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Explicit Instruction Based E-Module Development on Momentum and Impulsive Material

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ABSTRAK

Purpose of study: Aims to determine product development procedures and test product validity so that it meets eligibility as teaching materials.

Methodology: The research procedure is carried out through the steps of developing a 4-D model, namely define, design, development, and disperse using a descriptive method. This study uses a 4-D development model and is limited to the development stage (develop).

Main Findings: The results of this study indicate that the media and material expert validator stated that the electronic module based on explicit learning on momentum and impulse material had a very good proportion of 90%, so that it was declared feasible and as many as 88.67% of students were interested in learning to use the electronic module. This shows that the electronic module based on explicit learning on momentum and impulse material is very good and feasible to be used as a physics teaching material in class XI in Senior high school.

Novelty/Originality of this study: The latest in this research is the basis used. Because this research is based on explicit instructions that have never been done by previous research.

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1. INTRODUCTION

Physics learning is a learning process that has an important role in supporting science and technology [1]–[3]. However, students often think that Physics is a difficult lesson [4]–[6]. This was acknowledged by a physics subject teacher at SMAN 6 Jambi City, he said that only 50% of students were interested in participating in physics learning activities in class.

Based on the results of observations made in class XI IPA SMAN 6 Jambi City in the 2014/2015 school year, Physics learning was not optimal, teachers did not make use of school facilities such as infocus in the learning process, there teachers only relied on textbooks and worksheets as learning media. If the teacher uses infocus as a means of the learning process, students will be more interested in participating in the learning process. According to [7] states that the benefits of using digital media in the learning process include: (1) Teaching will attract more students' attention so that it can foster learning motivation, (2) Teaching materials will have clearer meaning so that students can understand more , (3) Learning methods will be more varied, not solely verbal communication through the rules of the teacher's words, so students don't get bored and teachers don't run out of steam, and (4) Students will do more learning activities, because they don't just listen to descriptions teacher, but other activities such as observing, doing, demonstrating and others.

One of the digital media that can be used in the learning process is an electronic module [8]–[10]. It is known that the use of learning media in the form of electronic modules is not optimal [11]–[13], This is supported by the results of observations from 36 students of class XI IPA SMAN 6 Jambi City. As many as 75% of students stated that they had never used electronic modules in the physics learning process, especially on momentum and impulse material. As many as 66.7% of students stated that momentum and impulse materials were difficult material to understand. As many as 77.8% of students stated that the teacher's explanation was not enough to understand the momentum and impulse material. And as many as 97.2% of students agree that learning is carried out using electronic modules to help students understand momentum and impulse material.

Based on the needs analysis above, the researcher developed an electronic module based on explicit instruction on momentum and impulse material that can be used as an alternative learning media that is able to overcome the limitations of learning space and time, and can increase students' motivation in learning Physics, especially on momentum and impulse material.

As a basis for this research, several problems have been identified as Teachers need learning media that can motivate students in learning and Students need learning media that can attract interest in learning and can be used independently with or without a teacher.

2. RESEARCH METHOD

In accordance with the problems and research objectives, this research includes development research. The product developed is an electronic module based on explicit instruction on momentum and impulse material for class XI SMA. The development model used in the development of this module is the 4-D development model. 4-D model consists of 4 stages of development, namely Define, Design, Develop, and Disseminate [14]-[16]. Given time and limited funds, the development of this module is only carried out until the Develop stage. Where in the Develop (development) stage, researchers will see student responses to the use of the developed module.

Based on the above research design, the development research procedure is as follows:

Stage Define (Definition)

The aim at this stage is to determine and define learning needs by analyzing the objectives and limitations of the material [4], [17], [18]. The activities in this stage are as follows: (a) initial-end analysis, aims to identify and determine the basic problems encountered in the implementation of high school physics learning so that it requires the development of teaching materials such as electronic modules; (b) student analysis, which is a study of student characteristics in accordance with the design and development of learning tools. These characteristics include student characteristics, abilities and experiences of students; (c) concept analysis, aimed at identifying physics lesson materials in class XI which tend to be complex and complicated for students to understand; (d) task analysis, which is the identification of the main tasks or skills that students carry out during learning. Then analyze it into a more specific sub-skills framework; and (e) formulation or specification of learning objectives, learning objectives can be used as guidelines and guidelines for student learning activities.

Design Stage (Design)

At this stage, the design of the learning device draft is carried out. The steps for designing learning tools are: (a) preparing tests. In this study, researchers did not arrange initial tests, only compiled final tests (including instruments) to be given to students, aiming to find out students' understanding of the material; (b) media selection, carried out in order to determine the right media for presenting learning material and adjusted to task analysis and material analysis, student characteristics and existing facilities at school; (c) format selection [19]–[21]. In this stage, an analysis of the syllabus is first carried out, then a needs analysis is carried out. This needs analysis aims to determine the title of the module; (d) the initial design of the learning device. At this stage, preparations are made before making the initial design of the module. The results of this stage are the initial design of the learning device which is draft I along with the research instrument. This design is an extension of the compiled module format.

Stage Develop (Development)

This stage aims to produce a draft II of learning tools that have been revised based on input from experts and data obtained from trials. The activities at this stage include: (a) expert assessment, learning device designs that have been prepared at the design stage (draft I) will be assessed or validated by experts (validators). The validator provides input and suggestions for improving the learning tools that have been prepared. The things that are validated by the validator include: material and media validation; and (b) development trials.

