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Improving Physics Concepts and Students' Learning Interests Through Interactive Learning Media

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Abstract

This study aims to determine the effectiveness of interactive multimedia-assisted learning media in improving concept understanding and students' learning interests and determine students' responses to interactive multimedia learning media. The research method using Pre-test Post-test Control Group Design. The data collection techniques used were observation, tests, and questionnaires. The subjects of this study were students of class X SMA Negeri 1 Petanahan with a limited trial of 10 students, an experimental class of 36 students, and a control of 36 students. The data obtained were analyzed using the n-gain formula with n-gain criteria. The result of this study indicate the effectiveness of interactive multimedia learning media on concept understanding and learning interest seen from the results of pretest posttest concept understanding and pre post learning interest. The result of data analysis showed that the understanding of concept and interest in learning in the experimental class both overall and in each indicator experienced a better increase than in the control class. The result of the n-gain value of increasing concept understanding is 0.69 with a moderate category and the result of the n-gain value of increasing interest in learning is 0.69 with a moderate category. Thus it can be concluded that the interactive multimedia learning media developed can effectively improve learning interest.

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1. Introduction

A good learning activity process is able to involve students to play an active role, so that students are able to foster the values needed in life [1]. In the world of education, science, and technology that is developing rapidly continuously is highly utilized. Learning media in its use often utilizes technological sophistication. The situation experienced by Indonesia today is the lack of quantity of humam resources (HR) that can accompany the progress of science and technology optimally [2]. The problems that students' usually experience in the learning process are understanding, responding to material delivered by educators, and students' interests in learning. This is because there are still few educators who utilize learning media in the learning process. The method chosen must also be able to increase students' understanding of concept and interests in learning.

Learning media is a tool or intermediary that is useful to facilitate the teaching and learning process in order to convey material to be more interesting and easily understood by students [3].
One of the learning media that can increasing students' interests in learning in the form of interactive learning media [4]. Interactive multimedia is an intermediary tool that conveys messages with the

collaboration of various elements that can create active learning so that message of the information conveyed can be received properly [5]. Physics studies natural phenomena physically and is written in mathematical form so that it emphasizes more the aspect of understanding concepts [6]. In essence, physics is a process and product about the study of the occurrence of natural phenomena. The process is an activity that includes observation, making hypotheses, planning, carrying, out experiments, evaluating measurement data, and so on. The product is the result of the process in the form of facts, concepts, principles, theories, laws, and so on.

Learning objectives are basically the ability of students to understand the content, purpose, and message given by the subject [7]. In the learning process, students are still passive and do not want to ask questions related to material that students have not understood [8] so that misconceptions often occur when given a problem or evaluation. Concept understanding as one of the research issues that is very necessary in evaluating science learning [9]. Concept understanding is the level of ability that expects students to be able to understand the meaning or concepts, situations, and facts they know [10]. Understanding concepts can help someone understand and understand, namely interpreting, giving examples, classifying, summarizing, concluding, comparing, and explaining [11]. Interests have an important role in learning activities. Learning interest is an individual's interest in doing learning with a feeling of pleasure without coercion, which causes changes in knowledge, behavior, and skills. The characteristics of interest in learning can be seen from a strong desire to improve their quality [12].

Based on the results of observations and interview with physics educators in class X SMA Negeri 1 Petanahan, information was obtained that the understanding of concepts and students' interest in learning was still low due to the fact that there were still few educators who could optimally utilize learning media in the learning process and students who easily felt bored when the learning that takes place is one-way. So that it results in students not understanding the material presented, easily feeling bored, and lacking focus during the learning process. Therefore, in this study, interactive multimedia learning media will be developed to improve students' understanding of concepts and interest in learning. The result of the interview conveyed that the understanding of concepts and interest in learning class X students is still low with a percentage of 50% who can understand physics material and the response of students who are less happy when the physics learning process takes place, and students are less interested in learning physics. Low concept understanding and interests in learning can actually be overcome with an interactive multimedia learning media. With this learning media, it can improve students' understanding of concepts and interest in learning. The selection of appropriate learning media is one of the important factors so that the transfer of knowledge from educators is more optimal and not boring so that students not only hear what is conveyed by educators but also follow the lerning process correctly.

Based on the description that has been presentes, it is known that it turns out that the mastery of concept understanding and learning interest of students is relatively low and interactive multimedia as learning media has not been developed and is rarely used by educators as media in learning. This research needs to be studied because to find out how much influence interactive multimedia learning media has on increasing students' concept understanding and interest in learning so that students do not feel bored, understand, and understand what is explained, and motivated to learn.

