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Implementation of the Flipped Classroom in Learning Sound Wave toward Students' Learning Interest

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Abstract: This study aims to see the influence of the Flipped Classroom learning model on student learning interests. Samples were taken by purposive sampling technique with samples of students of grade XI IPA1 and XI IPA2 SMAN 9 Banda Aceh. The method used quasi-experiment with the design of The Nonequivalent Control Group Design. The instrument used is a questionnaire using the Likert scale to measure students' interest in learning. The results of the study showed that there was a difference in increased interest in learning between students who taught with the flipped classroom model and classes without the flipped classroom model. Testing the hypothesis of increased interest in learning has $t_{count} = 4.108 > t_{table} = 2.306$ with a two-sided significance value (Sig. 2-tailed) greater than $\alpha = 0.05$ which is 0.003, meaning that there is a significant difference, then Ha is accepted and H0 is rejected.

Keywords: flipped classroom, interest in learning, physics education.

Abstrak: *Penelitian ini bertujuan untuk melihat pengaruh model pembelajaran Flipped Classroom terhadap minat belajar peserta didik. Sampel diambil dengan teknik purposive sampling dengan sampel peserta didik kelas XI IPA1 dan XI IPA2 SMAN 9 Banda Aceh. Metode yang digunakan quasi eksperimen dengan rancangan The Nonequivalent Control Group Design. Instrumen yang dipakai berupa angket dengan menggunakan skala likert mengukur minat belajar peserta didik. Hasil penelian menunjukkan bahwa bahwa terdapat perbedaan peningkatan minat belajar antara peserta didik yang ajarkan dengan model flipped classroom dan kelas tanpa model flipped classroom. Pengujian hipotesis peningkatan minat belajar memiliki thitung = 4,108 > ttabel = 2,306 dengan nilai signifikansi dua sisi (Sig. 2-tailed) lebih besar dari α = 0,05 yaitu 0,003, artinya terdapat perbedaan yang signifikan, maka Ha diterima dan H0 ditolak. Peningkatan minat belajar peserta didik dengan penerapan model flipped classroom lebih baik dibandingkan kelas tanpa penerapan model flipped classroom.*

Kata kunci: *flipped classroom, minat belajar, pendidikan fisika.*

▪ INTRODUCTION

Education has a very important role in ensuring the survival of the nation and state, because education is a vehicle for improving and developing the quality of human resources. Factors that support a student's achievement in learning include the student's interest in learning. During the pandemic, online learning had problems that caused students' interest in learning to decrease (Yanti & Sumianto, 2021). Information technology learning has indeed been implemented in the last few years in the education system in Indonesia (Pusdatin Kemdikbud). Regarding the implementation of learning activities, students at school study various sciences and efforts are made so that all students get good grades which of course can be achieved by having a high interest in learning (Astuti, 2015). Learning applied in the 21st century requires student-centered

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learning (Nyeneng et al. 2018). Currently, teachers are required to be able to utilize technology in the learning process to attract interest in learning so that students are active in ongoing learning activities as well as classroom learning.

Several problems were found in the initial study at one of the state high schools in Banda Aceh in physics subjects, including: lack of teacher participation in designing and implementing various methods that were relevant to the situation or material, the school learning process only used textbooks as the only learning resource. one, and a lack of interest in learning from within students. This can be seen from students who do not pay attention to lessons, students who are lazy to express opinions, are not active in class, and the learning process looks monotonous because learning methods are not optimal. Even though active students are a form of their interest in learning. As a result, students' daily scores are still below the minimum completion criteria, namely 75 and based on the explanation from the Head of Curriculum that none of the national examination tryouts held before the pandemic in physics learning have met the target. Apart from that, interviews were also conducted with physics subject teachers, it was found that the teacher explained that schools currently need online learning to catch up with material. The teacher also added that the decreasing interest in learning about physics material is a solution that the application of appropriate media and models is really needed so that students can catch up and increase students' interest in learning.

Interest has a big influence on learning (Slameto, 2010: 89). Someone who is interested in a subject will achieve optimal learning outcomes. Researchers in the field generally agree that interest consists of cognitive and affective components (Fryer, 2015). In order for interest to develop, someone needs to create interesting content (Renniger and Hidi, 2017). Therefore, teachers must be able to arouse the interest of all students to achieve the specified competencies.

