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Development of Lathe Machine E-Learning Module for Vocational High School Students

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Abstract. This study aims to develop the form and determine the feasibility level of a lathe machining e-learning module according to the curriculum for online learning at Vocational High School 3 Yogyakarta. The research approach used was Research and Development (R&D). The instruments used were questionnaire assessment of media expert, material expert, teacher, and students which then analyzed using a descriptive statistic method. The study obtained the following results: has been produced a product in the form of a Lathe Machining E-Learning Module for Grade 11 vocational high school students in two forms, namely .exe and .html with the materials adjusted to the syllabus which consecutively discusses the concept and parts of a lathe, equipment and types of turning work, parameters of turning process, and cutting tools for turning process; the feasibility test based on a media expert, a material expert, teachers, and students obtain an average score of 4.25 (very good), 4.32 (very good), 4 (good) and 3.65 (good), respectively. In conclusion, the product has an overall average score of 4.06 which is categorized as good.

INTRODUCTION

The development of science and technology in the era of globalization is increasingly forcing the formation of an educated and skilled workforce in the world of work. In an effort to produce a quality workforce, Vocational High School which are a form of secondary level education that organize and implement vocational education are required to be able to plan an appropriate design or learning pattern in order to increase the effectiveness of the learning process, prepare and develop human resources.

Vocational High School students are equipped with not only theoretical knowledge but also practical skills that are expected to be better prepared and faster to be absorbed by the job market after graduation or as capital to continue to a higher level. Learning with modules is one of the choices of media that can be used in the implementation of learning. A module is an independent unit that stands alone from a series of planned learning activities and is designed to assist students in achieving certain well-defined goals [1]. A module needs to have several characteristics in order to be said to be a proper and good module to be used as a learning resource. With the presence of the learning module, it is trusted that the learning system will be more dynamic and open learning is not just instructor focused yet in addition understudy focused and the accessibility of good writing sources could uphold understudies to expand their viewpoints with the goal that the aftereffects of the nature of learning could be improved [9].

The development of the module should pay attention to several characteristics, namely self-instructional, self-contained, stand-alone, adaptive, and user friendly [2]. Learning with modules encourages students to be more active and able to learn independently. Meanwhile, the teacher plays a role in assisting and assisting students in achieving learning objectives. The application of the engineering materials learning module to students in the Department of Mechanical Engineering Education Engineering Faculty UNY affects learning achievement where the group of students who are given the module has better achievement than the group of students who are not given the module [3]. The other examination directed showed that learning module applications that utilization android-based smart phones as understudy learning colleagues assist with working with understudies in learning and increment understudy learning inspiration [8].

According to research conducted by the other author [4] regarding the development of a manufacturing engineering module at Vocational High School 1 Purworejo also shows that the developed module is able to influence learning achievement where results are obtained for assessing the quality of material aspects and media aspects by experts. materials, media experts, teachers, and students with an overall average percentage of 84% (very feasible) and 86% (very feasible) with an increase in the class average of 60.3% and students who completed learning by 95.5% based on the results of the analysis pre-test and post-test of 22 students.

The implementation of the module can increase the student's activeness and learning achievement, as seen from the practice test results which increased by 52.38%, and the written test results increased by 51.53% with 21 students willing to read the module, 14 students understanding the material quickly, 8 students responding to the material, and 9 students who can give tutorials to their friends [5]. In addition, the high intensity of using gadgets in the online learning process becomes an opportunity and encourages the development of an e-learning-based module which at the same time reflects the flexibility characteristics of a module developed in the form of an electronic module (e-module).

Based on the results of these observations and exposures, as an effort to improve the conditions that occur, the study was carried out using a Research and Development (R&D) approach with the aim of developing an e-learning module assisted by Flip PDF Professional software with a focus on Lathe Machining Engineering material that can be used. offline or accessed via the internet using their own gadgets so that students are more motivated to be more active and able to learn independently so that they can improve and or increase the effectiveness of the online/online learning process in the eleventh grade Lathe Machining Engineering subject at Vocational High School Negeri 3 Yogyakarta.

RESEARCH METHOD

This study uses a research and development approach (Research and Development). Research and development is a method used to create a new product or develop and improve existing and accountable products [6]. The research was carried out at Vocational High School Negeri 3 Yogyakarta. The subjects of this research and development are a media expert and a material expert who is a lecturer at Yogyakarta State University, a teacher who teaches Lathe Machining Engineering subjects, and 30 students in the eleventh class (XI) Vocational High School Negeri 3 Yogyakarta majoring in Machining Engineering.

The procedure in this development research refers to the Borg & Gall development procedure [7]. The data in this study are qualitative and quantitative data. The instrument used was several interview questions and questionnaires based on a Likert scale with 5-scale intervals containing assessment points for each category of media and module material/content. The data collection technique used is non-test using observations and interviews with teachers and students to explore information related to the continuity of the online learning process in the form of qualitative and giving questionnaires to media experts, material experts, teachers, and students to obtain quantitative and qualitative data. Guidelines for determining the Eligibility Criteria assessment based on five value scales are shown in Table 1.