2. Methods

In this study researchers used quantitative methods. While the research method used is pretest posttest control group design according to Sugiyono [13]. In this research design there are two classes, namely the control class and the experimental class. The experimental class was treated with interactive

multimedia-assisted learning media, while the control class did not use interactive multimedia-assisted learning media. Both classes were given a pre-test post-test and with the same of instrument. This research was conducted at SMA Negeri 1 Petanahan. The research activities were carried out from March to May 2024. The subject of this research is class X SMA Negeri 1 Petanahan in the academic year 2023/2024 even semester. The number of participants in this study was 72 students who were divided into two classes, namely the control class X3 and the experimental class X6. In this study, a limited trial was conducted with a sample of 10 students and a broad trial in the experimental class of 36 students.

In the data collection stage, to obtain data related to the learning media to be developed, data collection is carried out in the form of observations and interviews with Physics Educators in class X SMA Negeri 1 Petanahan, the test method, and the questionnaire method. The concept understanding test method is in the form of essay questions. The questionnaire method uses two questionnaire, namely a student response questionnaire and a questionnaire of student interest in learning media assisted by interactive multimedia. This interactive multimedia-assisted learning media product design contains the material to be delivered. The material used in this study is effort material. Interactive multimedia-assisted learning media will be used after students do a pretest of concept understanding and pre questionnaire of interest in learning with an allocation of 3 × 45 minutes of physics lessons.

The research subjects of interactive multimedia-assisted learning media were SMA Negeri 1 Petanahan class X students'. The instuments in this study are response questionnaires, concept understanding tests, and learning interest questionnaires addressed to class X students. The instrument was prepared to determine the effectiveness of learning media in improving students' concept understanding and interest in learning. After all the data is collected, the next process is to analyze the data, this data analysis uses quantitative. In this data collection is used to see the effectiveness and response to the product so that the data analyzed is the effectiveness of the product in increasing concept understanding and learning interest and students' responses to interactive multimedia-assisted learning media. The total assessment score obtained is entered into the n-gain category level with equation 1.

$$g = \frac{S_f - S_i}{100 - S_f} \quad (1)$$

description: g = normalized gain, S_f = pre-test score, S_i= post-test score. The n-gain criteria g ≥ 0.7 is higt criteria, 0.3 ≥ g > 0.7 in medium criteria, and g < 0.3 is low criteria.

3. Results and Discussion

The results of interactive multimedia learning media on business material can be seen in Figure 1. The results of the questionnaire of students' responses to interactive multimedia learning media in limited trials conducted to ten students. In the content aspect, the percentage obtained was 95%, the language aspect was 96.25%, the display aspect was 90%, the design aspect was 91.25%, the usage aspect was 92.50%, and the overall aspect with a percentage of 93.02%.

Figure 1. Interactive Multimedia Learning Media Results

In this study, a paired sample t-test calculation was carried out on a broad trial that had carried out a pretest posttest of concept understanding and pre post learning interest. The paired sample t-test calculation of concept understanding and student interest can be seen in Table 1 and Table 2.

Table 1. Paired Samples Statistics Concept Understanding

Paired Sample Test									
		Paired Differences					*T*	*Df*	*Sig. (2-tailed)*
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
					Lower	*Upper*			
Pair 1	*Pretest*_E - *Posttest*_E	-27.056	12.835	2.139	-31.398	-22.713	-12.648	35	.000

Table 2. Paired Samples Statistics of Learning Interest

Paired Sample Test									
		Paired Differences					*T*	*Df*	*Sig. (2-tailed)*
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
					Lower	*Upper*			
Pair 1	*Pre*_E - *Post*_E	-28.139	6.970	1.162	-30.497	-25.781	-24.223	35	.000

Based on Table 1 and Table 2 shows the results of the paired sample test results that at the broad trial stage as many as 36 students had carry out pretest posttest concept understanding and pre post interest learning interest. The significant result of testing concept understanding is 0.000 < 0.05, so it can be concluded that there is a difference in n-gain on the test of understanding the concept of students, which means that there is an effect of the use of interactive multimedia learning media in the learning process. There is an effect of using interactive multimedia learning media in improving concept understanding. The significant result of testing learning interest is 0.000 < 0.05, so it can concluded that there is a difference in n-gain in the learning interest questionnaire which means there is an effect of using interactive multimedia learning media in improving concept understanding, which means that there is an effect of using interactive multimedia learning media in increasing interest in learning. Graph of the increase in concept understanding and interest can be seen in Figure 2.

In the broad trial phase of class X6 as many as 36 students have carried out a pretest posttest of concept understanding and pre post learning interest. The average result and n-gain of understanding of concepts in the control class obtained pre result of 58.89 and post 77.67, while in the experimental class obtained pre results of 60.94 and post of 88.00. While the average results and n-gain of learning interest in the control class obtained pre result of 58.06 and post of 78.75, while in the experimental class obtained pre results of 59.11 and post of 87.25.

