Application of Flipped Classroom Model Assisted Edmodo to Improve Students' Understanding of Concepts in the Material Sound Waves

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ABSTRACT

The Edmodo-assisted classroom flipped classroom model is a learning process by applying the flipped classroom model with the help of Edmodo to deliver learning materials. This study aims to determine the improvement of students’ understanding of concepts in sound wave material. The type of research used is pre-experimental design. The design of this study used the Nonequivalent Control Group Design. The sampling technique that the researchers chose was purposive sampling of 40 students consisting of 20 students’ experimental class and control class. The research instruments used are observation sheets and student concept comprehension tests. The data analysis techniques used are learning implementation analysis, calculating the value of students’ concept understanding results and N-gain score. The average N-Gain score for the control class was 0.69 with a moderate category. While the average N-Gain score for the experimental class is 0.77, which is included in the high category. So, it can be known that there is an increase in the understanding of students’ concepts in the experimental class who apply the Edmodo-assisted flipped classroom model to sound wave material. This increased understanding of the concept occurred because the experimental class implemented an Edmodo-assisted flipped classroom model. In the flipped classroom model, students first learn to understand the learning materials uploaded by the teacher through Edmodo. Learning materials in the form of videos can be played repeatedly through Edmodo, so that students can learn anywhere and anytime without any time limit according to their respective learning.

Keywords: flipped classroom model, edmodo, concept understanding, sound waves

INTRODUCTION

The world of education is currently in the 21st century, in this century it is the era of Society 5.0 which integrates skills, knowledge, skills and attitudes as well as mastery of technology. Teachers must be able to take advantage of technological advances to play an active role in delivering learning to students (Pérez & Maria, 2022). It is not enough if the teacher only explains the learning conventionally. Conventional learning is more teacher-centered and students tend to only pay attention to and accept the material, so students are not used to playing an active role in the classroom (Warren, 2021). Teaching in this manner will
make students' abilities less honed because they are not accustomed to thinking outside the context presented by the teacher and become passive in selecting additional learning resources beyond those provided by the teacher (Kuntarto, 2017). To achieve good learning goals, teachers must also change their mindset from initially being teacher-centered to student-centered (Wasis, 2015), so that innovation in learning activities is needed, especially in physics learning.

Physics is a branch of science that examines the natural symptoms that exist around (Novitasari et al., 2017). So innovation is needed in delivering physics material, such as by utilizing innovative and effective learning media, as well as learning styles that are adapted to current developments. With this innovation, it can help teachers explain abstract concepts so that students will understand the concept of the material well. The incomprehension of concepts in physics is something that is common, because in physics lessons students must understand concepts first before students describe them in mathematical form (Amin, et al., 2016)

Understanding concepts in learning is something very important. the ability to understand concepts is one of the important indicators to achieve success in learning science (Dewi & Ibrahim, 2019). By understanding the underlying principles and laws of physics, students can make more accurate predictions and develop better problem-solving skills. Additionally, understanding concepts in physics can help students develop a better appreciation for the beauty and complexity of the physical world. Finally, understanding concepts in physics can help students develop a better understanding of the scientific method and how to apply it to their own research. Similarly, Arends (2012) reveals that understanding concepts is the foundation for a network of ideas that guides a person's thinking, enabling them to master the material effectively. This is why it is important to understand concepts in physics, as it allows students to develop a deeper understanding of the physical world and its laws.

