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Would Students Learn Better with Media?

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***Abstract*—This article presents the application of multimedia product of physics learning of kinematics material of straight motion to help improve students' Physics learning outcomes. Using multimedia can help students to understand the material in the form of facts, concepts, principles, or certain procedures to be real or concrete. This research applied ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. The validity of the product was done by the material and media experts at the development stage to determine the level of qualification before applying into field trial. Field trials were conducted on 30 science students grade X in one of the senior high schools in North Minahasa. The results of field trials with 5 indicators indicated the percentage of product which is 88.89% and classical completeness of the material comprehension test which is 83.3%. These results stated that product development is good in qualification and therefore good to be used in learning. To test the result of learning improvement, we used the one-sample statistical test with SPSS 17.0 software application with the results in which $t_{Count} = 4.723 > t_{table} = 1.699$. Thus, with 5% significance it is concluded that there is a significant increase in learning outcomes by using this developed media. Product revisions after field trials are conducted based on student suggestions and feedback.**

Keywords—multimedia; physics learning; senior high school

I. INTRODUCTION

The learning process that occurs in schools aims to bring changes to students that occur systematically and planned to develop aspects of cognitive, affective, and psychomotor. Teachers in modern teaching systems, directly involved from planning to implementation and evaluation have a huge role for the success of teaching. Likewise, with the process of student learning interaction, influenced by many elements including the students who are around him, teachers, principals, teaching materials, and media or learning resources used.

The process of teaching and learning on the development of science and technology increasingly encourages renewal efforts in the utilization of technology in learning. The use of instructional media is one way that can be used by teachers to improve student learning outcomes. Learning media can represent what is less able for teachers to convey and the learning process will be more effective and efficient.

The presence of instructional media has a meaning that is quite important in the learning process. It is explained that the media in the learning process is not only in the form of tools and materials, but things that enable students to gain experience knowledge [1]. Where in the event there is a lack of clarity of material or material, then the presence of media as an intermediary can assist in the delivery. The complexity of the material delivered can also be simplified with the help of the media. Even the material or material abilities can be concertized through the media. The success of students in the learning process is determined by a variety of factors, and one of the factors that are high enough effect is the medium of learning [2]. Therefore, the teacher wants the students to digest the taught material will maximally try to use the tools (media), in addition to relying on the mastery of materials and methods. This is based on the principle that the ability of teachers to convey the lesson has limitations, especially the ability to articulate the material in verbal form. In other words, the teacher seeks to use the media as a tool as well as a partner that accelerates the process of transfer of material taught.

The ability of the child to capture the material and the lesson depends on his learning style. Many children declining learning achievement because children are forced to learn not in accordance with his style. Children will easily master the subject matter by using their own way of learning. The theory of accelerated learning claims that people remember and learn more effectively when information is presented through more than one sensory capital, which means knowing and remembering information by utilizing the senses, what is heard, seen, feeling, and touch; or in other words learn visual (vision), auditory (auditory) and kinesthetic (movement) [3]. In addition, the absorption of human senses is not the same [4]. Each human sense has its own characteristics in the absorption of learning [5]. One's learning process by using the sense of vision reaches 82%, hearing 11%, feelings 3.5%, flavors 2.5%, and 1% olfaction. Based on these statements, it can be concluded that the delivery of more material utilizing the senses of vision will obtain the highest results. When combined between the use of senses of sight and hearing together, then the results will be maximal again [6].

Presentation of linear motion kinematics using multimedia can help students to understand the material in the form of facts, concepts, principles, or specific procedures to appear real or concrete [7]. Use of this multimedia as well, because appropriate conditions and learning needs such as goals to be achieved, student characteristics, learning methods and technology capabilities are available [8]. It has also been described that multimedia is useful in teaching and learning, to:

(1) clarify the presentation of messages so as not to be very verbalistic, (2) overcome the limitations of space, time and sense power, (3) students, (4) facilitate the teacher in delivering the material [9].

Based on the above statement, multimedia is more effectively used in the learning process because it is able to attract attention and generate student curiosity through the sense of hearing and sight as well. Multimedia has the potential to create a multisensory environment that supports a particular way of learning. Multimedia can access a variety of data and objects that cannot be seen directly, due to remote location or process takes a very long time. Learning by using multimedia is more concrete and interesting because it combines several elements of media in its presentation such as: text, images, audio, animation, simulation, and video [10]. Furthermore, multimedia is an integration of animation, video, images, text, graphics, photos and maps. In addition, the multimedia is equipped with a controller and can be operated by the user (the student), so the user can choose what is desired for the next process so that it becomes more interested and can understand the material well [11].