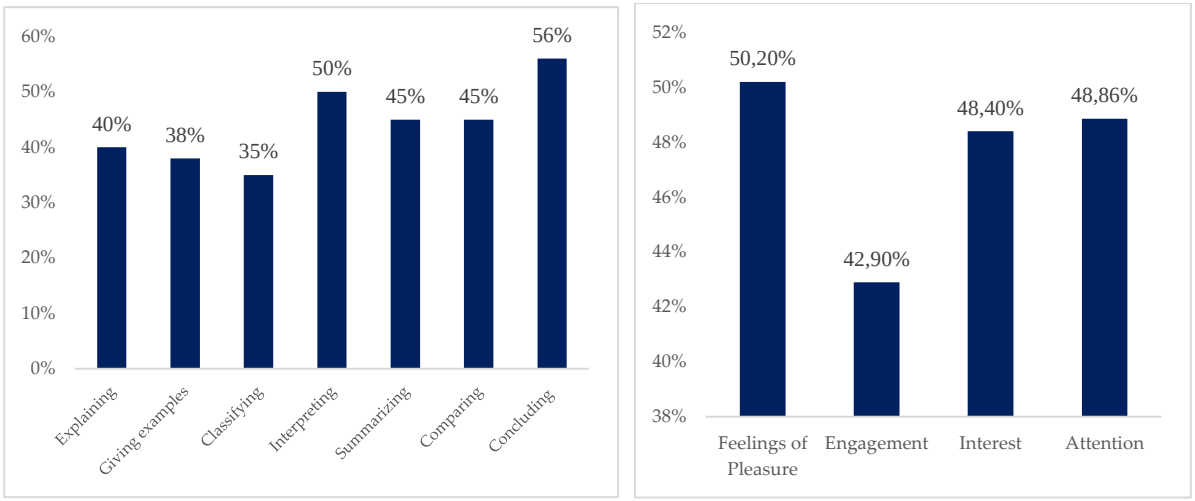

Figure 2. Students' Concept Understanding and Physics Learning Interests

The concept understanding aspect consists of seven aspects, namely explaining, giving examples, classifying, interpreting, concluding, comparing, and summarizing. In the aspects of explaining an increase of 40%. The increase in aspects explained because students answered the test questions correctly without rushing in doing so that students could understand deeply. The increase in explaining aspects to become the fifth aspect from the highest to the lowest aspect of the increase also occurred in the study [11]. The aspect of giving examples increased by 38%. The increase in the aspect of giving examples is because students get examples of problems that illustrate a concept. The classification aspect increased by 35%. The incraese in the classification aspect is because students can express the concept an example. The aspect of interpreting increased by 50%. The increase in interpreting aspects is because learners can organize the same information in different forms. The concluding aspect increased by 45%. The increase in the conclusion aspect is because students can abstract a concept. The comparing aspect increased by 45%. The increase in the comparing aspect is because students can find out the relationship between two or more obejcts. And the summarizing aspect has increased by 56%. The increase in summarizing aspects to be the highest aspect of improvement also occurred in the study [14] which states that one of the aspects of concept understanding with the highest percentage of improvement is the summarizing aspect with a percentage of 65%. There are two aspects of concept understanding that have the same percentage increase, namely the summarizing aspect and the comparing aspect.

The physics learning interest aspect consists of four aspects, namely feelings of pleasure, involvement, interest, and attention. The aspect of feeling happy has increased by 50.20%. The increase in the aspect of feeling happy because students know the use of physics in everyday life, students are excited and happy to follow physics learning takes places, and students are present when learning physics. The involvement aspect is 42.90%. The increase in the involvement aspect is because students follow and like physics guidance, are active in discussion, actively answer questions from educators, and students study physics before and after learning. The increase in the engagement aspect with the lowest increase compared to other aspects also occurred in the study [15]. The aspect of interest increased by 48.40%. Thus, aspect of interest increasing because students are enthusiastic about physics learning, students do not delay the tasks given by educators, students do not shout when approaching the change of lesson hours, and students do not complain when given tasks by educators, and the attention aspect has increased by 48.86%.

