

# Milling Machine Technique Module with Project Based Learning to Improve Vocational High School Students Competency

Tomy Ardiyono<sup>1</sup>, Muhammad Akhyar<sup>2</sup> and Agus Efendi<sup>3</sup>

{tomyardiyono@student.uns.co.id<sup>1</sup>, makhaliya@yahoo.com<sup>2</sup>, & agusuns@yahoo.com<sup>3</sup>}

<sup>1,2,3</sup>Education Technology, Post Graduate Programme,  
Teacher Training and Education Faculty, Sebelas Maret University, Indonesia

**Abstract.** Vocational High School is a part of high vocational education aimed to prepare the graduates to get into the world of work. The learning process in Vocational High School is designed in order that their graduates have attitude, knowledge, and skill for certain kind of job. One of the competencies that have to be learned and mastered by them is milling machine technique. The objective of the research is to find out whether or not by using module material with Project Based Learning can improve Vocational High School students competency. The method of writing this article is by using relevant literature research journal and books review. The main problem of the research is the learning process happened in the classroom is still in conventional way and it has not used various learning media yet, so that the students do not understand the learning material and it affects to their low vocational competency. Through module with Project Based Learning media, it will be easier for students in understanding the concept deeply, improving their critical thinking skill and problem solving skill so that it can improve the Vocational High School students competency.

**Keywords:** module, milling machine technique, project based learning, vocational high school

## 1. INTRODUCTION

Occupational education is an education aimed to prepare students to be ready in facing the world of work. Based on [1] National Education System verse 15 stated that vocational education is a high education to prepare students especially to work in certain field. It is simply defined by [2] that vocational education as a part of individual total experience where he/she studies to make themselves to be successful in a certain work field. Meanwhile, according to [3] vocational education is a part of education system that prepare someone in order to be able to work in a group of work or a certain work field rather than the other work fields.

The learning process in the latest curriculum is no longer use teacher-centered approach (teacher center), but it uses student-centered approach (student center). Thus, the students are insisted to be active and creative improve their competency, in this learning process teachers role is only as a facilitator. A teacher does not become a knowledge resource for students anymore, but he/she will be the learning guide for the students in the learning process. In this kind of learning process is usually called active learning, where the students are active to improve their competency.

One of the learning method that force students ability to improve their competency in knowledge, skill, and attitude is by using project based learning approach, an approach that can create a work based on project. Project Based Learning is not a new thing, it had been popular in 20th century (especially is struggled by John Dewey) and started to be popular in 1970ies [4]. Project Based Learning will force students to be active in learning, the students will take part, ask questions, make a decision, analysis, think critically, construct and present their learning result as an independent thinking individual [5].

By using Project Based Learning method in learning process, it can improve students learning achievement in which it is called as a competency for occupational high school students. Based on [6], [7] and [8], there are an effect that the students or first year science undergraduates who are being taught by using Project Based learning are more successful, more improve and have higher behavior achievement than those who without used Project Based Learning method.

## **2. METHOD**

The method being used in milling machine technique module for enhancing occupational high school students competency is called as Project Based Learning. Project Based Learning (PjBL) is a learning model involving students participation in a project activity that creates a product. Student participation in this activity is started from planning, making a product design, doing an action/ project, and reporting the result of activity in the form of their product and activity report. PjBL emphasizes on the long-term learning process, where students are directly involved with various issues and daily life problems, learning how to understand and solve the real problem, having inter discipline behavior, and involving students as an actor started from planning, executing, and reporting the result of their activity (student centered).

## **3. RESULT AND DISCUSSION**

### **3.1. Module**

Module is one of learning media (instructional media). Learning media is all materials and tools that can cause stimulus and they are needed to support a learning process for students and given learning assignment [9]. [10] defined module as one of learning material which is as an independent instruction designed to be used by single learner or a small group of students without teacher's presence. [11] stated that module is a package contained of one unit concept from learning material.

A certain training field consists of some training units including some learning modules. Learning module can be developed by combining some learning activities. Learning activity is the smallest unit from learning process [12].

Therefore, based on some definitions above, it can be concluded that learning module is a learning material designed for experience training or a practice which is arranged specifically for some learning activities aimed to be used by an individual or group completed by manual guidance by some teachers.

