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Multimedia Learning Module Development based on SIGIL Software in Physics Learning

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Abstract. Technology is important in learning, especially in physics learning. This paper aims to determine the feasibility of the Multimedia Learning Module. Multimedia Learning Module in compliance with ADDIE development model. Helped by SIGIL software that can convert files into epub that can be used as an ebook, so that it can be compatible with smartphone educators and students and equipped with animations and analyzing videos that can help in understanding the concepts of physics, so they can solve problems in physics learning.

Keyword: Physics learning; Multimedia learning module; SIGIL.

1. Introduction

Current technological developments are very rapid, including the development of technology in Indonesia, especially the development of mobile learning. Based on data from e-Marketers, news agencies based in New York, the number of smartphone data users in Indonesia reached 55.4 million users in 2015, and ranked 3rd in Asia Pacific and is expected in 2016 user data will increase to 65.2 million and 74.9 million users in 2017 [1]. Technology in education is a practice and study in learning facilitation and participating in improving performance by using, creating, and managing appropriate technological processes and resources [2].

The multimedia learning environment combines many sources of information (eg, texts, diagrams, and simulations) to help students to cognitively challenging learning. Self explanations are constructive or generative learning activities that facilitate deep and strong learning by encouraging students to make conclusions by using learning topics, identifying previous misunderstandings, and improving mental models [3]. Presenting a framework for categorizing various forms of self-explanations and explanations so that they are incorporated into a multimedia learning environment to enhance learning [5].

Physics learning an important role in various professions and fields in the real world such as industry, education and engineering. Physics provides skills to someone regardless of gender with the hope of being able to be used to solve problems in modern society [4] [5]. One form of learning media is interactive multimedia. Multimedia Learning Module (MLM) are introduced to students as an introduction before learning activities begin, so that students become more prepared and motivated in learning [6] [15]. The MLM used as a solution to solve problems in the use of text books that are less effective, some students not read books carefully and take a lot of information that is not important [6] [17] [25].

The MLM as an introduction to learning that aims to make students have an first impression understanding before learning, and MLM is designed in many forms of multimedia presentations such as representational animated and audio videos [6]. The MLM can positively influence the concept of learning and improve their class performance, and can be accessed from anywhere at any time. Student responses to MLM are very positive; they enjoy the flexibility associated with online learning materials, feel easy to use, very effective in helping learn Physics [7].

Problem solving is the same as with insight. Problem Solving provides a complex solution and is an effective strategy for learning achievement, and the use for strategy [8]. Integration of mathematical knowledge in physics problem solving begins with reading the problem, writing the information given



and asked using mathematical symbols, and focusing on the details of the problem, so that mental representations can be formed in each problem solving. In the different perspectives, Problem Solving as aims, methods and skills [9] [10]. In solving physics learning problems, interactive tutorials are based on students' cognitive development so they can solve the problem of physics concepts that build to be complicated and difficult. In physics learning, the use of problem solving strategies depends on the representation that will be used in learning [11] [12].

Multimedia Learning Module is one of the interactive physics learning module solutions that can be developed to meet technology-based physics learning, which has several advantages, one of which is the adjustment of modules and lesson adjustments with the Kurikulum 2013, and this module is free and can be accessed anywhere at any time computer or smartphone. So that authentic, efficient, effective and interactive learning can be realized. The MLM will be tested for feasibility based on several aspects and feasibility of its use in physics learning activities that have been carried out. Hence, this paper develops multimedia learning module based on SIGIL software in physics learning.

The rest of this paper is organized as follow: Section 2 describes the notions of MLM and SIGIL. Section 3 presents the proposed research method. Section 4 presents the obtained results and following by discussion. Finally Section 5 concludes this work.

2. Rudimentary

This section presents the notions of MLM and SIGIL.

2.1. MLM

In using interactive multimedia in learning activities there are several advantages including: 1) Learning and teaching systems are more interactive and innovative., 2) Educators must be more creative in creating new innovations and learning and teaching processes, 3) Text, images, videos , audio, music, animation can be combined into one in order to achieve the goals of teaching and learning, 4) Motivation of students increases teaching and learning activities, 5) Topics can be visualized with conventional teaching aids, and 6) Students are taught to be independent in exploring learning [13]. The MLM can influence students' learning concepts in improving performance in class, and can be accessed anywhere and anytime. The implementation of multimedia techniques today is more effective for learning the concept of physics than other concepts in order to achieve an understanding of concepts [14].