For the development of this multimedia Auto play software was used where Auto play is a software to create multimedia products, interactive windows software, business presentations, CD auto-run setup, and others. To use this software, we just need to drag and drop favorite media files, include photos, text, audio, video, Macromedia flash, and others. The development of multimedia is expected to help teachers in explaining the various subject matter, so that no longer depend on the existing textbooks and students as recipients of the subject matter, it will be easier to understand the material of straight-line kinematics delivered.

The purpose of this research is to examine the influence of the use of multimedia learning physics kinematics material motion straight on student learning outcomes.

II. Research Design

This research study involved 30 high school students of X class. Instruments used to collect data in this study are questionnaires and documentation. The instruments used are: (1) questionnaire in the form of a description of the improvement of the expert field of study and media experts in the form of the results of the description of validators, discussion, and consultation is used to revise media products; and (2) field test questionnaires aimed at assessing the level of product acceptance by students. The ADDIE model is procedural that describes the steps and the flow, in order to produce a multimedia product of physics learning for the topic of straight motion kinematics [12]. The ADDIE development model consists of 5 steps: Analysis, Design, Development, Implementation, and Evaluation.

Data obtained from both validation and respondent subjects (trial) were processed using descriptive percentage technique by converting quantitative data into percentage form. The next data were interpreted with qualitative sentences. The formula used for data processing is the formula of data processing of cross items and the overall data processing formula. If the results obtained reach 85% above the score, it can be concluded that the learning media developed in this study already meet the valid criteria or eligible for use as a medium of learning in school.

Meanwhile, to find out whether there is an increase or not in student learning outcomes by using learning media that were developed, Quasi Experimental Analysis with one group pretest post-test design method using SPSS 17.0 software was employed. Normality test aims to find out normal distribution of data. Hypothesis testing using t-test one-sample.

III. Results and Discussion

A. Description of Research Steps

1) Analysis: At this stage, there are three analyses, namely competence analysis of Physics Subject, material, and students need as follows.

a) Physics subject competencies: The basic competencies of the subjects analyzed in this medium are in accordance with the 2013 curriculum. "3.4 Analyze the magnitudes of straight motion with constant velocity (fixed) and straight motion with constant acceleration (fixed) a little bit of absorbing in everyday life. 3.4 Present data and graphs of experimental results for motion properties of moving objects perpendicular to constant velocity (fixed) and perpendicular to constant acceleration". After the determination of this basic competence is selected then learning indicators were developed. Indicators in this learning are:

Show the difference between displacement and distance.
Carefully observe the motion demonstration to distinguish the straight motion with fixed speed and straight motion with fixed acceleration
Analyze the physical quantities of motion at constant speed
Analyze the physical quantities of motion with constant acceleration
Analyze the magnitudes in GLBB and free fall motion.

b) Material analysis: This analysis is conducted to determine the material to be developed. Based on the results of the analysis, it is known that the topic of kinematics in the class X high school students in the 2013 curriculum belongs to the material that needs the media as shown in table 1. The analysis of the material needs of the straight motion kinematics media that is examined through the textbook of students used in the school.

TABLE I. ANALYSIS OF MATERIAL NEEDS

No	Material Analysis	Media	Reason
1	Magnitude in straight motion a) Distance and displacement b) Speed and velocity c) Progress and acceleration	Text, audio, images	These media helped students understand the magnitudes in a straight motion
2	Regular Straight Motion	Text, audio, image, Animation	Image Animation clarifies the material so that students can easily understand
3	Straight forward Changed Motion	Text, audio, image, Video Animation	Animation and videos make it easier for students to understand the GLBB process
4	Application of GLBB in Daily Life a) Fruit Fall from tree b) The ball is thrown down vertically c) Ball thrown up	Text, audio, image, Video Animation	Animations and videos make it easier for students to understand the GLBB process

[a] Source: Physics Student Book for Class X.

From the above material analysis data, kinematics materials need media for an interesting learning process and allows students to understand the material kinematics of the straight motion.

c) Student needs: The absorption capacity of human senses varies that each human sense has their own characteristics in the absorption of learning [13]. One's learning process by using the sense of vision reaches 82%, hearing 11%, feelings 3.5%, flavors 2.5%, and 1% olfaction. Based on these statements, it can be concluded that the delivery of more material utilizing the senses of vision will obtain the highest results. When combined between the use of senses of sight and hearing together, the results will be maximal again.

2) Design: The design stage is still a conceptual nature that will underlie the development of the next stage. This stage is also known as designing. In the initial design phase of the product for multimedia development, it is clear that fragments or parts of kinematics of straight-line material will be displayed in Multimedia Learning, called story board.