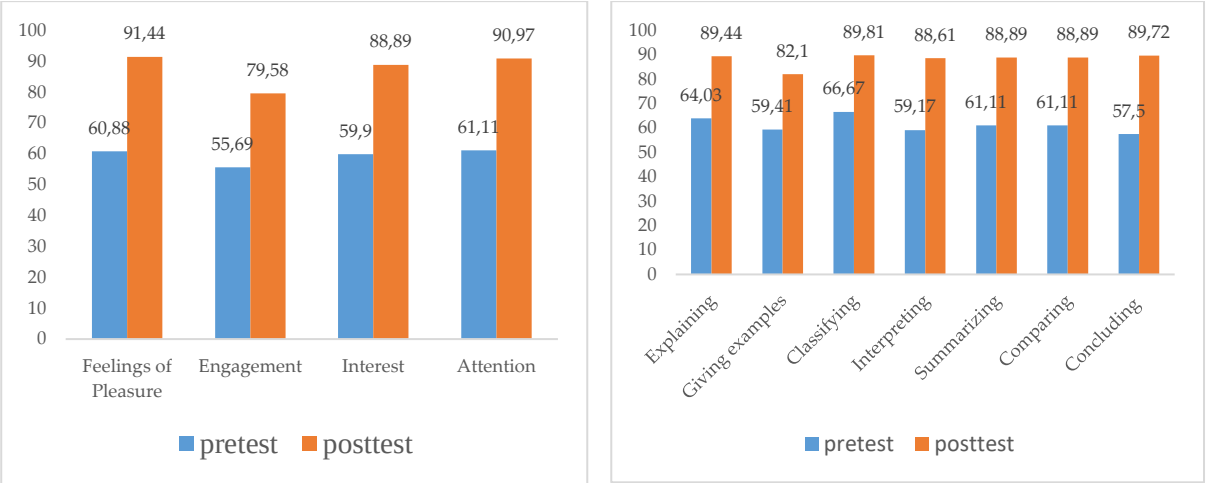

Figure 3. Pre-test and Post-test Result Student's Concept Understanding and Learning Interests

The increase in the attention aspect is because students pay attention and listen to the explanation of the educator, students record the material that has been explained, students are not busy themselves when physics learning increase in the attention aspect is because students pay attention and listen to the explanation of the educator, students record the material that has been explained, students are not busy themselves when physics learning takes place, and students who listen and pay attention to the opinions of friends. The increase in the aspect of feeling happy with the highest improvement also occurred in the study [15]. The graph of increasing concept understanding and learning interests on each indicator between pre-test post-test shows on Figure 3.

Based on the above statement, it can be concluded that interactive multimedia learning media is proven to improve students' concept understanding and interest in learning. The pretest results revealed that students had limited understanding of fundamental physics concepts. Many struggled with applying theoretical principles to problem-solving scenarios, and misconceptions were commonly observed. Additionally, survey responses indicated a moderate level of interest in physics, with several students expressing difficulty in relating physics concepts to real-world applications. The integration of multimedia in physics education has been widely studied as an effective strategy for improving students' conceptual understanding and increasing their interest in learning [16]. This study aimed to evaluate how multimedia-based instruction influences students' comprehension of physics concepts and their engagement in the learning process.

The findings indicate a significant improvement in students' understanding of fundamental physics concepts after multimedia-based instruction. Interactive simulations, animations, and video demonstrations helped students visualize abstract concepts, such as motion, energy, and electromagnetism, in a more concrete manner. Compared to traditional lecture-based learning, multimedia allowed students to grasp relationships between variables more effectively, thereby reducing misconceptions. Pre-test and post-test results demonstrated a measurable increase in students' ability to apply theoretical principles to real-world problems [17].

The study also revealed that multimedia positively influenced students' motivation and interest in physics. Engaging visual content and interactive learning experiences made the subject more accessible and enjoyable. Many students reported feeling more involved in the learning process, as multimedia provided a dynamic and engaging way to explore physics concepts. The survey responses indicated that students appreciated the variety of multimedia elements, such as augmented reality (AR), virtual experiments, and gamified learning activities, which contributed to a higher level of enthusiasm and participation [18].

Despite the promising results, some challenges were identified, such as technological accessibility and students' varying levels of digital literacy. Some students initially struggled with navigating interactive tools, highlighting the need for structured guidance. Additionally, educators expressed the need for professional development to effectively integrate multimedia into their teaching practices. The research findings confirm that multimedia plays a crucial role in improving students' conceptual understanding and fostering greater interest in physics learning. By transforming abstract theories into engaging and interactive experiences, multimedia has the potential to revolutionize physics education, making it more accessible, enjoyable, and effective.

4. Conclusion

This learning media explains about effort material and its application in everyday life. After conducting the validation stage of several expert lecturers and physics educators as well as trials conducted on interactive multimedia learning media in class X SMA Negeri 1 Petanahan material, it is said to be effective for improving students' concept understanding and learning interest with an n-gain value of 0.69 on students' concept understanding and an n-gain value of 0.69 on students' learning interest.

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