**Problem of Research**

Based on the results of observations at SMA Negeri 1 Dewantara on January 22, 2022, students carried out the learning process offline or face-to-face, while in the field some students said that physics is a fun lesson but there are some students who also say that when learning physics there are often difficulties in understanding concepts, due to the large amount of learning materials and mathematical equations delivered with limited time, especially when learning physics the current COVID-19 pandemic, where the class hours that were originally 45 minutes were reduced to 30 minutes, so that students who do not understand the subject matter will find it difficult to catch up and have to follow the next new material. As a result, the expected learning objectives become difficult to achieve because the ability to understand and reason to relate one material to another is still very low, so students have difficulty understanding the lesson. This situation makes teachers as teachers have to choose the right learning model. One model that is considered to fit the current millennial style is learning with a flipped classroom model.
Learning with the Flipped classroom model is a form of reverse learning from learning that is usually carried out by teachers in the classroom (Apriyanah et al., 2018). In conventional learning, in class the teacher gives material then gives assignments as feedback from the material that has been given while the flipped classroom model of the teacher first provides material online in the form of videos and resumes that must be watched and understood and students take notes on things that are not understood. During face-to-face learning sessions in class, students and teachers discuss and do assignments. In this case the teacher plays the role of facilitator. Flipped classroom learning is believed to be able to increase student learning independence, as well as student motivation. In accordance with the research conducted by (Agustina et al., 2019; Gumilar, 2021) in the study revealed that learning with a flipped classroom model can increase student independence and learning motivation. Students become enthusiastic and interested in learning. With this flipped classroom learning, students can learn without any time limit. Adhitiya et al (2015) argue that students can repeat learning videos until they fully understand, and while at school, students can focus more on the difficulties they encounter when understanding the material at home. Flipped classroom models can be collaborated with learning media, one of which is Edmodo. Edmodo is a social school environment-based network (school-based environment) (Vania et al., 2018). Edmodo provides a secure and easy way for classes to connect and collaborate between students and teachers to share educational content, manage projects and assignments and handle notifications of every activity in the classroom (Putranti, 2013). The objective of the research is to improve students' understanding of concepts related to sound waves through the use of a flipped classroom model and the Edmodo application. The ability to understand concepts using the flipped classroom model is better than the ability to understand concepts using the lecture method (Saputra & Mujib, 2018).

Research Focus

The purpose of this study is to determine the improvement of students' understanding of concepts in sound wave material by applying the edmodo-assisted flipped classroom model at SMA Negeri 1 Dewantara.

METHODOLOGY OF RESEARCH

General Background of Research

This research uses a quantifiable approach, quantifiable research itself is a study that refers to experiments and surveys (Sugiyono, 2016). The type of research used in this study is quasi-experimental design. The research design used in this study is Nonequivalent Control Group Design. This research was conducted at SMA Negeri 1 Dewantara located on Jalan BTN Arun, Paloh Lada Village, Krueng Geukueh, Dewantara District, North Aceh Regency, Aceh. The time of this study took place in the even semester of 2021/2022.
Subject of Research

The population in the study to be carried out is the entirety of class XI MIPA students at SMA Negeri 1 Dewantara which consists of 5 rof class XI MIPA money with a total of 176 students. The samples that the researchers took were students of class XI MIPA 1 which totaled 20 people as a control class and XI MIPA 5 which amounted to 20 people as an experimental class. In this study, the sampling technique that the researcher chose was Nonprobability Sampling. This technique is a sampling that is carried out not randomly or randomly (Ardat, 2013). The type of technique used is purposive sampling, this technique determines the selection of samples with certain reasons or considerations, this sample is recommended by teachers of physics subjects.