### **3.2. Milling Machine Technique**

Milling machine is included in conventional tool machine category. The operational of milling machine to make a high-quality product must be conducted by operators who have skill in operating milling machine and have knowledge about milling machinery. An operator of milling machine has to be skilled in maintaining the machine by controlling the handle for work piece movement and applying milling machinery parameter well.

Just like another machinery process in general, milling machinery is also completed by basic element machinery process. Basic element machinery process should be mastered by each operator in order to produce good product. The significant part of basic element machinery process, such as; (1) cutting speed, (2) feed, (3) depth of cut, and (4) cutting time.

### **3.3. Project Based Learning (PjBL)**

According to [13] Project Based Learning (PjBL) have to be seen as a teaching learning philosophy not as an education strategy. PjBL is a frame work about how education will be carried you in the future. Meanwhile, [14] explained that PjBL s greater than Problem Based Learning and consists of some problems that students will solve them. PjBL can give contextualization, authentic experience which is needed by students to learn and build a concept of knowledge frame, technology, technique, and mathematics deeply and supported by language art, social science, and art.

[4] stated that Project Based Learning refers to students activity to design, plan, and do a project that produce an output which can be shown to public such as, product, publication, or presentation. It is related to inquiry based learning and problem based learning. The characteristic of project based learning is the output in the form of product that can be shown to public.

According to [15] Project Based Learning which is supported by contemporary technology is a certain strategy to change the traditional classroom. When the students learn by involving themselves into real projects, every aspect of their experience will be touched. The change can be conducted by the transition of teachers role. Teacher is no longer a content expert that shares information to students. The attitude of students will change too. Instead of following their teachers instruction, the students tend to find the answer of their questions by creating their own interpretation. Furthermore, the borders of the class will also change. the teacher designs a project as a frame for learning and the students can finish their project by using technology to access and analysis the information all over the world. The connection between students and expert will happen in real time.

From the definition above, it can be concluded that Project Based Learning is a learning approach with a philosophy in which students take part in learning knowledge and skill to understand the deeper knowledge through complex inquiry process and do an authentic project or publication that can be shown to public.

### **3.4. Milling Machine Technique Module With Project Based Learning to Improve Vocational High School Students Competency**

To master milling competency, it is necessary to have knowledge ability about machinery and skill in operating milling machine. Knowledge ability machinery covers various things

related to milling process, started from knowledge about machine until milling machinery parameter. Meanwhile, knowledge ability is about ability in operating milling machine to do a certain job.

One of active learning model is Project Based Learning. Project Based Learning model give some advantages that will improve students understanding, such as (1) students have an opportunity to become “expert” by conducting their research, (2) projects can accustom students to conduct a deeper inquiry.

Project Based Learning (PjBL) is observed as a learning philosophy that gives freedom for teachers to apply it. However, some experts give practical steps that can be used as a parameter for those who will apply it. Some of expert’s opinion will be elaborated as follow.

According to [16] there are nine steps in implementing PjBL. In its implementation, teacher is a class manager that can modify the steps based on the kind of task and students characteristic. Those nine steps are as follow: (1) deciding stage with some examples in real life, (2) designing the project, (3) collecting important information, (4) deciding evaluation criteria, (5) collecting materials, (6) arranging the project, (7) preparing for project presentation, (8) presenting the project, and (9) reflecting and evaluating process.

Meanwhile, according to [17], there are five steps of Project Based Learning, they are: (1) getting an idea, (2) designing the project, (3) balancing the project, (4) doing the project, and (5) showing the project result.

Based on the elaboration above, the steps of project based learning consist of six stages. First, deciding basic questions to stimulate students curiosity. Second, arranging plans collaboratively between teachers and students. Third, arranging schedule. Fourth, teachers monitor the learning implementation. Fifth, teachers examine the result. Sixth, evaluating experience by teachers and students.