One effort that can be made to increase students' interest in learning is by implementing a learning modelflipped classroom which is integrated with learning media. Technological developments have influenced aspects of human life, especially in the field of education (Wahyuliana, et al. 2023). According to Uzunboylu & Karagozlu (2015) the flipped classroom is replacing direct instruction with videos and encouraging students to focus on important learning activities with their teachers in the classroom. Zamorano, et al (2019) stated learningFlipped Classroom has a positive effect on students' knowledge, skills and engagement. Furthermore, Awidi and Paynter's (2018) findings show that the elements of the student learning design model presented in this article correlate with student self-confidence, motivation and engagement. Learningflipped classroom is the result of new ideas and includes e-based learning modelslearning which supports the industrial revolution 4.0 and 21st century learning. The face-to-face model plus one tutorial every week has become the standard approach for course delivery in higher education for some time (Butt, 2014). The flipped classroom is a learning design that plays an important role in blended learning (Baepler, Walker & Driessen, 2014)

Use of modelsFlipped Classroom requires learning media in its use. Among the many options, Edmodo has become one of the most widely used social learning platforms by educators, offering many features that enable different modes of interaction and virtual activities. It can be said to be like Facebook but aimed at the learning process (Sulisworo, et al. 2018: 57). Through stepsflipped classroom such as pre-class activities, students are ready to learn at school because materials and videos regarding the material have been

provided first in pre-class activities. Busyaeri, et al (2016) Videos can be used for almost all topics, types of learning, and every domain: cognitive, affective, psychomotor, and interpersonal. This is in accordance with Chandra and Nugroho (2016) who stated that students become active and motivated to practice the exercises because the examples from video media are very clear using audio visuals which are very easy to catch and interesting. However, the use of this learning model adds to the tasks that must be carried out by teachers (Odzamli & Asiksoy, 2016). Before flipping an entire course, teachers can start small and proceed at a reasonable pace (Grypp and Luebeck 2015; Snyder et al. 2014).

According to Bariroh (2021), students are taught using modelsflipped classroom shows higher interest and activeness in learning compared to students taught using conventional learning models. Students who have good initial abilities will understand the material more quickly compared to students who do not have initial abilities in the learning process and this will have an impact on learning achievement. Schools can provide opportunities for teachers to share their experiences in implementing flipped classrooms as well as receive feedback from colleagues or other experts (Mazur et al. 2015). In the study of Kirvan et al. (2015), a student teacher joined the team teaching of their flipped classroom. Teachers can create online discussion forums for students to post their questions and discuss with peers (Bhagat et al. 2016).

Some research regardingflipped classroom carried out by Farman and Chairuddin (2020) stated that the learning modelflipped classroom Edmodo-based can increase student interest and learning outcomes. Rohmah, et al (2019) stated that there were several positive effects produced after implementing the learning modelflipped classroom including increasing motivation, interest in learning and learning outcomes. Chotimah, et al (2021) added that learning using Edmodo can influence students' interest in learning. Furthermore, research related to the use of Edmodo was carried out by Muhajir, et al (2019), Hatip and Listiana (2019), and Dewi (2014) with the result that the application of Edmodo learning media was more effective because there was an increase in interest and learning outcomes. By increasing interest, it is hoped that student learning outcomes can increase, this is in accordance with Khumairah, et al. (2020), Walidah, et al. (2020), (Rusdi, et al. 2016), that the application of the learning modelflipped classroom has a positive effect on learning outcomes. According to Tsai,et al (2020) Brainstroming flipped classroom has increased learning motivation and student learning outcomes.

▪ METHOD

Participants

To determine the sample to be used, the researcher used a purposive sampling method, namely purposeful sampling by looking at the level of cognitive equality of students in two classes which was balanced based on pretest or initial test scores. The samples taken in this research were 2 classes where 1 class was an experimental class, namely XI IPA 2, with a total of 26 people and 1 control class, namely XI IPA 1, with a total of 25 students.