The response students towards MLM is very positive, very flexible with online learning topics, easy to use, and effectively helps students in studying Physics [7]. In exploring learning models using visual, verbal, and multimedia learning modules, MLM is preferred by students, by adding more modules with visual components that can make learning more enjoyable [15]. Cognitive and affective processes in multimedia learning provide an experience of how cognitive processing and learning outcomes can provide thoughts such as "situational interests", "positive emotions", or "confusion" [16]. Applying the principle of emotional design to learning topics can encourage positive emotions and positive emotions in multimedia-based learning to facilitate cognitive processes and learning [17].

The implementation of learning modules before physics learning, results in an increase in learning outcomes on conceptual and representational reasoning tests. Complementing this module, in addition to regular course instruction, enhancing students' conceptual understanding and representational abilities is greater than regular learning [18]. Modules that are developed using certain learning methods, and designed with an attractive appearance can increase reading interest, so motivation in learning increases and learning becomes meaningful [19]. The characteristic in the module are students can learn independently, present the material thoroughly, only use one main media, must be in accordance with the curriculum used, and can facilitate of the learning. [20]

2.2. SIGIL

With the development of the world of technology, there are digital books or better known as e-books. E-books can be read with computer devices, laptops, and even mobile devices. Various types of e-book formats have been used, but those that can display e-books according to mobile devices with varying screen sizes are electronic publication (epub) formats. So epub is the standard e-book format introduced, with the editor application is Sigil. Sigil is an Open Source editor that is easily available to all authors and readers [21]. With this software, it will be used as a learning media maker software that

has quite good economic value. Where the economic value is viewed from several aspects of ease, features and user friendliness of the output of learning media produced by Sigil. As well as the comparison of this Sigil software with similar software which is seen in terms of making the learning media [9].

3. Data and Proposed Method

This section describes the proposed research method.

3.1 Data

The data obtained in this study uses quantitative data and qualitative data. Quantitative data used in the form of MLM product assessment data by validators. Qualitative data in the form of response data provided by material experts, media experts, teachers, and peers to assess the quality of MLM products.

The instrument used in this study is a questionnaire. The questionnaire compiled in this research is a media validation questionnaire. The instrument was arranged using a Likert scale with four answer choices. The score obtained is then converted to a value on a scale of four. The media validation questionnaire was used to obtain MLM feasibility data. From the development results, it is reviewed the structural aspects of the module, the writing organization of the topics and the aspects of language. The questionnaire is intended for material experts, media experts, teacher, and peers. The instrument was developed based on indicators of quality of learning media in three aspects by referring to the theory and opinions of experts in accordance with the field. Validation of questionnaire instruments was carried out in consultation with material experts and media experts.

Qualitative data in the form of criticism and suggestions from experts, teachers, and peers collected and used as guidelines in MLM improvement. Data analysis of media validation questionnaires was carried out on the score of the validator responses obtained from each aspect that was tabulated and the average score was calculated. To find out the quality of MLM in terms of the structural aspects of the module, the writing organization of the topics and the aspects of language, the original data in the form of scores was converted into four-scale interval data. As a reference the data was analyzed using the percentage

$$P = \frac{f}{N} 100\% \quad (1)$$

Where:

P : Percentage

f : Frequency

N : Total number frequency

Furthermore, determined the length of the interval class in each category consisting of five categories, grouping the values in each category is presented in Table 1.

Table 1. Assesment Category

No	Interval %	Category
1	$80,01 \geq x \leq 100$	Very good
2	$60,01 \geq x \leq 80,00$	Good
3	$40,01 \geq x \leq 60,00$	Enough
4	$20,01 \geq x \leq 40,00$	Deficient
5	$0,00 \geq x \leq 20,00$	Bad

3.2 Method

This research developed a type of model ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) which is limited only to the step *Implementation*. This research was conducted in April 2018 at MAN 2 Yogyakarta. From the result observation with physics teachers, the research subjects using X MIA I and X MIA 2 totally 60 students. The first development procedure to be carried out is the Analysis stage, at this stage includes analyzing the curriculum, studies, and students.

In the second step of the Design stage, at this stage after analyzing the curriculum and lesson so that it can make the design of learning activities, and making MLM feasibility instruments, so that MLM can be designed accordingly and appropriately. In the third stage, Development, this stage has been

made MLM in accordance with the results of MLM instrument validation, design of learning activities and validated instruments. The fourth stage is Implementation, this stage MLM products have been carried out in real learning (see Figures 1, 2 and 3).