3) Development: The stage in which to embody the design or design stage into a real product form. At the development stage, the steps taken are to generate and validate the media [14]. Weaknesses and flaws will be known from validation, so they can be fixed or revised before testing. Some things to note in this stage are: generating content, developing the media for students, and compiling revisions as well as compiling the Trial Product.

Learning media generated has a display like the website in which there is a menu button that can be selected. The initial view when opening the media is intro, then there is the Input Logon button to continue to the main page. On the main menu page there are five choices of buttons are; guidance, competence, material, competency test and developer. In addition, a glossary menu is provided to make it easier to understand the Physics terms.

4) Implementation (Trial): At this stage the learning media of physics material kinematics straight motion is ready for use by user / user (student). Activities undertaken in this stage are implementing the design and products that have been developed in real situations i.e. in the classroom. The purpose of this stage is to provide independent learning resources and generate competence in the form of knowledge, skills and attitudes required for students during the learning process.

By descriptive percentage, the result of the evaluation of the material understanding obtained by the students is presented in the table 2 below.

TABLE II. STUDENTS ACHIEVEMENT

		Class Achievement		Individual Achievement	
Class	***Minimum Passing Criteria***	***Class Average Value***	***Complete Achievement***	***Number of students Completed***	***Number of students Unfinished***
X Science	75	82	Achieving Minimum Criterion	25 Students	5 Students

The level of understanding of this material measured by the Minimum Passing Criteria of physics subject has been determined by the school, that is 75. Based on the results of the test table understanding is known that as many as 25 students get the above Minimum Passing Criteria values that have been determined, while 5 students got the value under the Minimum Passing Criteria. The average grade obtained is 82. In classical, the percentage of students who achieve the value of mastery as much as 83.33%. The results of this test indicate the majority of students have mastered the material well and has achieved the value of learning mastery.

The conclusion that can be taken from the analysis of the results above, that this multimedia product can help students in understanding the material kinematics motion straight.

5) Evaluation (Revision): Evaluation can be done in two forms, namely formative evaluation and summative evaluation. Formative evaluation can be done during and in each of the 4 stages above. The purpose of this evaluation is for revision or improvement needs. While summative evaluation is done after the last revision applied and aims to assess the effectiveness of overall learning either the final competencies or learning objectives to be achieved.

Based on the analysis of data obtained as a whole from the validator stated that the development of Multimedia Learning products does not need revisions which are included in the criteria is very good and feasible to be used in the field test phase. Multimedia Products Learning outcomes of development can be well received. Multimedia Learning products developed got approval from validation experts with no need for revision test decisions, but there are some important notes as input for corrective action. It is intended to

examine the concepts or conformity of all content contained in the media whether in accordance with the development objectives.

Improvements or revisions other than in the validation activities by experts, are also carried out during and in the stages of development, especially after field trials. This stage is called the final revision in the data response or response students. Product revisions based on field trials or also called prototype revisions were made after the results obtained by students' assessment through analysis of student responses to multimedia learning. Overall, the value of 88.89% with the qualification is valid and feasible. Based on the decision-making table, a score of 88.89% has decent qualifications and does not require revision [15]. In addition, the assessment of the feasibility of using multimedia in the learning process of students on the basis of recommendations in the form of input and suggestions collected. The overall improvement argument has the same essence as the validators' recommendation.

To identify the feasibility of Multimedia Learning used in teaching and learning activities then the material understood by students was tested. This stage is done so that the integrity of learning objectives is achieved through the utilization of learning multimedia. Based on the results of material understanding test, there is a significant improvement of learning outcomes achieved by students in using multimedia learning. It is concluded based on the average grade and achievement of good class learning by showing the mastery and the level of good understanding.

IV. Conclusions and Recommendations

A. Conclusion

Based on the discussion and after going through several stages of development that refer to the model of ADDIE, it can be concluded that the multimedia product of physics learning of kinematics material is straight for high school students of class X. After revised during field trials, multimedia product has a good qualification that is 88.89% and feasible for use in learning. Furthermore, the multimedia product of physics learning of kinematics material of straight motion for high school students of X class can improve student learning outcomes. This refers to the results obtained from the material understanding test that received 88.83% for classical mastery. And the parametric test shows $T_{count} = 4.723 > T_{table} = 1.699$ So with 5% significance there is a significant improvement in learning outcomes by using developed media.

B. Recommendation

Suggestions in this research, to optimize the utilization and development of multimedia learning are among other product development results can be widely used by physics teachers in high school as teaching materials to understand the material Motion Straight Kinematics, this program should be developed on all other basic competencies, product testing should be done in some schools to get data and input to make the product more qualified in learning.

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