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Interactive Multimedia Assisted Direct Learning to Improve Student's Understanding of Fluid Concepts

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ABSTRACT

The use of appropriate media is minimal in physics learning today, which impacts students' lack of motivation and indirectly affects their learning outcomes. A direct learning model with interactive multimedia is an alternative solution during the current pandemic. This study aims to improve students' understanding of physics concepts by applying a direct learning model with interactive multimedia. This is a quasi-experimental research with a pretest-posttest control group design using a purposive sampling technique. Forty-five respondents were divided into two groups, experimental and control. N-Gain was used to determine the high increase in both groups. The test was used to collect data on students' conceptual understanding in the form of a description with a total of 5 questions. In addition to the N-Gain, a t-test was also conducted to test the mean difference of the data. The findings revealed that the understanding of the concepts of the two groups had increased, where the experimental group was 40.3, and the control group was 35.8 but did not differ significantly. It can be concluded that the understanding of the fluid concept of the experimental class students is not better than the control class students.

Introduction

Physics is an empirical science with abstract concepts and is quite challenging to imagine. The problematic concept must be changed to be actual to make this easier. Students in learning physics are required to interact actively with concrete objects. Preliminary observations show that some high schools in Sumbawa Regency are still unable to provide opportunities for students to be able to observe actual events related to the learning material being studied to construct their understanding. This causes students' low motivation to learn, which will impact their lack of ability to understand physics concepts.

The concept of physics that students consider difficult is more difficult due to its unique characteristics that are not shared by other subjects. Physics subjects are categorised as subjects that students dislike because they are too tricky (Astalini et al., 2019). These problems impact the low enthusiasm of students to take physics lessons. The complex physics assumptions, such as the formula for each material that students must memorise and do not understand the formula's origin, make students bored (Chusni, 2016). In addition to these causes, many students feel bored and do not understand physics concepts because lectures and practice questions dominate the delivery method. The impact of continuing such habits on student learning outcomes is the low level of student understanding of physics concepts. Yahya et al., (2019) stated that physics learning in the classroom is more dominant using lectures and simple demonstration methods.

We use interactive multimedia as a direct learning medium in physics lessons to change students' mindsets to overcome these problems. Interactive multimedia is one of the computer-oriented media that can be developed to help educators and students in the

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learning process (Hapsari et al., 2020). Interactive multimedia can be adapted to the characteristics of fluid materials and must be adapted to learning models that can construct student understanding to facilitate its application. The direct learning model can be used as an appropriate alternative solution to be combined and matched with interactive multimedia to overcome the impact of existing problems on student motivation and learning outcomes. According to Ekasari et al., (2017), using a direct learning model is very effective in improving students' skills.

Learning media is very necessary for direct learning to support the achievement of learning objectives. Therefore we need appropriate learning media to make it easier for students to understand physics material. The use of interactive multimedia in the teaching and learning process can generate students' motivation to learn. It will affect the psychology of students to grow interested and desire to learn (Nugrahani, 2007). This media is also because the teaching-learning process itself always involves interaction activities. Teaching and learning interactions are to help children in certain development. Therefore the learning process must be aware of the goals (Qosyim & Priyonggo, 2018). The learning process should use the student centre method to be more motivated, and there is a conducive interaction with the teacher as a learning facilitator.

A direct learning model process with interactive multimedia is carried out so that students can process the information received to build their understanding of concepts directly. A direct learning model was used because the school where the research was conducted used this model. In addition, the direct learning model is a model that refers to learning patterns in which the teacher explains more concepts or skills to several groups of students (Auliyah & Prabowo, 2020). The computer is the main device that can be used to meet the expectations desired by the teacher in the learning process. This device presents various kinds of information to students through multimedia. The research showed that the device could make it easier for students to understand difficult topics (Diah & Sekreningsih, 2017).

Husein et al., (2017) stated that students' reasoning abilities could be improved by using interactive multimedia in the learning process because of the ease experienced by students. They find it easier to understand the material being studied.

Methods

This study aims to improve students' understanding of concepts in physics subjects by using interactive multimedia with direct learning. This research is quasi-experimental by applying a direct learning model combined with interactive multimedia during the physics learning process, especially in the fluid concept. The design of this study used a pretest-posttest control group design. Before giving, students are given a pretest (pretest) in both classes to determine their initial abilities of students. After using interactive media in the learning process directly in the class, a post-test was carried out to determine the final capacity of students so that they could know the increase in students' understanding of concepts.

One of the senior high schools in Sumbawa Regency was chosen as the place for the research. The research population of all class XI MIA (Math and Science Class) in SMAN is 45 students. Sampling used a saturated sample with a full selection of 2 classes, namely class XI MIA 1, totalling 23 students, used as the control class and class XI MIA 2, totalling 22 students, as the experimental class. Data was collected using a test technique in the form of giving a test. The type of test used is a descriptive test of 5 questions and is applied at the beginning and the end of the lesson. The calculation of the pretest and post-test results increasing students' understanding of physics concepts is calculated using the N-Gain formula. To find out the difference between the two groups, the data that has been obtained is tested for the average difference using the t-test (independent sample t-test).

Result and Discussions

In this study, a pretest and posttest were conducted to determine the level of understanding of students' concepts. The pretest was given before starting the research to determine the student's initial abilities. At the same time, the posttest was tested after the study to measure the understanding of the concepts obtained by the students. After the pretest was given, the two classes were offered treatment using different media with direct learning models. The control class was given treatment using conventional media as is usually done by teachers in the classroom. The experimental class was given treatment using interactive multimedia as a comparison medium. Traditional media used are books and physics worksheets provided by the centre, and there are no other developments. The interactive multimedia has been adapted to the material and fluid concepts studied. Interactive multimedia contains fluid material, learning videos, simulations, animations, and images related to the material. The pretest and posttest data calculations can be seen in Table 1.