The resulting product is based on the development of a Multimedia Learning Module equipped with a video analysis made with the help of Sigil software, so that it can be opened and applied to students' smartphones and teachers using the Himawari Reader application.

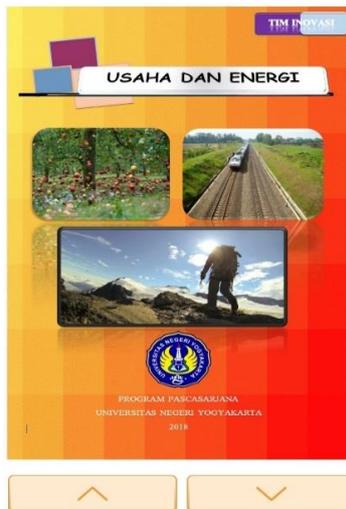


Figure 1. Cover of Multimedia Learning Module

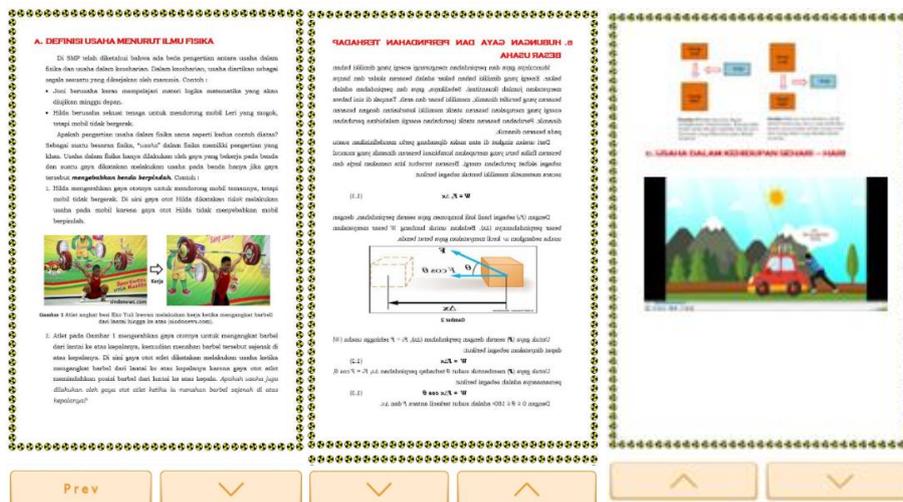


Figure 2. Main Content of Multimedia Learning Module

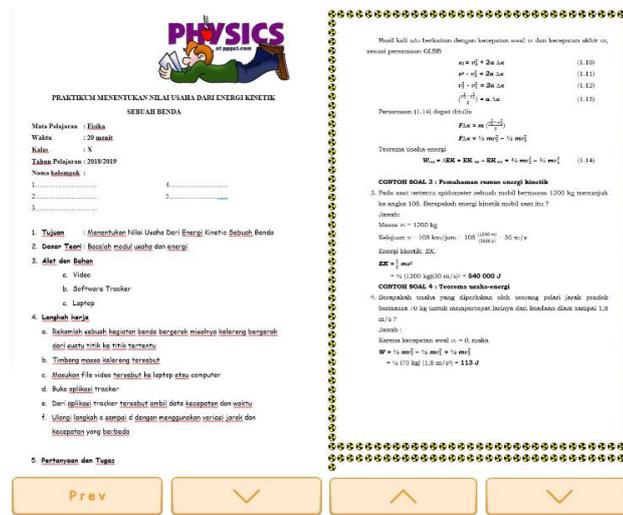


Figure 3. Worksheet of Multimedia Learning Module

4. Result dan Discussion

Based on the results of the validation of the Multimedia Learning Module (MLM) learning devices that have been created, such as learning modules, the three experts obtained the results shown on Table 2.