Research Design

The research design used was Quasi Experimental Design with Nonequivalent Control Group Design. This design is a pretest and posttest design carried out in two

groups, namely one experimental class and one control class. In this way, the results of the treatment can be known more accurately, because it can be compared with the situation before the treatment was given (Sugiyono, 2012: 110) [25].

This quasi-experimental research carried out one measurement at the beginning of the class (pre-test) before the treatment, after being given the treatment, another measurement test (post-test) was carried out. The experimental class treatment used the Edmodo-based Flipped Classroom learning model, while the treatment given in the control class was a conventional Edmodo-based model.

Instruments

The research data collection technique used is non-test in the form of a questionnaire. The learning interest questionnaire is prepared based on a Likert scale with 4 alternative answer choices, namely strongly agree, agree, disagree and strongly disagree. The learning interest questionnaire contains 20 statement items. Questionnaires about interest in learning before or after learning are given after the learning has been completed.

The learning interest questionnaire was prepared based on 5 indicators adapted from Friantini and Winata (2019) along with information taken from Darwin (2012). The five indicators include: 1) a feeling of enjoyment towards learning; 2) there is concentration of attention and thoughts on learning; 3) a willingness to learn; 4) the presence within oneself to actively learn; 5) there are efforts made to realize the desire to learn. The indicators derived were developed by the researchers themselves to produce 20 statement items and have been tested. Details of Indicators 1) a feeling of enjoyment towards learning; represented by 4 statement items, 2) there is a focus of attention and thoughts on learning; represented by 6 statement items, 3) the willingness to learn; represented by 3 statement items, 4) the presence within oneself to actively learn; represented by 4 statements, and finally indicator 5) the efforts made to realize the desire to learn, represented by 3 statement items. Based on the values obtained from the 20 statement items used that have been tested, the results of the average validity of the 20 statement items are at an r_xy value of 0.722 with the "High" validity category and the average reliability of the 20 statement items is at a value of 0.865 with the "High" reliability category.

Data Analysis

Analysis of data on the achievement of students' learning interest using the Excel test using the Yusrizal method (2016). The interest questionnaire was analyzed by determining the n-gain score first, then determining the difference using a two-sided t-test based on the n-gain value obtained. The t-test chosen is the independent sample t-test (test of two unrelated samples) carried out using SPSS (Statistical Package Social Science) version 20.0 for Windows.

▪ RESULT AND DISSCUSSION

Statistical Analysis

The first stage in analyzing the learning interest questionnaire is carried out by determining the score for each indicator of learning interest, then looking at the increase through N-gain. After carrying out the N-gain test, a hypothesis test is then carried out based on the N-gain obtained. The following is an analysis table of increasing student

interest in learning which has been presented briefly, which can be seen in the following table.

Table 1. Students learning interest analysis

Group	Average score		Average N-gain	Category
	Pretest	Posttest		
Control	67.2	76.4	0.28	Low
Experiment	70.198	87.6	0.52	Middle

Table 1 analyzes the increase in interest in learning in the mean pre-test interest score column. Although there is a slight difference in the pre-test scores between the control and experimental classes, overall the difference is not much, and based on the pre-test interest t-test, there is a difference where the significance is not far from 0.05, namely 0.02. Based on data analysis for each indicator, a data indicator score is obtained on the interest questionnaire as presented in table 2.

Table 2. Analysis of increasing student interest in learning for each indicator item

No	Indicators	Control			Experiment		
		Pre	Post	N-gain	Pre	Post	N-gain
1	There is a feeling of enjoyment towards learning	66	78	0.37	67	86	0.51
2	There is a concentration of attention and thoughts on learning	68	75	0.24	71	85	0.43
3	There is a willingness to learn	67	76	0.27	69	93	0.69
4	The presence within yourself to actively learn	68	75	0.23	72	90	0.55
5	There are efforts made to realize the desire to learn	67	78	0.32	71	84	0.41

To carry out a t-test or Independent Sample T-Test, normality and homogeneity tests must be carried out first. The data normality test was carried out to see whether the data on increasing interest in learning was normally distributed or not, while the data homogeneity test was carried out to see the difference in variance in increasing student learning outcomes between the control class and the experimental class. The homogeneity test was carried out using the Levene Statistics test using a significance level of $\alpha = 0.05$.