TABLE 1. Guidelines for Determining Eligibility Criteria

Average Score	Value	Category
X > 4,18	5	Very good
3,39 < X ≤ 4,18	4	Good
2,60 < X ≤ 3,39	3	Adequate good
1,81 < X ≤ 2,60	2	Less good
X ≤ 1,81	1	Very poor

RESULT AND DISCUSSION

Research and development are carried out by referring to the modified Borg & Gall development procedure including the subject selection stage, identification stage, design, and development stage, validation stage, user feedback, and final product. Identification is done using observation and interviews with eleventh-grade students majoring in machining engineering and teachers in lathe machining techniques. The purpose of the identification is to find out the problems that occur and analyze the needs of vocational students majoring in mechanical engineering as targets for the use of e-learning modules.

In the early stages of design and development, materials related to lathe machining were collected as literature in drafting the contents of the module containing the concepts and parts of the lathe, equipment and work procedures for the turning process, turning process parameters, and cutting tools for the turning process. Then the development of

the draft module into an e-learning module was carried out with the help of Flip PDF Professional software. The module display can be seen in Fig. 1.

FIGURE 1. Fullscreen On Desktop Computer

The next stage is the validation of the e-learning module by one media expert and one supporting teacher before it is applied to the learning process. Qualitative data is used as a reference in improving the e-learning module and quantitative data is analyzed to determine the feasibility level of the developed e-learning module. The purpose of expert validation is to obtain assessment data that can indicate the shortcomings or weaknesses of the e-learning module that was developed before being applied to students. The assessment data obtained is used as a basic material in improving the e-learning module to make it more perfect.

Products in the form of e-learning modules are developed in the form of .exe and .html as the final form of development. Furthermore, the distribution is carried out by being packaged on a CD for the .exe-shaped module and can be directly run in offline conditions without additional applications on a desktop computer or laptop with Windows OS. In addition, the module is also provided in .html format to be accessed online/connected to the internet on a desktop or laptop computer as well as a tablet or smartphone.

The feasibility test by media experts aims to measure the feasibility level of the e-learning lathe machining module in terms of media based on the aspects of the module design appearance, ease of use, consistency, format, and graphics as presented in Table 2.

TABLE 2. Media feasibility assessment results

Aspect	Average	Category
Module Design View	4	Good
Ease of Use	4.5	Very Good
Consistency	4.33	Very Good
Arrangement	4.5	Very Good
Graphics	4	Good
Average Score	4.25	Very Good

The results of quantitative data on the feasibility of the e-learning module media that have been analysed obtained a score of 85 out of 100 with an overall average value of 4.25 which is included in the very good criteria and is feasible to be applied as a student learning resource. Feasibility testing by material experts aims to measure the feasibility of the material presented in the lathe e-learning module based on the aspects of the feasibility of content, language, presentation, usefulness as presented in Table 3.

TABLE 3. Material feasibility assessment results.

Aspect	Average	Category
Content Eligibility	4,5	Very Good
Language	4,14	Good
Appearance	4,29	Very Good
Expedience	4,33	Very Good
Average Score	4,32	Very Good

The results of the quantitative data on the feasibility of the e-learning module material that has been analyzed obtained a total score of 108 out of 125 with an overall average value of 4.32 which is included in the very good criteria and is feasible to be applied as a source of student learning. The feasibility test by the lathe machining teacher is intended to find out various things that include the feasibility of all aspects in terms of media and material aspects of the e-learning module that will be used by students being taught as presented in Table 4.

TABLE 4. Teacher eligibility assessment results

Aspect	Average	Category
Module Design View	4	Good
Ease of Use	4	Good
Consistency	4	Good
Arrangement	4	Good
Graphics	4	Good
Content Eligibility	4	Good
Language	4	Good
Appearance	4	Good
Expedience	4	Good
Average Score	4	Good

The results of the quantitative data analysis of the feasibility of the e-learning module tutors that have been analyzed obtained a total score of 180 out of 225 with an overall average value of 4 which is included in good criteria and is feasible to be applied as a source of student learning. The user trial phase was applied to the eleventh graders majoring in mechanical engineering, totaling 30 students at Vocational High School Negeri 3 Yogyakarta. The trial aims to determine the student's response to the quality and feasibility of the e-learning module on the lathe that was developed to be applied in learning. Data from user trials are presented in Table 5.

TABLE 5. Student eligibility assessment results

Aspect	Average	Category
Material Presentation	3.70	Good
Language	3.78	Good
Graphics	3.55	Good
Ease of Use	3.59	Good
Average Score	3.65	Good

The results of the analysis of quantitative data on student eligibility in the developed e-learning module obtained a total score of 2516 out of 3450 with an overall average value of 3.65 which is included in good criteria and can be applied as a source of student learning.

Then all the feasibility assessments including media experts, material experts, teachers, and students were analyzed and obtained an overall average score of 4.06 which was included in good criteria so that the overall e-learning module developed was declared feasible to be applied as a learning resource for class XI students majoring in engineering machining.

TABLE 6. Overall assessment results

Evaluation	Average	Category
Media expert	4.25	Very Good
Materials expert	4.32	Very Good
Teacher	4	Good
Student	3.65	Good
Average overall score	4.06	Good

CONCLUSION

Based on the results of the research conducted, it can be concluded that the feasibility of the e-learning module based on the assessment of media experts obtained an average value of 4.25 with very good criteria. The assessment

of material experts obtained an average value of 4.32 with very good criteria. The teacher's assessment obtained an average value of 4 with good criteria. Student assessment obtained an average value of 3.65 with good criteria. The overall assessment obtained an average value of 4.06 with the criteria of "good" and not less than the specified minimum limit so that it can be concluded that the e-learning module developed is feasible to be applied in online learning.

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