



The Effect of Edmodo-Based Flipped Classroom Learning Model on Students' Learning Outcomes on the Topic of Sound Waves

Miswatul Hasanah¹, A Halim^{2*}, Rini Safitri², Yusrizal²,

¹ Postgraduate Program, Science Education Study Program, Syiah Kuala University, Banda Aceh, Indonesia

² Physics Education Study Program FKIP Syiah Kuala University, Banda Aceh, Indonesia

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Abstract: This study aims to see the effect of the Edmodo-based Flipped Classroom learning model on student learning outcomes. The method used in this study is a quasi-experimental design with The Nonequivalent Control Group Design. The instruments used are in the form of choice questions to measure learning outcomes and student response questionnaires to the use of the Edmodo-based flipped classroom model. Learning outcomes were analyzed using an independent sample t-test based on the acquisition of N-gain. The results showed that there was a significant difference in improving learning outcomes between the control class and experimental class with $t_{count} = 3.06 > t_{table} = 2.02$ with a two-tailed significance value (Sig. 2-tailed) smaller than $\alpha = 0.05$ which is 0.004. There is a significant difference in learning outcomes, indicating that there is an effect caused by the implementation of Edmodo-based flipped classrooms. The results of data analysis showed that the increase in student learning outcomes in the experimental class by applying the Edmodo-based flipped classroom model was better than the control class without the Edmodo-based flipped classroom model. Around 88.4% of students gave a positive attitude towards the use of Edmodo-based flipped classrooms.

Keywords: Flipped Classroom; Edmodo; Learning Outcomes

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Introduction

The COVID-19 pandemic has become a global problem today. Covid-19 ravaged almost all aspects of wildlife, not only from the economic sector but also has a major impact on the education sector. For the sake of the continuity of education at this time, ICT is an option as the only way so that the world of education does not experience a worse impact due to the Covid-19 pandemic.

The industrial revolution 4.0 which was widely promoted in 2019 in Indonesia now really feels accelerated (Rachmawati, et al., 2020). Currently, teachers are required to be able to utilize technology in the learning process to attract students' interest so that

students are active in learning activities that take place as well as classroom learning.

The rapid development of information technology affects the development of increasingly sophisticated learning media. In fact, the learning media is able to help teachers carry out the learning process without face to face in class (Sudarsana, et al., 2020). The development of information and communication technology in the Industry 4.0 era has had a major influence on the teaching and learning process (Rezeki, et al., 2021)

Based on the results of observations in high schools which were the research objectives, it was found that students' daily scores were still below the Minimum Completion Criteria and an explanation from the curriculum waka that the National Exam tryout in

*E-mail: abdul.halim@unsyiah.ac.id

physics learning had not yet met the target, schools currently need online learning to catch up with material. Even if you go to class, the time allotted is very little. This is a way out that the application of the right media and model is needed so that students can catch up and grow interested in learning during the pandemic. Furthermore, the 2019 National Examination scores for Wave and Optical materials occupy the lowest position after other materials in the achievement of learning outcomes, which are 34.71% who answered correctly at the district level (Puspendik Kemdikbud, 2019).

Learning outcomes can be interpreted as the maximum results that have been achieved by a student after experiencing the teaching and learning process in a certain subject matter (Amalia, et al., 2021). The achievement of learning outcomes is influenced by various elements. The most important element is the element of the teacher, the element of the student, the element of the curriculum, and elements of infrastructure to support the learning process (Arifin, 2012). Interest in learning is also one of the factors that greatly affect the success of learning. Therefore, the teacher's role is considered important in growing student interest in learning (Nuraisyah, et al., 2021). Teachers can also be more creative in using a physics learning model that can provide opportunities for students to be active in the classroom so that the teaching and learning atmosphere becomes fun (Walidah et al., 2020).

One effort that can be made to improve learning outcomes is through the application of appropriate models and media. The right learning model for this condition is the flipped classroom. The flipped classroom is defined as a class that is reversed. According to Bergman & Sam, (2012) the flipped classroom method is an innovative pedagogical approach that focuses on learner-centered teaching by reversing the traditional classroom learning system that has been carried out by teachers. The concept of the flipped classroom itself is that what is generally done in class is now done at home and what is done at home is now done in class. In its implementation, the flipped classroom model can be integrated with technology media to carry out online learning at home and face-to-face learning models in the classroom (Farman and Chairuddin, 2020). Thus, students can understand the importance of teaching given outside the classroom to provide a supportive learning experience when in the classroom (Moore, 2015).

