DOI: doi.org/10.21009/03.1102.PF48

DEVELOPMENT OF ELECTRONIC MODULE BASED ON INTERACTIVE LECTURE DEMONSTRATIONS WITH MICROSOFT SWAY ON DIRECT CURRENT ELECTRICAL CIRCUIT

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Abstrak

Seiring dengan perkembangan IPTEK di bidang pendidikan, bahan ajar dapat dibuat berbasis teknologi. Oleh karena itu, penelitian ini bertujuan untuk mengembangkan modul elektronik fisika berbasis *interactive lecture demonstrations (ILD)* berbantuan Microsoft Sway pada materi rangkaian listrik arus searah untuk siswa SMA kelas XII. Penelitian ini dilakukan dengan menerapkan metode *Research and Development (R&D)* dengan menggunakan model *ADDIE (Analyze, Design, Development, Implementation, and Evaluation)*. Berdasarkan hasil survei yang dilakukan di kelas XII MIPA SMAN 3 Kabupaten Tangerang terhadap 34 siswa, hasil yang didapat menunjukkan bahwa sebanyak 85,3% siswa mengalami kesulitan dalam memahami materi fisika, 76,5% siswa tertarik mempelajari fisika menggunakan modul elektronik, dan 100% siswa tertarik mempelajari fisika melalui demonstrasi. Modul elektronik yang dikembangkan didesain dengan menerapkan model pembelajaran *Interactive Lecture Demonstrations (ILD)*. Pada setiap kegiatan belajar terdapat tahapan model pembelajaran *Interactive Lecture Demonstrations (ILD)* yaitu diawali dengan tahap *predict*, selanjutnya dilanjutkan dengan tahap *experience*, dan diakhiri dengan tahap *reflect*.

Kata-kata kunci: modul elektronik, *ILD*, Microsoft Sway, fisika, rangkaian listrik arus searah

Abstract

The problem-solving skills of students in the 21st century and the need for electronic teaching materials are the reasons for this research. These problems solving skills can be trained in practical activities. In this case, a sound wave electronic student worksheet was made according to the results of observations of field needs to produce electronic student worksheets based on problem-solving using Flip PDF Professional application on sound wave material to help students study independently due to the pandemic that caused changes in systems outside the network to become networked. The method used in this research is research and development (R&D) with the ADDIE approach. This article describes the use of the Flip PDF Professional support application and the content according to the problem-solving stages. This electronic student worksheet presents multimedia as a stimulus. Students are asked to answer preliminary and final knowledge tests, conduct simple experiments according to the work steps, create experimental observation tables, and process data and concepts regarding related experimental material. The data was collected using a questionnaire, revised by the researcher regarding material content and appearance, and processed using the effect size formula. This electronic student worksheet was declared feasible regarding material and learning media by validators training HOTS students through student problems solving skills.

Keywords: electronic module, ILD, Microsoft Sway, physics, direct current electrical circuit

PENDAHULUAN

Physics is a science that studies the nature and phenomena of nature and all interactions between the two. One of the physics subjects in high school class XII is direct current electrical circuits. Today, human life has become heavily dependent on electrical energy. Electricity has become an indispensable part of human activity. Currently, electricity has become a primary need in addition to food and a place to live. However, many students need help understanding the concept of electrical circuits, especially this direct current circuit, because of the weak ability of students to apply problem-solving concepts [1]. In addition, students need help analogizing and using precise modeling of the concept of direct current electrical circuits on a problem without demonstration [2]. Therefore, the material of the direct current electrical circuit is difficult for students to understand.

Students' mastery of concepts depends mainly on the learning model used. Most teachers teach physics using conventional learning models or commonly referred to as lecturing [3]. But still, in reality, most students find it challenging to analogize the concept of physics being studied if lecturing only explains it without demonstrations. A learning model is needed to overcome these problems to make it easier for students to understand physics material in the learning process using demonstrations. The model is the Interactive Lecture Demonstrations (ILD) model. The Interactive Lecture Demonstrations learning model is one of the effective learning models in improving students' understanding of concepts and motivating students through demonstrations [4]. The steps in the Interactive Lecture Demonstrations model are (1) predict, (2) experience, and (3) reflect [5].

