The Implementation of Project-Based Learning Mastercam Module Development of Vocational High School 1 in Padang City

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Abstract: This study aims to examine the practicality of Project-Based Learning Mastercam Module developed so that it can be used in basic CNC Mastercam learning processes. This type of research is development research using a 4-D development model (defining, designing, developing, and disseminating).This study looks at the practicality of theProject-Based Learning Mastercam Module developed then a trial is carried out to users, namely teachers and students. Data analysis techniques used descriptive analysis techniques to describe the practicality of Project-Based Learning Mastercam Module. The results obtained from this development research are Project-Based Learning mastercam module that is very practical based on teacher responses and student responses of 88.82%. Based on the findings of this study, it can be concluded that Project-Based Learning mastercam module is declared practical to be used as a learning resource in basic CNC mastercam subjects and can be developed and used in other vocational high school.

Keywords: practicality, mastercam learning module, project-based learning.

1. Introduction

Vocational High Schools have an important role in preparing a reliable workforce by following the evolving market needs. Vocational education is an education that prepares students to be skilled in the field of expertise they choose according to the needs of the workforce [1,2,3,]. To prepare skilled students, so in the latest curriculum, namely the 2013 curriculum applied a comparison ratio between practical learning and theoretical learning at 70:30. With such a ratio, it can be interpreted that students will carry out many practical activities, both practices carried out in workshops or practices in the field such as industrial work practices (apprenticeship) rather than theory learning.

Based on the structure of the vocational high school curriculum in the field of Mechanical Engineering, there are NC / CNC and CAM subjects as C3 Expertise Programs for Class XI and XII. This mastercam module discusses the study of class XI material in semester 2, There are six basic competencies students must study in the second semester. The seven competencies must be well understood by students. In order for these competencies to be achieved, learning components are

needed that can support the learning process, but during the learning process there are still obstacles in terms of using the learning module. In NC / CNC and CAM learning, when learning mastercam, the teacher does not use the module as a learning medium, which is used by the teacher in delivering learning material in the form of blackboards, markers, and object worksheets. The absence of the mastercam learning module causes the level of understanding and student learning outcomes below the KKM value. There are students who are passive and active when listening to the teacher's explanation directly, active students will ask again if they encounter material that is poorly understood, and students who are passive make it a problem, embarrassed or lazy to ask the teacher or colleagues, so that it causes achievement student competence is not optimal [4].

The use of modules is very important influence in learning. In general, the position of modules in the learning system is as an intermediary for teachers in delivering information more thoroughly, clearly and interestingly to students to increase knowledge [5,6]. One of the media that can help, in mastercam learning that can facilitate and expedite the process of delivering messages or material from the teacher to students is the mastercam module based on project based learning. Through the learning program contained in the mastercam module package with the project based learning method, it can enrich conventional learning plus a module accompanied by learning video links that can be used as other reference sources for learning and skill development [7,8]. Based on the description of the benefits of the module, in the discussion of this study, the authors will focus on discussing the practicality of using the learning module based on project based learning in vocational schools. Practicality is an aspect that must be met from the development of a quality learning module so that products can be used by teachers and students [9].

2. Methodology

The type of this research is development research. This can be seen based on the formulation of the problem previously revealed. Research and development method is research that intentionally, systematically, aims to find findings, formulate, improve, develop, produce, test the effectiveness of products, models, methods / strategies/ways, services, certain procedures that are superior, new, effective, efficient, productive and meaningful [10]. The development model used in this study is a modification of the 4-D model learning development model (Four D-Model) which consists of 4 main stages, namely, Define, Design, Develop and Disseminate [11]. While the data analysis technique used in this study is descriptive data analysis techniques namely by describing practicality after using mastercam module based on project based learning.

3. Result of the study

This research was conducted for one month namely from january21 to february22 2019 in class XI expertise mechanical engineering at SMK 1 Padang by using the mastercam learning module which is combined with the implementation of project based learning. Before the mastercam learning module is tested into the learning process, first steps are developed according to the 4D development procedure. Mastercam learning module are developed from the problems seen when doing direct observation in the learning process, then the problems are analyzed according to learning needs starting from the curriculum, student characteristics, material analysis and assignments and formulation of learning objectives to be achieved, this stage is called the defining stage.

After the defining process is complete, then the data from the existing information will be designed to suit the user's needs, then selecting the format and design of the module, then do the initial design, the module is designed after that validation is done to experts, from the data experts obtained, the module was revised so that the practical testing process could be carried out, this practical process was revealed in this study, whether the modules designed to solve problems that occur in basic programming subjects could solve existing problems by obtaining practical values in terms of users, namely teachers and students.

After the defining process is complete, then carried out media design from existing data information which is according to user needs, then do the media selection, format then do the initial design, the planned media was then validated to experts, from expert data obtained, the media was revised so that the practical testing process could be carried out, this practical process would be revealed in this study. Whether the media designed to solve problems that occur in basic programming subjects can solve existing problems by obtaining practical values in terms of users, namely teachers and students.

After implementation of the mastercam module with the method of learning based on project based learning in class XI mechanical engineering expertise program, teachers and students fill the practical questionnaire. The results of the questionnaire filled in by the teacher and students are described by the formula:

$$NA = \frac{S}{M} \times 100\%$$

Information:
NA = final score
S = a score obtained
M = maximum score

With the category of achievement values respondents used classification according to [12].

