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

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**ABSTRACT**

This research is based on the problem of the modules used by lecturers in the Regulatory System course who are still not able to encourage their students to be able to study independently. 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. This has an impact on the one-way learning system, where students only expect explanations from the lecturer. This study aims to produce a valid, practical, and effective E-Module Regulatory System. This study uses a 4D model that is defined, designed, developed, and dissemination. While the subjects in this study were students of Electrical Engineering, Padang State University. The research instruments were validity questionnaires, practicality questionnaires, and tests. The results of the study obtained data on the validity of the E-Module from material experts and media experts with valid categories. Based on the practicality test with the lecturer and student respondents, it was found that the E-Module Learning System Management was in the very practical category. Testing the effectiveness of the E-Module Learning Management System through the students' post-test results, it was found that the E-module was categorized as effective.

**Keywords**: Problem Based, E-Module, Regulatory System, Validity, Practicality, and Effectiveness.

## 1. INTRODUCTION

Ki Hajar Dewantara (father of Indonesian education) explained "Education generally means efforts to advance character (character, spiritual strength), mind (intellect) and the body of children in harmony with nature and society". Education is a learning process carried out as an effort to develop the potential of students to become real human beings, become knowledgeable, creative, independent human beings as a provision to live life. In an effort to increase students' understanding in understanding the Regulatory System course, the application of the Problem-based Learning Model is used. This learning model aims to provide opportunities for students to identify learning materials independently and find problems and make solutions in solving problems.

In the application of Problem-based Learning, it must also coexist with good teaching materials or learning modules. Learning modules can be made in electronic or printed form. In the electronic 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 and active.

Based on observations at Padang State University for the 2021 / 2022 academic year in the Regulatory System 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 problems above, it is known the reason for the low understanding of students towards the Regulatory System learning material which has an impact on the low level of student competence. The solution from the researchers 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 Regulatory System 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 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.

| | | |
|---|---|---|
| 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 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 30 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 | 85 | Very Practical |
| 2 | Student | 87 | 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 the tests carried out, namely the pre-test, students got a completeness score of 45%, while in the post-test, students obtained a completeness score of 87%. Based on this, the e-Regulatory System module 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 Regulatory System course in the Electrical Engineering department of the Padang State University was included in the valid category based on the assessment of three validators. The results of the practicality test from lecturers and students 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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