In connection with this, information and communication technology also offers other opportunities in the world of education, namely the existence of the internet which has provided space for teachers to design innovative teaching and learning activities by creating virtual classes utilizing the learning

management system (LMS) (Kurniawati et al., 2019). . Some of the tools that will help the use of the flipped classroom include the use of the LMS (Learning Management System) dashboard (Reidsema, et al., 2017).

Edmodo is a social media-based learning platform (Fauzi and Inindiati, 2020). Edmodo is a school-based social network (school-based environment). It can be said to be like Facebook but is intended for the learning process (Sulisworo, et al., 2018). By using Edmodo as a platform instead of face-to-face interaction, it will increase contact hours between students and teachers and facilitate peer-to-peer feedback, which can create a productive learning environment for them (Dewi, 2014).

Several studies on the flipped classroom were conducted by Khumairah, et al., (2020), Walidah, et al., (2020), Rusdi, et al., (2016), with the results showing that the application of the flipped classroom learning model has a positive effect on learning outcomes. Farman and Chairuddin, (2020) suggest that the Edmodo-based flipped classroom learning model can increase students' interest and learning outcomes. Research related to the use of the Edmodo platform conducted by Muhajir, et al., (2019) the application of Edmodo learning media is more effective because there is an increase in interest and learning outcomes.

Method

This type of research is quantitative research with the Quasi-Experimental method, namely quasi-experimental or unreal experiments. The research design chosen is the nonequivalent control group design. The research design is presented in Table 1.

Table 1. The Non Equivalent Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	O1	X	O2
Control	O3	-	O4

(Sugiyono, 2001)

Information :

- O1 : Pre-test for the experimental class
- O2 : Post-test for the experimental class
- X : Experimental class treatment (flipped Edmodo based classroom)
- : Control class treatment (Without flipped Edmodo based classroom)
- O3 : Pre-test for the control class
- O4 : Post-test for the control class

The samples were selected purposively (purposed). This research uses two classes with details, one experimental class, and one control class. In this quasi-experimental study, one test was carried out before (pre-test) the treatment (treatment), after the

treatment was carried out further measurements were taken (post-test).

This research was conducted at SMAN 9 Banda Aceh with the subject of XI IPA2 as the experimental class with 26 participants and the control class X IPA1 with 25 participants. The instrument used in this study is a choice question containing 20 question items. The questions have given concern the sound wave material with answer choices a, b, c, d, and e as an instrument to measure student learning outcomes.

Items about learning outcomes were tested first to see the level of validity and reliability using the personal test developed by Khaldun, (2017). Furthermore, the research data were processed using SPSS version 20.0. The pretest-posttest data on learning outcomes were analyzed to determine the N-gain, after that the differences in results were determined using parametric statistical tests, namely the independent sample t-test test to see whether or not there was an effect based on the presence or absence of differences in learning outcomes in the control class and experiment.

Results and Discussion

Instrument Validation Results

The results of the instrument validation of learning outcomes items obtained 20 questions used in the study were valid, the average acquisition was 0.711 with a "high" validity level. The reliability of the items obtained is 0.96 seen from the test *Spearman brown* with the category of "very high" reliability level. So, the questions used in the pretest and posttest were valid and reliable.

Result of Learning Outcomes

Table 1. Analysis of improving student learning outcomes

Class	The Average Value of Learning Outcomes		N-Gain	Category
	Pretest	Posttest		
Control	28.40	65.20	0.50	Currently
Experiment	33.60	75.90	0.64	Currently

Furthermore, to test the hypothesis in this study, the learning outcomes data were tested using the t-test based on the acquisition of the N-gain score. The chosen t-test is using the Independent Sample t-test. The conditions that must be met before carrying out this test are that the data must be normality and homogeneous.

The data normality test was conducted to see whether the data for improving learning outcomes were normally distributed or not. The normality test was carried out using the Shapiro Wilk test with a sample consideration of less than 50, with a significance level of

$\alpha = 0.05$. The test criteria are as follows: 1) If Sig. > 0.05 then the data is normally distributed; 2) If Sig. < 0.05 then the data is not normally distributed.

