure
6	Evaluating the changes and modify the image of engine components and product assemblies

Table 12. Hard skills machining – production control.

No	Hard skills in machining jobs – production control
1	Understanding the types of types of production and implementing procedures in the process flow of the manufacturing industry
2	Implementing and measuring the performance of a production system in the manufacturing industry
3	Analyzing and planning the location and the standard of production in the manufacturing industry
4	Analyzing and improve production results which were not effective and efficient (waste)
5	Implementing and continuing improvement (continuous improvement) in the management of production
6	Understanding and applying in time production system in the manufacturing industry
7	Presenting and analyzing the design of an optimal control of production costs
8	Analyzing and managing the work environment according to the concept of production planning

9	Analyzing and processing data production forecasting total demand
10	Implementing and demonstrating the operation process map for manufacturing production
11	Applying and implementing procedures production process from beginning to end of production (materials, time, capacity)

Table 13.Hard skills machining logistics management.

No	Hard skills in machining jobs – logistics management
1	Implementing and understanding the concept, the basic procedure for warehouse control (in, out, quality)
2	Processing and analyzing inventory balance
3	Implementing and analyzing the dismantling, removal and structuring effective and efficient goods

Table 14.Hard skills machining – warehouse governance.

No	Hard skills in machining jobs – warehouse governance
1	Understanding the classification and demonstrating the use of the equipment used in the warehouse (the main equipment, support)
2	Implementing and carrying out the process of care and maintenance equipment and supplies warehouse
3	Understanding and implementing procedures for distributing and structuring the concept of shortening the distance/channel of distribution of goods from producers to consumers
4	Understanding and carrying out the principle of distribution of goods based on the accuracy of the type and specifications of the products, the accuracy of the value of the product, the accuracy of the number of products, on time and delivery place
5	Applying the data recording of goods in warehouse equipment used along with the use of the information system of warehousing
6	Implementing and demonstrating the process of using the material handling warehousing information systems

Table 15.Hard skills machining – safety at work.

No	Hard skills in machining jobs – safety at work
1	Understanding and applying the basics and work safety system
2	Understanding and implementing safety procedures in all processes of machining work and industrial work processes
3	Analyzing and managing resources hazards and potential hazards posed to the manufacturing of machining jobs
4	Applying and demonstrating tools safety standards according to the procedure in the manufacturing of machining jobs

Based on the findings in the needs analysis of work skills, it is then compiled into an integrated learning design between vocational schools and the world of work. This integrated learning combines the lean manufacturing system stages in vocational school learning. The stages of learning that are arranged are then called the lean manufacturing-based learning model. this section is included in the phase of developing the initial product. The next phase is to carry out product validation tests, field tests and product finalization. This stage is carried out by product validation testing, product effectiveness testing and product practicality testing.

The Validity Test Model. Based on the results of the study, the Lean-based learning model has been tested through content validity by 5 experts assessment. The content 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: a) the adequacy and accuracy of the theories to arrange the learning needs and the learning model development, b) the concepts and teaching processes with the relevant learning strategies and techniques as the foundation of the learning models, c) the adequacy and accuracy of the relevant theories related to learning strategies to support the learning model, d) the background of the model development, e) the objectives of the model development, f) the model description, g) the reaction principles of

the learning, h) the media system in learning, i). the supporting systems in learning, j) The use of learning approach, k) The learning steps, l). The assessment technique, m). the evaluation of assessment results, n) the proposed competency, o). 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».

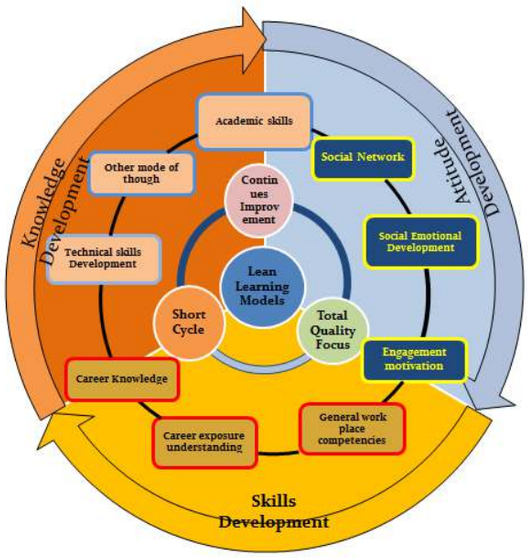

Figure 1.Lean based-learning model design (Hartanto et al., 2020)

The appropriate learning models will greatly influence the success of the teaching process. It includes the series of steps or often called "phases" to help the students to achieve the specific learning goals, Eggen.P;D.Kauchak [7],Hartanto [13]. The Lean-based learning model provides real experience by directly connecting the learning process with the experts of the working field in the Mechanical Engineering Department or called the integrated learning with the world of work.

Learning should be integrated with the workforce that directly the professional world of work to provide meaningful experiences for students. This learning model provides an opportunity to combine theoretical knowledge from classroom learning with direct application in the world of work, Melo [21]. This model can be called Work Integrated Learning (WIL), i.e. the educational activities that integrate academic learning of a discipline with its practical application in the workplace. This model is able to provide students with real work experience and present a bridge connecting the students' academic and the professional world of work. The lean-based learning model provides the opportunity to combine skills and theory of learning in school with direct application in the world of work, Estriyanto [8], Robinson [24]. The good learning experience will support students' competency and this is in line with the basic concept of vocational education. Moreover, this learning model becomes an effort to prepare and enhance students' ability to have work skills as vocational learning is a type of education to prepare students to work. Students must learn knowledge, skills, attitudes and

do work in accordance with the rules and the real conditions of the world of work, afterwards the learning strategy must be directed according to the needs of the world of work, Melo [21], Hartanto et al.,[15].