Instrument and Procedures

The data collected is the implementation of learning and understanding of students’ concepts. The data collection instrument used is an observation sheet to observe physics learning activities on wave material referring to the learning implementation plan that has been made and the question of understanding the concept of sound waves as many as 20 multiple choice questions. In order for the test instruments used to be of high quality, before being presented to students, the test instruments are tested for validation first, namely with a validator of one lecturer who is then tested on class XII MIPA 1 students who have learned about sound waves. Determining the criteria for a good instrument to use, the validation test must be carried out, namely validity, reliability, level of difficulty and distinguishing power. On the validity test the criteria that must be met are if \( r_{xy} > r_{table} \), then the question is said to be valid. The results of the calculation of the validity test from 40 questions obtained 24 valid questions because \( r_{xy} > r_{table} \). Furthermore, reliability is tested to determine the level of trust, a test is said to have a high level of trust if the test can provide a fixed result (Arikunto, 2013). The criterion is that if \( r_{counts} > r_{table} \) then the instrument is said to be reliable. The results of the reliability test calculation are obtained \( r_{count} = 0.903 > r_{table} = 0.334 \), then the question can be used for pretest and posttest. Furthermore, the question is tested for the level of difficulty According to (Arikunto, 2013) a good question is a question that is not too easy and not too difficult. Based on the calculations obtained that all questions totaling 40 belong to the medium category. Furthermore, the questions were tested for differentiation with the aim of distinguishing students who were smart (high-ability) from students with low abilities, from the calculation results obtained from 40 questions, there were 3 questions with very bad categories, 11 items of bad category questions, 6 items of sufficient category questions, 12 items of good category questions, and 8 questions of excellent category.

Data Analysis

The data analysis technique used is the analysis of learning implementation, and the testing of understanding of concepts obtained from pretest and posttest is analyzed using the N-Gain score test formulated as follows.

\[
< g > = \frac{S_{Post} - S_{Pre}}{S_{m-ideal} - S_{Pre}}
\]
With $g < >$ normalized average gain score, $S_{post} = $ The average score of the student's final test, $S_{pre} = $ The average score of the student's initial test, $S_{m\text{-ideal}} = $ Ideal maximum score. The category used is according to (Hake, 1999) if the value of $g > 0.7$ "High"; $0.3 < g \leq 0.7"\text{Medium}"; $g \leq 0.3$ "Low".

RESULTS AND DISCUSSION

1. Learning Implementation

Data on the observation of learning implementation is used to determine the level of implementation of ongoing learning. This observation is carried out by one observer who observes students during the learning process using an observation sheet in accordance with the steps in the flipped classroom learning model. To get a total score, researchers add up each encounter with "yes" points scored 1 and "No" scored 0. After obtaining the total score, the percentage of learning implementation is obtained by comparing many indicators carried out with the total number of indicators (Gherheș et al., 2021). Data from these observations can be summarized at each meeting as in the following table.

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Observer (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>74.07%</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>Excellent</td>
</tr>
<tr>
<td>3</td>
<td>100%</td>
<td>Excellent</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>Excellent</td>
</tr>
<tr>
<td>5</td>
<td>92.59%</td>
<td>Excellent</td>
</tr>
<tr>
<td>6</td>
<td>92.59%</td>
<td>Excellent</td>
</tr>
<tr>
<td>7</td>
<td>92.59%</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

2. Results of Understanding Student Concepts

Based on data analysis using SPSS Software Version 25, descriptive results of student pretest and posttest scores are as follows.

<table>
<thead>
<tr>
<th></th>
<th>Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Pretest Experiments</td>
<td>20</td>
</tr>
<tr>
<td>Posttest Experiments</td>
<td>20</td>
</tr>
<tr>
<td>Pretest Control</td>
<td>20</td>
</tr>
<tr>
<td>Posttest Control</td>
<td>20</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td></td>
</tr>
</tbody>
</table>
Based on table 2 and it can be seen that the lowest experimental class pretest score is 15 and the highest score is 35. While the control class of the lowest pretest value is 10 and the highest value is 55. For the data of the posttest results of the experimental class based on the results of the research and the calculation of the lowest value of 60 and the highest score of 90, so that the average score of the pretest-posttest of the experimental class students from 21.50 to 82.00. This also happened in the control class based on the results of the study and the calculation of the lowest value, namely 70 and the highest score of 95 with the average pretest-posttest value from 29.25 increasing to 79.25. The posttest score in the control class is higher than to the experiment class, this is because the students in control class have had the opportunity to learn and understand new concepts and they did not receive the same intervention as the experimental class and so they did not have the same opportunity to learn and improve their academic performance.