Table 2. Normality test for improving learning outcomes

Class	Shapiro-Wilk			Conclusion
	Statistics	df	Sig.	
Control	0.937	25	0.128	Normal
Experiment	0.961	26	0.418	Normal

Based on table 2. the normality test for improving learning outcomes is obtained in the Shapiro-Wilk column, namely, in the significance column, the significant value for the control class is 0.128 and the experimental class is 0.418. This indicates that the values of 0.128 and 0.418 are greater than 0.05 or 0.128 and 0.418 > 0.05. So it can be concluded that the data on improving learning outcomes in the control class and the experimental class are normally distributed.

Based on the t-test requirements that must be met after performing the normality test, the data homogeneity test is performed. The homogeneity test of the data was carried out to see the difference in the variance of the increase in student learning outcomes between the control class and the experimental class. The homogeneity test was carried out using the Levene Statistic test using the significance level $\alpha = 0.05$. The test criteria are as follows: 1) If Sig. > 0.05 then the data variance is homogeneous; 2) If Sig. < 0.05 then the data variance is not homogeneous

The results of the analysis of the homogeneity of the Levene test for improving student learning outcomes in the control class and experimental class are presented in Table 3.

Table 3. Test the homogeneity of increasing student learning outcomes

Class	N	Levene Statistics (F)	Sig.	Conclusion
Control	25	1.115	0.296	Homogeneous
Experiment	26			

Based on Table 3. the homogeneity test of student learning outcomes in the control and experimental classes has a significance value greater than $\alpha = 0.05$ which is 0.26. This shows that the data on improving learning outcomes for the control class and the experimental class come from the same variant (homogeneous).

After the normality and homogeneity tests are met, then the different test of the two samples is then carried out using an independent t-test using a significance level $\alpha = 0.05$. This test was conducted to

prove that there was a significant difference in the achievement of student learning outcomes between the experimental class and the control class. The criteria for testing the hypothesis are: 1) If Sig. 2-tailed > 0.05 then there is no significant difference in the improvement of learning outcomes. 2) If Sig. 2-tailed < 0.05 then there is a significant difference in the improvement of learning outcomes.

The results of the analysis of hypothesis testing data on improving student learning outcomes in the control class and experimental class are presented in table 4.

Table 4. Hypothesis testing for improving student learning outcomes

Class	N	df	t _{count}	t _{table}	Sig. (2-tailed)	Conclusion
Control	25					There is a significant difference in the improvement of learning outcomes
Experiment	26	49	3.06	2.02	0.004	

Based on table 4. the data on increasing learning outcomes of students in the control class and experimental class have $t_{count} = 3.065 > t_{table} = 2.021$ with a two-tailed significance value (Sig. 2-tailed) smaller than $\alpha = 0.05$, which is 0.004, meaning that the increase in student learning outcomes in the control and experimental classes is that there is a significant difference. There are differences in learning outcomes between students who are taught with the Edmodo-based flipped classroom model and without the Edmodo-based flipped classroom. The difference in learning outcomes indicates that there is an influence caused by the application of the Edmodo-based flipped classroom.

The difference in N-gain scores or learning outcomes between the control and experimental classes can be seen in Table 1. It shows that the learning outcomes of students in the experimental class by applying the Edmodo-based flipped classroom model were much better than the control class that did not apply the Edmodo-based flipped classroom model because the application of the flipped classroom model makes students learn before entering class, meaning that there are activities carried out before the start of class. Like learning from material that has been given by the teacher and videos uploaded on the Edmodo platform, making students have initial knowledge before the start of class. In class, students only have discussions to solve problems, develop concepts and engage in collaborative learning. On the other hand, researchers can streamline the time to interact with students personally, help solve

difficulties in understanding concepts and accommodate each activity so that classroom learning is more effective and quality, as a result, student learning outcomes will also be better. In accordance with Evendi, et al., (2021) active student participation creates learning involvement and motivation which has an impact on learning success.

Students make summaries and record things that have not been understood about the sound wave material in pre-class activities. Students have been able to manage study time both at home and at school, set targets for the completion of assignments, and arrange questions for discussion in class. As described by Salsabila, et al., (2020) Preparation before providing learning services is one of the determining factors in successful learning, especially in online learning where there is a distance between the learner and the teacher. This is a concern and a new style that is implemented in the current learning process. According to Ario and Asra (2018) meeting time in class can be maximized to discuss exercises or problems that are more difficult and diverse. With this situation, students are required to study at home through a summary recorded before class begins. Broad material can be reached and learning becomes much more effective by being student-centered.