Beneficial learning experiences will support students' competency that supports the basic concept of vocational learning. Vocational education emphasizes the learning process to prepare people to work. To realize this objective, the instructional strategies should be directed to all procedures and actions required in the world of work. The students should learn the knowledge, skills, attitudes, and values that are essential for doing certain jobs as applications in real work settings. Lubis, [18], Suryo. Hartanto et al.,[16].

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. 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,(Furham, 2005).

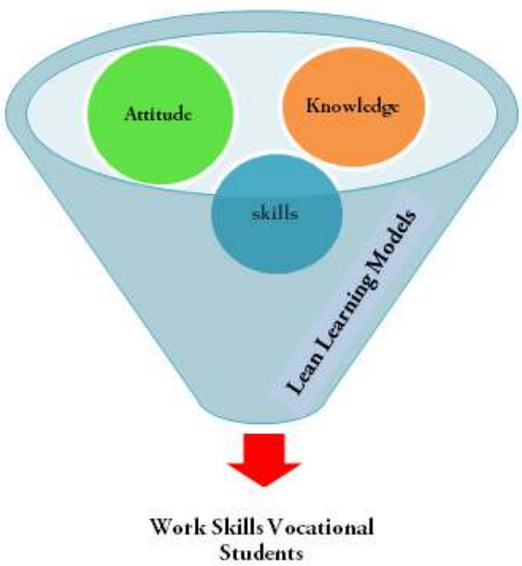

Figure 2. Rational of work skills achievment

5 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, as a result of research this learning model is feasible to be implemented in vocational schools. Applying this model is very important because it is a way to integrate school learning with the world of professional work. This learning model makes vocational students will get real work experience. Learning systems that integrate the world of work provide exceptional benefits in the development of vocational student work skills competencies.

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WORK SKILLS IMPROVEMENT OF VOCATIONAL STUDENTS THROUGH THE LEAN-BASED LEARNING MODEL DEVELOPMENT

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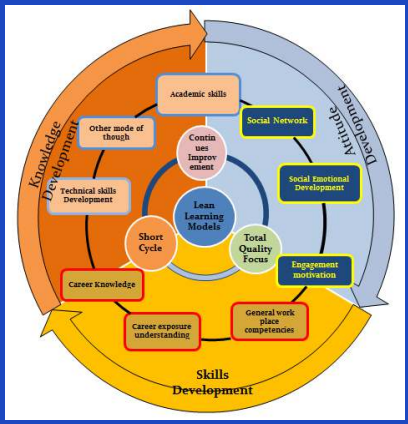
Introduction

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.

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, based on Indonesian Statistical Database, BPS. 2017. This gap must be solved immediately by enhancing the competency among vocational students in order to meet the industrial standard. 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

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.

Literature Review



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 manufacturing. 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.

The lean-based learning model provides a solution to realize work skills development among vocational high school students. 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.

The concept of lean-based learning model is created to meet the achievements of vocational work skills.

lean-based learning model has been declared valid to improve vocational students' work skills that are supported by the syntax of (1) stimulus, (2) identification, (3) reflective observation, (4) monitoring, (5) proof, (6) assessment and (7) reflection

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Methodology/Materials

This research is a research development (R & D) using the modified design of Borg and Gall. It included four steps, i.e. 1) analyzing the product to be developed, 2) developing the initial product, 3) expert validation and revision, 4) field trials and products finalization

The research product has been tested 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 conducted 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. Indonesia.

The sample was selected through the random cluster sampling technique, i.e. 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.

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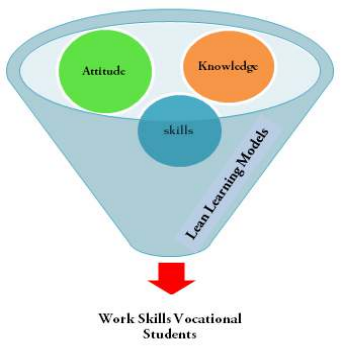
Results and Findings

- Based on the results of the study, the Lean-based learning model has been tested through content validity based on 5 experts assessment. The content validity test referred to 3 assessment aspects, namely: 1) the supporting theory, 2) the structure of the learning model and 3) the learning outcomes. the analysis results, the Lean-based learning models can be included in the «valid» category.
- 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».

Results and Findings



- The Lean-based learning model provides real experience by directly connecting the learning process with the experts of the working field in the Mechanical Engineering Department or called the integrated learning with the world of work.
- This learning model provides an opportunity to combine theoretical knowledge from classroom learning with direct application in the world of work.
- This model is able to provide students with real work experience and present a bridge connecting the students' academic and the professional world of work. The lean-based learning model provides the opportunity to combine skills and theory of learning in school with direct application in the world of work,
- The good learning experience will support students' competency and this is in line with the basic concept of vocational education

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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, as a result of research this learning model is feasible to be implemented in vocational schools. Applying this model is very important because it is a way to integrate school learning with the world of professional work. This learning model makes vocational students will get real work experience. Learning systems that integrate the world of work provide exceptional benefits in the development of vocational student work skills competencies

THANK YOU

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