#### **4. CONCLUSION**

Based on literature study above, it can be concluded that it is necessary to create an innovation in education through development of teaching materials. One of teaching materials that can provide learning activity and involve the students active contribution is namely module teaching materials with Project Based Learning method. Module with Project Based Learning method enables students to learn actively and independently is presented clearly, containing learning process steps which has been designed in meaningful and attractive way, and it also stimulate students in thinking critically. During the learning process using this module, it can create a different learning atmosphere; it is not as usual as learning process that took place at school which is monotonous and boring. A learning atmosphere that uses PjBL method is more interesting, joyous, fun, and useful for the students. Learning by using module with PjBL method can also help students in developing their skills in real life, such as; having well cooperation skill with others, making right decisions and initiatives, and being able to solve complex problems. As the result of learning process, they will feel so excited when they succeed in solving project assignment given by their teacher. In the same time, the students feel proud when they can create something then they perform and present it to the public. It will make them feel worthwhile, skillful, and their confidence is also increased too. Thus, by using teaching materials in the form of module with Project Based Learning, it will be easy to improve the students understanding, material mastery, and competency in the learning process. Therefore, it can also enhance occupational competency in Vocational High School students maximally.

## REFERENCE

- [1] R. Indonesia, *Undang-Undang RI Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional Pasal 1*. 2003.
- [2] C. Prosser, "Vocational Education in A Democracy," *Am. Tech. Soc. Chicago*, p. 2, 1949.
- [3] W. Djojonegoro, *Pengembangan Sumber Daya Manusia Melalui Sekolah Menengah Kejuruan (SMK)*. Jakarta: PT. Jayakarta Agung Offset, 1998.
- [4] A. Patton, "Work That Matters: The Teacher's Guide to Project-Based Learning," *London Paul Hamlyn Found.*, p. 13, 2012.
- [5] J. Klein, "Project-Based Learning: Inspiring Middle School Students to Engage in Deep and Active Learning," *New York NYC Dep. Educ.*, 2009.
- [6] G. Baş, "Investigating The Effects Of Project-Based Learning On Students ' Academic Achievement And Attitudes Towards English Lesson: Educational Sciences / Curriculum and Instruction Department," vol. 1, no. 4, pp. 1–15, 2011.
- [7] S. A. Yalçın, Ü. Turgut, and E. Büyükkasap, "The effect of project based learning on science undergraduates' learning of electricity, attitude towards physics and scientific process skills," *Int. Online J. Educ. Sci.*, vol. 1, no. 1, pp. 81–105, 2009.
- [8] Dilek Zeren Özer and Muhlis Özkan, "The Effect of the Project Based Learning on the Science Process Skills of the Prospective Teachers of Science," *J. Turkish Sci. Educ.*, vol. 9, no. 3, pp. 131–136, 2012.
- [9] R. Charles M., "Instructional-design Theories and Models: An Overview of their Current Status," *New Jersey Lawrence Erlbaum Assoc. Publ.*, p. 99, 1983.
- [10] S. Smaldino, J. Russell, R. Heinich, and M. Molenda, *Instructional Technology and Media for Learning (8th edition)*, 8th ed. New York: NYC Department of Education, 2005.
- [11] J. D. Russell and B. Lube, "Modular Instruction: A Guide to Design, Selection, Utilization and evaluation of Modular Materials," *Minnesota Burgess Publ. Comp.*, p. 3, 1973.
- [12] G. Mc Ardle, *Instructional Design for Action Learning*, 1st ed. Amacom, 2010.
- [13] T. Markham, "Project Based Learning: Design and Coaching Guide," *Calif. Hear. Press*, vol. ix, 2012.
- [14] R. M. Capraro, M. M. Capraro, and J. . Morgan, "STEM Project-Based Learning An Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach," *Rotterdam Sense Publ.*, p. 2, 2013.
- [15] S. Boss and J. Krauss, "Reinventing Project-Based Learning: Your Field Guide to Real World Projects in The Digital Age.," *Washingt. Int. Soc. Technol. Educ.*, p. 11, 2007.
- [16] A. Stix, *Teachers as Classroom Coaches: How to Motivate Students Across the Content Areas*. Alexandria: Association for Supervision and Curriculum Development, 2006.
- [17] A. Patton, "Work That Matters: The Teacher's Guide to Project-Based Learning," *London Paul Hamlyn Found.*, pp. 34–67, 2012.