In addition to the learning model, teaching materials are also one of the components that are needed in the implementation of the learning process. Along with the development of science and technology, teaching materials are not only in the form of printed teaching materials, but can also be in the form of interactive teaching materials based on information technology, one of which is an electronic module [6]. In addition, electronic modules can help students in learning learning materials more interestingly, interactively, effectively, and also efficiently.

Microsoft Sway is one of the programs that can be used to create electronic teaching materials. Microsoft Sway is one of the cloud-based programs released by Microsoft 365 [7]. Microsoft Sway can be used anytime and anywhere [8]. Therefore, Microsoft Sway is suitable for teaching materials, especially electronic modules.

Referring to the explanation above, developing teaching materials in interactive lecture demonstration-based electronic modules assisted by Microsoft Sway for learning physics on direct current electrical circuit materials is necessary. This electronic module is expected to have a positive impact on students and can help students understand the learning material. Therefore, the author plans to develop an electronic physics module based on Interactive Lecture Demonstrations assisted by Microsoft Sway on direct current electrical circuit materials. This electronic module is intended for high school students of class XII.

METODOLOGI

This research was conducted by applying the Research and Development (R&D) method using the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) model. As for the research steps as in FIGURE 1.

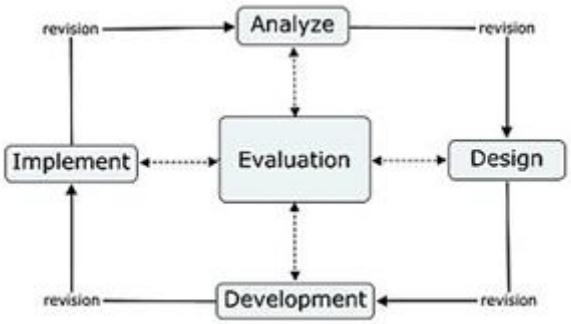

FIGURE 1. Steps of the ADDIE Model

Analyze

In this step, a survey is carried out to students to identify learning objectives, determine teaching materials, learning models, and materials that are suitable for students, and find out what processes and facilities are available for learning. Based on the results of a survey conducted in class XII MIPA SMAN 3 Kabupaten Tangerang on 34 students, it was found that as many as 85.3% of students had difficulty understanding physics material, 76.5% of students were interested in learning physics using electronic modules, and 100% of students were interested in learning physics through demonstrations.

Design

This step is the step for designing electronic modules. At the design step, the researcher collects information about the product to be developed. In addition, in this step, the researcher makes a research schedule so that the development of electronic modules can be completed on time according to the schedule that has been planned.

Development

At this step, the development of electronic physics modules on direct current electrical circuit materials is realized. In developing electronic modules, researchers use Microsoft Sway. The output of this product is in the form of a website. The electronic module developed applies the Interactive Lecture Demonstrations learning model. Each learning activity has a step of the Interactive Lecture Demonstrations learning model, which begins with the Predict step, then continues with the Experience step, and ends with the reflect step.

Implementation

At the implementation step, validation tests are carried out by material experts, media experts, and learning experts. This validation test is intended to analyze the feasibility of an electronic module developed as teaching material for students. In this case, the validation test is carried out by experts through a survey using the Likert scale. Improvements will be made based on experts' input in the validation process. After the electronic physics module went through validation tests by material experts, media experts, and learning experts, the electronic physics module was tested on teachers and high school students of class XII to find out student responses regarding the physics learning electronic module that has been developed.

Evaluation

At this step, an evaluation of electronic modules tested on teachers and students is carried out. Are there still flaws in the developed electronic modules? If there are still shortcomings, it is necessary to carry out the evaluation step to improve the developed electronic module, namely the evaluation of unmet needs in the developed electronic module. The ultimate goal of the evaluation is to measure the achievement of the objectives of developing an electronic physics module based on Interactive Lecture Demonstrations with Microsoft Sway on direct current electrical circuit subjects suitable for use as physics teaching materials.