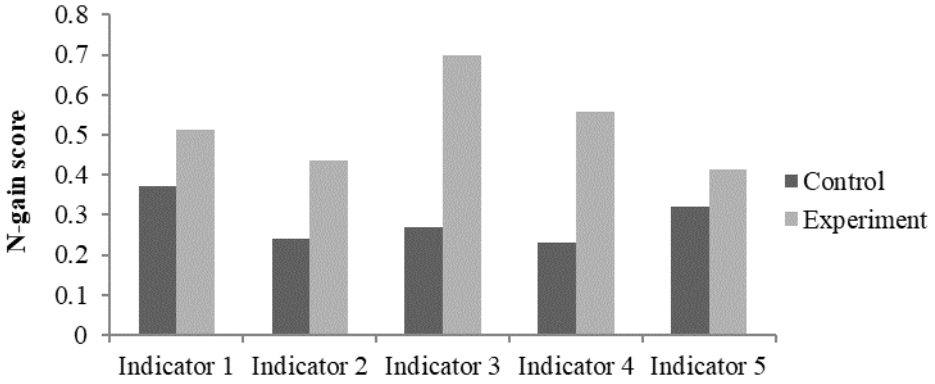
Based on the results table, the Sig value in the Shapiro-Wilk column is obtained. for the control class it is 0.531 and the experimental class it is 0.553 where 0.531 and 0.553 are greater than 0.05 or $0.531 > 0.05$ and $0.553 > 0.05$. Therefore, it can be concluded that the n-gain data in the control class and experimental class is normally distributed. Based on the table of results, the learning interest of students in the control class and experimental class has a significance value greater than $\alpha = 0.05$, namely 0.301. This shows that the data on increasing student interest in learning in the control class and experimental class comes from the same variant (homogeneous). Next, a hypothesis test was carried out to see the difference in the means of the two samples using an independent t-test using a significance level of $\alpha = 0.05$. This test was carried out to prove that there was a significant difference in increasing students' interest in learning between the control class and the experimental class. The results of the test analysis of differences in data on

increasing students' interest in learning in the pretest stages of the control class and experimental class are presented in the following table.

Table 3. Hypothesis test of students learning interest

Groups	N	df	N-Gain	Mean Difference	T_{count}	T_{table}	Sig. (2-tailed)
Control	5	8	0.28	0.23	4.108	2.306	0.003
Experiment	5		0.52				

Based on the table above, data on increasing student interest in learning in the control class and experimental class has $t_{count} = 4.108 > t_{table} = 2.306$ with a two-sided significance value (Sig. 2-tailed) greater than $\alpha = 0.05$, namely 0.003 or $0.003 < 0.05$ means that there is a significant difference in the learning interest of students in the control and experimental classes, then H_a is accepted and H_0 is rejected. The standard of learning interest has been achieved in the experimental class with the students' posttest achievement score being 87.6. The increase in students' learning interest in each indicator item between the experimental and control classes can be seen in Figure.



Notes:
Indicator 1: Feelings of joy
Indicator 2: Focusing attention and thinking
Indicator 3: Willingness to learn
Indicator 4: Self-awareness to actively learn
Indicator 5: Efforts to realize the desire to learn

Figure 1. N-gain score for each indicator of students' learning interest

Based on the figure above, the data interpretation in the dark gray graph shows the n-gain of indicator items for the control class and the light gray color shows the n-gain of indicator items for the experimental class. The biggest difference lies in the third indicator, namely the willingness to learn, indicated by students asking questions in class, where the control class got a score of 0.27 in the "medium" category and the experimental class got a score of 0.69 in the "medium" category. This is because through the pre-class stage in implementing the flipped classroom model, students become enthusiastic in learning, especially when asking questions. The initial knowledge possessed by students

makes students interested in studying at school. This is followed by the fourth indicator of self-awareness for active learning, marked by students summarizing and recording the material, where the control class got a score of 0.23 in the "medium" category and the experimental class got a score of 0.55 in the "medium" category. In accordance with Darwin (2012), several indicators of interest in learning are asking questions when it is not clear, answering questions, being interested in doing practice questions, and concluding learning material. So, to encourage students to ask questions, researchers provided stimuli in the form of videos and teaching materials through flipped classroom steps. Furthermore, Hew and Low (2018) also stated that the flipped classroom approach was more effective when the instructor used questions at the beginning of each class session.