No	Achievement Level (%)	Category
1	81-100	Very practical
2	61-80	Practical
3	41-60	Pretty practical
4	21-40	Less practical
5	0-20	Not practical

The following are practical data obtained from questionnaires filled by NC/CNC and CAM teachers, this practical questionnaire is analyzed based on every aspect that exists, so that conclusions are obtained as follows:

Table 1.1 Teacher Questionnaire Response Results.

Aspek Validasi	(%)	Category
Ease of Use of Media	93,33	Very practical
Time effectiveness	95,00	Very practical
Benefits of media	95,00	Very practical
Average	94,44	Very practical

Refer to the practicality questionnaire obtained from table 1.1, it can be understood that The results of the average analysis of the results of practicality testing on Mastercam learning module according to the teacher amounting to 94.44 with a very practical interpretation. The practicality of Mastercam learning module is also seen from student responses. This data is obtained after going through the practical questionnaire given to students. Based on the results of practical values obtained, it is grouped according to the level of practicality as in Table 1.2 below:

Table 1.2. Students Questionnaire Response Results.

Aspek Validasi	(%)	Category
Ease of Use of Modul	86,15	Very practical
Time effectiveness	84,23	Very practical
Benefits of Modul	85,23	Very practical
Average	85,21	Very practical

Based on table 1.2. obtained the acquisition of practicality data from students of 85.21% so it can be concluded that Mastercam learning module is included in the category of "very practical".
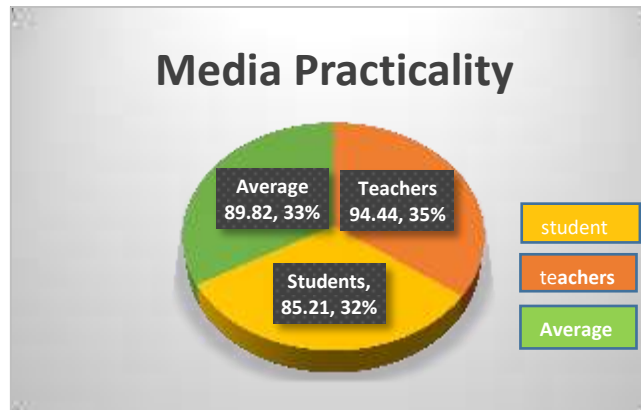

Figure 1.1: average practicality for Mastercam learning module

Referring to the results of the analysis of teacher responses and student responses based on Tables 1.1 and 1.2 above, the average practical values for Mastercam learning module are obtained as shown in figure 1.1. Mastercam learning module is categorized as very practical, making it easier for students to understand NC/CNC and CAM learning, in accordance with the opinion [13] that learning media must have the value of practicality and equality so that it can be used easily.

With the practical talks obtained from teachers and students, the mastercam learning module can be done for the last in the 4D development method, namely the deployment stage. The module deployment stage can be carried out with the target starting with a small class, then after the results reach the target, it can dissemination to other schools that carried out the NC / CNC and CAM learning process, or in other words the mastercam learning module can be implemented by other processes.

4.   Discussion

Mastercam is a learning tool that is very popular in use today. mastercam itself can be interpreted as a tool or media simulation of workpieces that have been made on CNC and CAM subjects [14]. The benefits of learning with mastercam can be seen from the point of view of facilities and infrastructure as well as student learning outcomes [15]. Learning by mastercam with the method of project based learning is a learning activity that uses modules as a reference and media to help deliver material to students with the implementation of projects and internet links sourced from learning videos that can be used as other references in learning, will require students to complete tasks or problems faced.

Based on the data obtained from the results of this study it can be concluded that the mastercam project-based learning module can be used into the learning process because it has gained practical value from users, namely teachers and students. Practicality is the level of use of the mastercam learning module in learning activities, namely carrying out teaching experiments using revised modules based on user ratings. The mastercam learning module has high practicality if it is practical and easy to apply. According to the purpose of the module, which that is easy to use, it can streamline the use of learning time and can help increase mastery of subject matter to support practical learning. [16].

But at this time learning using the mastercam learning module has not been fully maximized by vocational secondary schools to become a source and learning tool for students. Such a thing is very unfortunate, because the increasing technological knowledge must be followed by adequate facilities

and knowledge, namely for the selection of optimal compatibility between skills, learning requirements, training and available facilities that can support learning [17]. In order to realize the mastercam learning module, it can be implemented maximally. It requires support from the infrastructure and facilities contained in the school, without adequate facilities and infrastructure, it is impossible to implement learning using this mastercam learning module. Teachers as educators must also be provided with initial knowledge and skills regarding mastercam and NC / CNC material so that in the implementation the teacher can play a role and manage the learning process well.

The author greatly appreciates the SMK 1 Padang, because it has a high awareness to receive input from researchers about the used of the mastercam learning module in the learning process. If learning with a project-based mastercam module can be applied well in the future it is hoped that it will produce students who are competent in the field of CNC machining and CAM design, one day it will become its own excellence for schools in advancing vocational education.

5. Conclusion

The conclusion of this study is that this development research produces a product that is a master learning module based on project learning for NC / CNC and CAM subjects in class XI students of mechanical engineering at SMK Negeri 1 Padang. The results showed that the mastercam learning module developed was practically used as a learning medium. Practicality is assessed by CNC subject teachers and students of class XI mechanical engineering. So that the mastercam learning module meets practical criteria. The implementation of trials both for teachers and students shows a positive attitude starting from the beginning to the end of the implementation of learning using the mastercam learning module. The design of the mastercam module has been practical and can be used in the NC / CNC and CAM learning process in other schools.

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