HASIL DAN PEMBAHASAN

This research and development results in the form of an electronic physics module on direct current electrical circuit subject as teaching material for class XII high school students. This is supported by research by Pajr et al., which states that electronic modules can help students with learning materials and increase students' learning motivation [9]. And supported by research by Anggraeni *et al.*, which states that learning physics using electronic modules can improve students' critical thinking skills [10].

In developing this electronic module, researchers used Microsoft Sway. The output of the electronic module is in the form of a website, so it is effective and efficient because it can be accessed anytime and anywhere. The electronic module developed applies the Interactive Lecture Demonstrations learning model. Each learning activity has a step of the Interactive Lecture Demonstrations learning model, which begins with the Predict step, then continues with the Experience step, and ends with the reflect step.

When this electronic module is run, the first display listed is a module cover. At the bottom right of the module is a menu tool that makes it easier for students to open the module page without having to scroll the screen. After the cover, there is the next page, and there is a preface, a table of contents, and a concept map. Furthermore, it is an introductory section consisting of a description of the module, instructions for using it, core competencies and essential competencies, indicators of competency achievement, and learning objectives.

(a)

(b)

(c)

FIGURE 2. (a). Display of Module Cover, (b). Display of Concept Map, (c). Display of Module Usage Instructions

The following page contains learning activities. In this module, there are three learning activities. Learning Activity 1 is Ohm's Law and a Series of Electrical Barriers subject, Learning Activity 2 is Kirchhoff's Law subject, and Learning Activity 3 is Energy and Electrical Power subject. Each learning activity begins with the syntax of Interactive Lecture Demonstrations, which consists of 3 steps, starting with the Predict step, then continuing with the Experience step, and ending with the Reflect step. The following are the activities of the Interactive Lecture Demonstrations contained in the electronic module:

TABLE 1. Interactive Lecture Demonstrations Activities in Modules

Steps	Activity
Predict	In the Predict step, a demonstration video is presented by stopping the part that the student will predict. Furthermore, students are asked to write their predictions on the provided link.
Experience	In the Experience step, an overall demonstration video is presented along with the data on the results of the demonstration that has been obtained. Students were asked to compare the results of the demonstration data with the predictions they had written in the Predict step. Furthermore, students are asked to explain why their predictions could be appropriate (or inappropriate) with the data of the demonstration results.
Reflect	In the Reflect step, students are asked to conclude the learning outcomes learned from the Reflect and Experience steps.

FIGURE 3. Display of ILD Syntax in Predict Step

FIGURE 4. Display of ILD Syntax in Experience and Reflect Step

To help students understand the materials, in each learning activity, after the Syntax of Interactive Lecture Demonstrations, there is learning material, sekilas info fisika, sample questions, practice questions, and a summary. "Sekilas Info Fisika" is a page that aims to add insight for students. This page contains the application of physics or natural phenomena related to physics, especially related to electricity.

(a) (b)

FIGURE 5. (a) Display of Learning Material, (b) Display of Sekilas Info Fisika

After the learning material, there is an evaluation section, and in the evaluation section, there is a link containing evaluation questions. In addition, there is also a QR code that can make it easier for students to open the evaluation link. The evaluation consists of 15 multiple-choice questions. After the students send the answers, the grades will appear automatically. After the evaluation section in the module, there is a glossary, a bibliography, and an author profile.

FIGURE 6. Display of Evaluation

SIMPULAN

The product developed in this study is an electronic physics module based on Interactive Lecture Demonstrations (ILD) with Microsoft Sway on direct current electrical circuit subject for class XII high school students. This research was conducted by applying the Research and Development (R&D) method using the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) model. The electronic module uses the Interactive Lecture Demonstrations (ILD) learning model. Each learning activity has steps of the Interactive Lecture Demonstrations (ILD) learning model, which begins with the Predict step, then continues with the Experience step, and ends with the Reflect step. In developing this electronic module, researchers used Microsoft Sway. The output of this electronic module is in the form of a website, so it is effective and efficient because it can be accessed anytime and anywhere.

UCAPAN TERIMAKASIH

Thank you to all parties who helped manufacture this electronic module and provided criticism and suggestions in the process of making it. The criticisms and suggestions are constructive and valuable in manufacturing this electronic module.

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