Figure 1 shows that students' interest in learning in the experimental class is better than in the control class. Indicators of feelings of enjoyment towards learning, concentration of attention and thinking, as well as efforts to realize learning which is characterized by students looking for sources other than those provided by the teacher also show n-gain scores in the experimental class which are better than the control class. This difference in learning interest is caused by the application of the Edmodo-based flipped classroom model which causes students' interest in learning due to the video watching activities carried out by students through the activity steps in the Flipped Classroom model.

Students' desire to learn through the materials and videos provided in Edmodo classes is much greater because these activities are carried out outside the classroom. Meanwhile, the control class did not carry out any pre-class steps but the material was provided by the researcher during the class (direct learning). Following previous reviews (e.g., Bernard 2015; Betihavas et al. 2016; Bishop and Verleger 2013; Chua and Lateef 2014; Giannakos et al. 2014; O'Flaherty and Phillips 2015; Presti 2016; Seery 2015; Zainuddin and Halili 2016; Zuber 2016), we know that the flipped classroom approach allows teachers to spend more classroom time on student-centered instruction such as group discussions and individual teacher assistance; that student perceptions and engagement with the flipped classroom approach are generally positive; and that several indirect educational outcomes such as improving students' communication skills, promoting more independent learners, and changes in study habits (e.g., reviewing online learning materials before exams) may result from implementing this instructional approach. According to Zainuddin and Halili (2016) various fields are practiced in the flipped classroom, and several technological tools are used as online platforms for practice. Impact analysis shows that the flipped classroom has a positive impact on students, learning activities such as achievement, motivation, involvement and interaction.

The use of technology such as learning videos is a special attraction for students. Through Edmodo, students can view videos and comment freely on the videos provided, as well as on material shared by teachers on the homepage. As explained by Busyaeri, et al (2016), videos can be used for almost all topics, types of learning, and every domain: cognitive, affective, psychomotor and interpersonal. In the cognitive realm, learning can observe dramatic recreations of past historical events and actual recordings of current events, because the elements of color, sound and movement here can make the characters feel more alive. Apart from that, watching videos, after or before reading, can strengthen

students' understanding of teaching material. A learning atmosphere that suits the characteristics will make learning more enjoyable, so that the increase in students' reasoning abilities with Edmodo-based flipped classroom learning is higher than conventional learning. This is in accordance with Chandra and Nugroho (2016) who stated that students become active and motivated to practice the exercises because the examples from video media are very clear using audio visuals which are very easy to catch and interesting. Simpson and Richards (2015) show that the effectiveness of the flipped classroom design is useful in designing courses that are more effective regarding the needs of students. When comparing learning outcomes with traditional teaching, previous researchers suggest that the flipped classroom approach can improve student performance (Lo & Hew, 2017).

Table 7 shows that the increase in students' interest in learning in the control class and the experimental class is that there is a significant difference with a significance of 0.003, so Ha is accepted and H0 is rejected. The conclusion from these differences shows that there is an influence caused by implementing the Edmodo-based flipped classroom learning model. This difference is caused by the application of the flipped classroom model making students ready to take part in learning because the teacher has provided videos or material that must be studied before the start of class. In accordance with the research results of Bariroh (2021), students who were taught using the flipped classroom model showed higher interest and activeness in learning compared to students who were taught using the conventional learning model, because by using this method students felt more interested and enthusiastic in learning and Students become more interested when learning takes place.

▪ CONCLUSION

Testing the hypothesis of increasing interest in learning based on the results of data analysis shows that there is a difference in increasing interest in learning between students who are taught using the flipped classroom model and classes without the flipped classroom model. Increasing students' interest in learning by implementing the flipped classroom model is better than classes without implementing the flipped classroom model. This can be seen from students who ask questions when they are not clear, answer questions, are interested in doing practice questions, and summarize the learning material.

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