Product Trials

Trial Design

Module development begins with observing students to analyze the character and needs of students, then proceed to the design stage [22]–[24]. The product produced in this study is an electronic physics module that discusses momentum and impulse material for class XI Senior high school. This product will be tested on a large scale. The trial was conducted on 15 students of class XII IPA 3 and 30 students of class XII IPA1 Senior high school 6. Here the researcher will act as a teacher. Beginning with an introduction to students. Furthermore,

students use the module teaching materials. When finished, students who acted as test subjects filled out student response questionnaires.

Trial Subjects

In this study, the test subjects were 15 students of class XII IPA 3 and 30 students of class XII IPA 1 Senior high school 6. Where in class XII IPA 3 the reliability test of the research instrument (student response questionnaire) was carried out. While the trials conducted on class XII IPA 1 aim to retrieve module feasibility data.

The type of data obtained in this study is quantitative data. This quantitative data was obtained from the validation sheets of media experts and material experts on the electronic modules being developed, as well as from field trials conducted to find out students' responses to the products produced.

Data Collection Instruments and Analysis Data

The data collection instruments in this study consisted of: (1) interview guide sheets; (2) learning device validation instruments; and (3) student response data collection instruments. In this study, data analysis was conducted on all data from all respondents or data sources. Data analysis on material and media validation by a team of experts, as well as student response data was carried out statistically because the data is in the form of quantitative data.

3. RESULTS AND DISCUSSION

This development research activity was carried out using a 4-D model. This 4-D model consists of 4 stages of development, namely Define, Design, Develop and Desseminate [25]–[27]. The stages of the 4-D development model are only carried out until the Develop stage. This is because the research objectives have been achieved at the development stage (develop). This development resulted in a product in the form of an electronic module based on explicit instruction on momentum and impulse material using kvisoft flipbook and macromedia flash 8 software.

Results of Development Stages

At this definition stage it includes: (1) an initial-end analysis, based on the results of initial observations, it is known that there is a lack of interest in students at SMAN 6 Jambi City to take Physics lessons. This lack of student interest is because the teaching materials used in the learning process are not interactive in addition to that there is no use of electronic modules in the Physics learning process; (2) student analysis, based on the results of observations made on 36 students of class XI IPA that 86.1% of students have computers or laptops. And according to the confessions of the 36 students, that 100% of students use laptops or computers for learning activities, (3) concept analysis. Based on the results of observations of 36 students, it is known that 66.7% of students stated that momentum and impulse material is difficult to be understood, then (4) task analysis, the assignments given to students are in the form of multiple choices and essays; and (5) formulation or specification of learning objectives. After knowing the results of the concept analysis, the authors formulate learning objectives. The following learning objectives to be achieved, namely:

1. Explain the meaning of momentum
2. formulate and calculate the momentum of an object
3. Explain the meaning of impulse
4. formulate and calculate the impulse of an object
5. explain the application of impulse
6. Explain the meaning of the law of conservation of momentum
7. formulate and calculate the law of conservation of momentum
8. Explain the meaning of collision
9. Mention the types of collisions and their explanations
10. Formulate and calculate the types of collisions
11. explain the application of momentum

Results of the Design Stage (Design)

The design stage includes several stages, namely: (1) preparation of the test, the preparation of the test in the form of practice questions in the form of flash and essays which can be seen in the electronic module; (2) selection of media, at this stage the author chooses kvisoft flipbook and macromedia flash 8 software to develop electronic modules. (3) format selection, the format for compiling this electronic module is based on the KTSP syllabus; and (4) initial design.

Results of the Development Stage (Development)

Development (development) is the final stage carried out in this study [28]–[30]. This stage includes: (1) media and material validation by the validator. Based on the results of the revised media and material validation, the electronic module is declared feasible and can be used so that the electronic module is ready to be tested on

students. Furthermore, (2) development trials to determine the feasibility of electronic modules based on explicit instructions on momentum and impulse material.

The feasibility trial of this electronic module received a positive response from students, this is shown from the results of the questionnaire perception data analysis. As for the results from the media product aspect, it shows an average percentage of 87.38% and from the material aspect it gets an average percentage of 87.52%. It can be concluded that the electronic module that the author has made meets the standards of good media and teaching materials.

In addition to meeting the standards of good teaching materials, it turns out that 88.67% of students feel interested in learning by using electronic modules. Besides being interested in using the author's electronic module, 84.67% of students stated that by using this electronic module their enthusiasm for learning increased. Although the development of this e-module provides good final results, this study has limitations which can later be used as evaluation material for other studies to examine this issue broadly. The limitation in this study is that it only examines the development of instruction-based e-modules contained in momentum and impulse material only. Limitations can be used by other researchers to conduct research like what researchers do by differentiating the materials and development bases used. However, this research has never been done before by other studies so that this research can pave the way for other researchers to conduct similar research with broader study material.

4. CONCLUSION

An electronic module based on explicit instruction on momentum and impulse material for class XI Senior high school, was developed using a 4-D development model. The feasibility of an explicit instruction-based electronic module with a program on momentum and impulse material has been tested with a process of expert validation and trial and error. The developed electronic module is considered feasible by the media validator and material validator with a feasibility percentage of 90%, which is categorized as very good. So that the validator concludes the development product can be used without revision. As many as 88.67% of students are interested in learning to use electronic modules. This shows that the electronic module based on explicit instruction on momentum and impulse material is very good and suitable for use as physics teaching material in class XI in Senior high school.

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