Table 2. Validation of Module

No	Validator	Module Structure	Category	Aspect			
				Material Writing Organization	Category	Language	Category
1	Validator I	91.6 %	Very Good	81.2 %	Very Good	75 %	Good
2	Validator II	83.3 %	Very Good	87.5 %	Very Good	83.3 %	Very Good
3	Validator III	83.3 %	Very Good	93.7 %	Very Good	83.3 %	Very Good
Average score		86.06 %	Very Good	87.4 %	Very Good	80.5 %	Very Good

In the aspect of the structure of the module, there are several assessment indicators, based on the results of the expert validation the first is that the general presentation organization is good, the second general view is quite interesting, and the third is consistent linkages between the discussion topics is consistent. The scope of the material contained in the module is in accordance with the topics to be submitted. Clarity and sequence of topics are quite appropriate in accordance with the Basic Competencies that will be used. The relationship between problems with the context of life / cognition of students contained in the book of students / modules is quite appropriate, so learning can be carried out. The use of the language used in the module is sufficient in accordance with the justified spelling. The language used in the module is quite communicative, so students can understand it independently. As well as the simplicity of the sentence structure used is simple. Based on the results, it can be seen that the overall module components that are assessed by experts show very good results. So, it can be concluded that the Multimedia Learning Module is feasible and can be tested in the next stage. From the results of the validation of the Multimedia Learning Module (MLM) learning devices that have been created, such as learning design, the three experts obtained the results shown on Table 3.

Table 3. Validation of Instructional Planning

No	Validator	Aspect					
		Learning Objectives	Category	Content Presented	Category	Language and Time	Category
1	Validator I	85 %	Very Good	95 %	Very Good	85 %	Very Good
2	Validator II	90 %	Very Good	85 %	Very Good	90 %	Very Good

3	Validator III	80 %	Very Good	90 %	Very Good	80 %	Very Good
	Average skor	85 %	Very Good	90 %	Very Good	85 %	Very Good

In the indicator in the design of Core Competencies and Basic Competencies is clear, so that the suitability of Core Competencies and basic Competencies with learning objectives is appropriate. The accuracy of Basic Competency translation into indicators is quite appropriate. Suitability of indicators with learning objectives and with the level of development of students is sufficiently appropriate so that it can be implemented in learning.

In the systematics in the preparation of the instructional planning is right, so that the suitability of the sequence of learning activities is appropriate. Suitability of student and teacher activity descriptions for each stage of learning is appropriate. Obvious of learning scenarios such as the stages of the initial learning activities, core and cover are clear and appropriate. For the completeness of the evaluation instrument is quite complete because there are only questions and answer keys, or key and scoring or problem guidelines and scoring guidelines only.

In using the language quite in accordance with justified spelling, the language used is quite communicative, and the sentence structure used is quite simple. Suitability of the allocation of time used is in accordance with learning activities, for details of the time at each stage of learning in accordance with learning activities. Based on the results of the assessment, it can be seen that the overall components of the instrument for the implementation of the learning plan assessed by experts show very good results. So, it can be concluded that the instrument of learning implementation plan is declared feasible and can be adapted to the use of Multimedia Learning Module.

From the results of the validation of the Multimedia Learning Module (MLM) learning tools that have been made, such as the design of the student worksheets, the three experts obtained the results displayed on Table 4.

Table 4. Validation of Worksheet

No	Validator	Aspect			
		Content Presented	Category	Learning Objectives	Category
1	Validator I	87.5 %	Very Good	80 %	Very Good
2	Validator II	91.6 %	Very Good	75 %	Good
3	Validator III	83.3 %	Very Good	75 %	Good
	Average skor	87.5 %	Very Good	76.6 %	Good

The worksheet has been presented systematically, the topics / task is quite essential, the problem raised is quite in accordance with the cognitive level of the student, each activity presented is sufficient to have a clear purpose. The activities presented can also help to develop students' curiosity, and the presentation of worksheets is also equipped with appropriate pictures and illustrations. The language is quite appropriate justified spelling, the language used is quite in accordance with the level of development and the ability thinking of students, and communicative. The sentence is very clear and easily understood by students.

Based on the results of the assessment, it can be seen that the entire instrument component of the worksheets assessed by experts shows very good results. Thus, it can be concluded that the student worksheet instrument is feasible and adjusted by using the Multimedia Learning Module.

5. Conclusion

Multimedia Learning Module (MLM) is a learning module that can be used as a media for learning, so that students can learn independently, and facilitate students to understanding, especially learning physics. The MLM used in this research is using the help of SIGIL application, where this application is an intermediary in making MLM so that it can be used in epub format so that it can be used on smartphone and laptop. In Inquiry methods, students are expected to understand learning through practice methods so that they understand the concepts of learning material and can express their opinions and results of practice learning, so that learning can be carried out effectively, with the function of educators as facilitators. Overall validation carried out by experts, starting from module validation,

implementation and learning planning, and student worksheets, it can be concluded that all learning devices can be used without revision and suitable for use in an innovation in physics learning in schools.

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