Ario and Asra, (2018), explained that there are several factors that cause student learning outcomes who receive flipped classroom learning to be better than direct learning. This can be explained by paying attention to the stages contained in flipped classroom learning. In flipped classroom learning, the learning process is behind its application. The activity of delivering material in the classroom is diverted to doing exercises and discussions. Meanwhile, homework activities in the form of practice questions which are usually done outside the classroom (home) are replaced by watching videos to understand the material for the upcoming meeting. Video is a type of learning media that uses images, sounds, and animations or illustrations of events from the material being studied (Rahman, et al., 2021). According to Rindaningsih, (2018) learning with Flipped Classrooms makes class meetings more effective and meaningful. Furthermore, learning outcomes using the Flipped Classroom method showed an increase in learning outcomes, and students liked the video tutorial because they could show it repeatedly (Chandra and Nugroho, 2016).

The use of Edmodo helps students learn with online classes created by researchers so that students take advantage of the Edmodo platform as an appropriate learning medium to contain learning resources on sound wave material. Researchers can share various videos and files related to learning. Students can comment on a posted material without disturbing the Edmodo display. So that other students

can access the past material comfortably and without being disturbed by comments. Convenience/confidence with technology is related to greater computer integration in the classroom (Nikolopoulou and Gialamas, 2015).

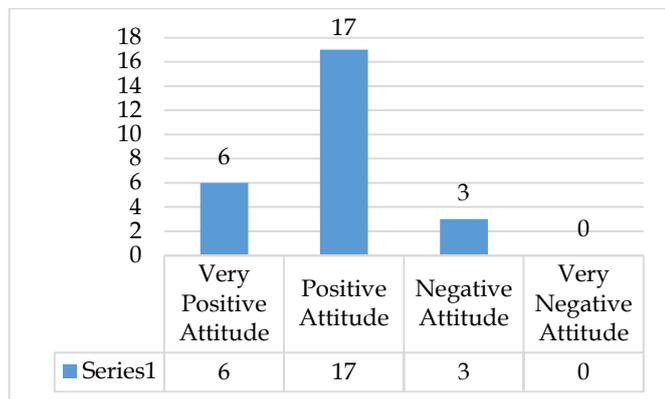


Figure 1. Graph of student responses to the Edmodo-based flipped classroom model

Based on the results of the questionnaire response analysis that has been carried out, students gave a positive attitude towards the use of the Edmodo-based flipped classroom model, namely 6 people responded in the "very high" category, 17 people responded in the "high" category and 3 other people responded "low", then 88.40% of participants students give a positive attitude towards the use of the Edmodo-based flipped classroom. This is in accordance with research conducted by Dewi, (2014) which showed that more than 50% of students strongly agreed that Edmodo provided relevant and interesting links for them to learn. This could result in half of the class being willing to spend more time learning to use Edmodo.

Edmodo's appearance, which is similar to Facebook, is very familiar to them as active social media users. Most of the students also think that they have no technical problems in doing exercises and assignments in Edmodo. Bergmann and Sams, (2014), who favor the flipped classroom learning model as learning that gives students the freedom to learn at their own pace.

Most of the participants had the same opinion about Edmodo's contribution to learning such as making learning fun, attracting students' attention, making teacher work easier, making lessons effective and organized and suitable for future learners (Cankaya, et al., 2013). Even though the students had never used Edmodo before, they tried to recommend this platform to help the learning process.

Conclusion

Based on the results of the research that has been done, it can be concluded that there is a significant

difference in improving learning outcomes in the control class and the experimental class with $t_{count} = 3.06 > t_{table} = 2.04$ with a two-tailed significance value (Sig. 2-tailed) smaller than $\alpha = 0.05$ which is 0.004. The results showed that there was a significant difference in the improvement of learning outcomes between students who were taught with the Edmodo-based flipped classroom model and without the Edmodo-based flipped classroom. This significant difference indicates that there is an effect caused by the implementation of the Edmodo-based flipped classroom. The learning outcomes of students in the experimental class by applying the Edmodo-based flipped classroom model were better than the control class that did not apply the Edmodo-based flipped classroom model. Students' responses to the application of the Edmodo-based flipped classroom model are: 6 people gave a response in the "very high" category, 17 people gave a response in the "high" category and 3 other people gave a "low" response to the use of Edmodo-based flipped classroom.

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