

E-Module Development of Problem-Based Learning Electrical Materials Courses

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ABSTRACT

This research is based on the problem of modules used by lecturers in Electrical Materials Science courses who are still not able to encourage students to be able to study independently because the modules used have not directed students to be able to find learning concepts and the material in the module does not fully cover every competency. The syllabus is applied based on the curriculum. The material presented by the lecturer in the regulatory system course at the Faculty of Engineering, Padang State University, has not been fully understood by students. This is because the material is not conceptual, and also less interactive so sometimes students feel bored and do not have the motivation to study independently after or before learning. This has an impact on the one-way learning system, where students only expect explanations from the lecturer. This study aims to produce an E-Module for Electrical Materials Science courses that are valid, practical, and effective. This study used development research methods using a 4D model, namely define, design, development, and dissemination. While the subjects in this study were students of Electrical Engineering, Padang State University. The subjects of the research were students of the Faculty of Engineering, Department of Electrical Engineering. The research instrument is a validity questionnaire, a practicality questionnaire, and a test. The results of the study obtained the validity of the E-Module data from material experts and media experts with valid categories. Practical test with the lecturer and student respondents obtained E-Module learning Electrical Materials Science is included in the very practical category. Test the effectiveness of the E-Module in Electrical Materials Science through the results of the post-test. Students obtained that the E-module is in the effective category.

Keywords: Problem Based, E-Module, Electrical Materials Science, Validity, Practicality, and Effectiveness.

1. INTRODUCTION

Education is a learning process to develop the potential of students to become real human beings, namely human beings who are knowledgeable, creative, and independent as provisions for living life. In addition, education has a big role in improving human resources through graduate competence and graduate competence is a standard in efforts to improve the education system. One of the efforts to increase students' understanding in understanding the basics of electricity is the application of the Problem-based learning model which is a learning model that aims to provide opportunities for students to identify learning materials independently and find problems and carry out solutions to improve students' ability to solve problems.

In addition to problem-based learning, to support the learning process, teaching materials or learning modules are needed, learning modules can be made in electronic or printed form. Currently, many electronic learning modules have been developed. In this module, it is not only in the form of writing and pictures, but there are additional forms of video and audio that make learning more interactive.

Based on interviews during the observation process at Padang State University for the 2021/2022 academic year in the Electrical Materials Science course, it is known that the method that is often used is the lecture method, dominantly using blackboard media and sometimes using ppt but it is still less attractive. Due to the lack of references, students are more focused on what is conveyed by the lecturer and tend to be passive in the learning process. Based on the problem above, it is known the reason for the low understanding of students towards the Electrical Materials Science learning material has an impact on the low level of student competence.

Based on the description above, the solution offered is the development of E-learning modules that can be accessed easily by students anytime and anywhere. One of the efforts is to implement an E-Module based on Problem-Based Learning in the Electrical Materials Science course.

2. EXPERIMENTAL

The research method used is a research and development method with a 4-D model, namely define, design, develop and disseminate. The research subject is a PBL-based E-module. Respondents are lecturers and students of electrical engineering at Padang State University. The research instrument is a validity questionnaire, a practicality questionnaire, and a test. Analysis of validity data using a percentage formula with categories, such as table 1.

Table 1. Validity Category

No	Achievement Rate (%)	Category
1	61 – 100	Valid
2	0-60	Invalid

Practical data analysis using the percentage formula with categories as in table 2.

Table 2. Practicality Category

No	Achievement Level	Category
1	81 – 100	Very Practical
2	61 – 80	Practical
3	41 – 60	Quite Practical
4	21 – 40	Less Practical
5	0 – 20	Not Practical

E-Module effectiveness analysis uses a percentage formula with the E-Module category declared effective if classical completeness is equal to or more than 85%.

3. RESULTS AND DISCUSSION

The research uses the Four-D development model. The Four D model is a research model starting by analyzing the problem in the background of the problem. The activity is in the form of observation/observation and concludes with several events that appear in the formulation of the problem. In this study, different treatments will be given to the experimental class and no treatment to the control class. Data collection was carried out by distributing instruments in the form of questions to electrical engineering students who took the Power Electronics Practicum course to assess their cognitive aspects of these students.

The source of data in this study is primary data obtained from students taken through the effectiveness of the E – K3 module and the developed Labor Law. The subjects of this study were electrical engineering students totaling 25 people. The sampling technique used is purposive sampling, namely sampling according to the needs of the researcher. The data analysis of the effectiveness of the e-learning module was carried out by using the t-test.

The development of the Electrical Materials Science E-module was carried out using a 4D model. In the first stage, the researcher will determine the competency standards and basic competencies. The results of the analysis of electrical engineering students show that many students are not satisfied with the learning provided by the lecturers in the class. So that the problem-solving ability of electrical engineering students decreases.

Table 3. Product Validation Results.

No	Validator Score	Validity Score	Value Validity	Category
1	Validator 1	72	0,80	Valid
2	Validator 2	81	0,90	Valid
3	Validator 3	84	0,93	Valid
Average Validation Results		79	0,88	Valid

The practicality test is conducted to find out the results of student responses with lecturers in Electrical Materials Science courses. The practicality test was carried out by distributing questionnaires to 20 electrical students at Padang State University. The results of the analysis can be seen in table 4

Table 4. Practicality Test Results

No	Respondents	Percentage (%)	Category
1	Lecturer	90	Very Practical
2	Student	92	Very Practical

The effectiveness test was carried out to see the level of effectiveness of using the developed module on the mastery of learning materials by electrical engineering students. Based on testing by doing a pre-test where students get a completeness score of 45% and in the post-test, the student's completeness score is 87%. Based on this, the e-module of electrical materials science is an effective module to be applied in the learning process.

4. CONCLUSION

Based on the data analysis and discussion, it was concluded that the e-learning module developed in the electrical materials science course in the Department of Electrical Engineering, Padang State University, was included in the valid category based on the assessment of three validators. The results of the practicality test from the teacher and student respondents are categorized as very practical. The results of the e-module effectiveness test are declared effective, this can be seen from the completeness of the learning outcomes of electrical engineering students who have met the specified classical mastery level.

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