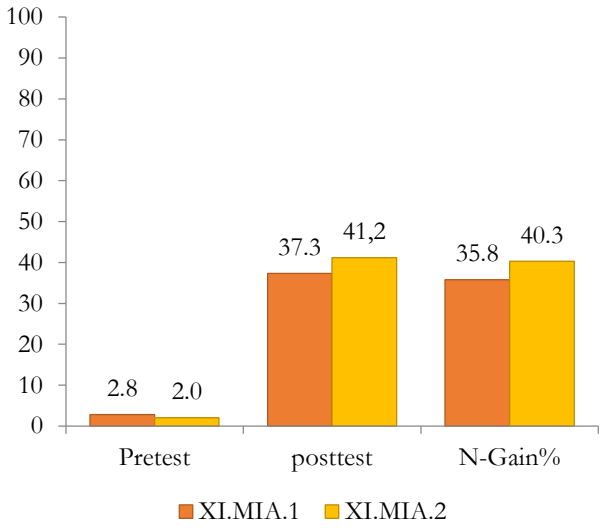
Table 1

Pretest and Posttest Results

Data	Pretest		Postest	
	Control	Experimental	Control	Experimental
Average	2.8	2.0	37.3	41.2

From Table 1, it can be seen that the effect of using interactive multimedia during direct learning in improving students' physics concepts is better than teaching without using learning media. The control class obtained an average initial test score of 2.8, and the experimental class received 2.0. For the final test, the experimental class got an average score of 41.2 and 37.3 for the control class. The average value of the two types is much different, with a difference of 3.9. The average score of learning outcomes is presented in Figure 1.

Figure 1
Comparison of the Average Value of Concept Mastery and N-Gain



From Figure 1, it can be seen that there is an increase in the average pretest and posttest scores. However, after calculating mathematically, the increase in the average value of the two classes after learning for the control class was 35.8 (from 2.8 to 37.3), while in the experimental category, it was 40.3 (from 2.0 to 41.2), there was a good increase in students' understanding of physics concepts by using multimedia interactive. The gain test is used to determine students' knowledge of fluid concepts. Figure 1 shows an increase between the results of the pretest and posttest.

To find out whether there is a significant difference in the average between the two groups, a t-test was used to test the mean difference between the two classes. As a prerequisite for the t-test, homogeneity and normality tests were carried out in both classes. The results of the homogeneity test and the normality test of the research data are presented in Table 2 and Table 3.

Table 2
Data Homogeneity Test

Levene Statistic	df1	df2	Sig.
15.510	1	43	.000

Based on the data in Table 2 and Table 3, it is concluded that the data is not homogeneous and normally distributed. Followed by the t-test, whose data are presented in Table 4. Based on the test data for the average difference, it can be concluded that there is no significant difference between the control class and the experimental class.

Table 3
Data Normality Test

		Class	Value
N		45	45
Normal Parametersa,b	Mean	1.4889	.3133
	Std. Deviation	.50553	.20321
Most Extreme Differences	Absolute	.344	.156
	Positive	.344	.156
	Negative	-.333	-.098
Kolmogorov-Smirnov Z		2.310	1.048
Asymp. Sig. (2-tailed)		.000	.222

Table 4
Independent Sample 2 Test

t	df	Sig. (2-tailed)
-1.374	43	.177

Students are still confused in answering questions during the initial test, which makes their pretest scores low. The problem is that students have difficulty solving problems because students are confused in starting calculations or solving. Students tend to think if the equations used in solving problems are equations or formulas that have just been taught. Students' unfamiliarity with fluid concepts makes it difficult for them to recall the material or images that have been taught so that they cannot identify quantities whose value is unknown to solve the given problems.

The results of data analysis using the n-gain test showed that students' understanding of physics concepts in the experimental class was higher than that of the control class; this indicates that the material contained in interactive multimedia has been arranged

in stages which can make it easier for students to understand fluid concepts. In line with that, Hermansyah et al., (2021) & Hermansyah et al., (2019) stated that the systematic presentation of material in the virtual media used makes it easier for users to understand the physics concepts be conveyed. Animations and simulations used to explain fluid concepts can train students' logical thinking in solving given problems.

Increased students' understanding of the indicators of making inferences is high compared to other indicators, showing that the concepts conveyed through interactive multimedia are arranged sequentially with examples of questions, interactive exercises and tests, assignments to work on questions, and activities to make conclusions on each worksheet. Students in interactive simulations proved to be influential in improving students' understanding of physics concepts.

Asyhar et al., (2018) stated that interactive multimedia is valid, reliable, practical, and effective for use in the learning process. Gunawan et al., (2017) noted that interactive multimedia could improve students' mastery of electrical concepts. Knowledge of students' physics concepts can be enhanced through the use of interactive multimedia (Gunawan et al., (2016); Yanti et al., (2017); Khamzawi & Wiyono, (2015)). By including interactive multimedia in learning, students can be more independent in obtaining information and constructing their understanding. The difference in the improvement that was still classified as moderate between the experimental and control groups was caused by a little time to prepare, students were still clueless, and math problems were still a scourge for students.

Conclusions

Based on the research that has been done, the conclusion that can be drawn is that the direct learning model with interactive multimedia is not better than the class that uses the direct learning model with conventional media. To maximise the increase in students' understanding of concepts, preparation before conducting research must be carried out to the maximum and adjusted between the sample and the media to be used so that analysis can run effectively and efficiently.

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