3. N-Gain Test

The difference between the pretest and posttest scores, gain shows an increase in the ability or mastery of students' concepts after learning is carried out by the teacher is called gain. For the calculation results of the N-Gain score test, you can see in the following table.

<table>
<thead>
<tr>
<th>Class</th>
<th>N-Gain score minimum</th>
<th>N-Gain score maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>0,50</td>
<td>0,88</td>
<td>0,77</td>
</tr>
<tr>
<td>Control</td>
<td>0,44</td>
<td>0,94</td>
<td>0,69</td>
</tr>
</tbody>
</table>

Based on the table above, it shows that the average N-Gain score for the experimental class (edmodo-assisted flipped classroom model) is 0.77 is included in the high category. With an N-Gain score of at least 0.5 and a maximum of 0.88 while the average N-Gain score for the control class (conventional with direct instruction model) is 0.69 including the medium category with an N-Gain score of at least 0.44 and a maximum of 0.94. As can be seen in the following diagram image.

![Figure 1. N-Gain Increase](image_url)
Based on the results of the study, it can be explained that the application of the edmodo-assisted flipped classroom model can increase students' understanding of the concepts in the sound wave material at SMA Negeri 1 Dewantara. This is evidenced by the average result of the N-Gain score for the experimental class (edmodo-assisted flipped classroom model) of 0.77 belonging to the high category, while the average N-Gain score for the control class (conventional with the direct instruction model) is 0.69 belonging to the medium category. In this study, there are several things that become obstacles or obstacles that have the potential to affect the results of this study, namely the presence of students in face-to-face sessions, the lack of student discipline in following the task rules such as summarizing the content of learning videos about sound waves that have been uploaded by teachers through edmodo. So that during face-to-face students will not be able to understand learning which later students will have difficulty in answering posttest questions so as to affect the results in this study.

The increase in understanding of concepts occurred because the experimental class implemented an edmodo-assisted flipped classroom model. In the flipped classroom model, students first learn to understand the learning material uploaded by the teacher through edmodo. Edmodo media can be applied by teachers to support students' learning activities and processes (Wardhani et al., 2022). Teacher can use Edmodo to create a virtual classroom where student can access course materials, participate in discussions, and collaborate on projects. The teacher can also use Edmodo to assign tasks, provide feedback, and track student progress. Additionally, Edmodo can be used to facilitate. Furthermore, it can be a place to replace class hours that cannot be done face-to-face in person, meaning that students can access learning outside of school hours, namely in the form of learning videos. Learning videos can make it easier for students to learn so that students can adjust their respective learning speeds and students can repeat the material in the learning video anywhere and anytime (Marita et al., 2022). When face-to-face, the teacher ensures that students work on the instructions that have been given, namely summarizing the content of the material contained in the learning video. The teacher acts as an instructor in guiding students when discussing sound wave material. Students also present the results of the group work they have completed. When applying the flipped classroom model, it can be seen that students are able to understand the concept of learning well where students are able to do the test well and present assignments and experimental results in accordance with the concept of sound wave material, in contrast to before applying this flipped classroom model, student test results are not as good as when applying the flipped classroom model, so it can be said that there is an increase in understanding of student concepts after Implement a flipped classroom model. In addition, students become more independent in learning at home and actively ask questions when discussing in class. This is in accordance with research (Agustina et al., 2019) that the use of flipped classrooms in learning can increase student independence and motivation and make students enthusiastic in learning. For the control class, it uses a conventional learning model, namely direct instruction, where the direct instruction model is more dominant in providing material or learning that is more teacher-centered and limited by time (Asmonah, 2019).
This research is in line with previous research by Saputra & Mujib (2018) indicates that students' understanding of concepts with the Flipped Classroom model is better than their ability to understand concepts with lecture methods. This is because the Flipped Classroom model uses more learning videos to provide opportunities for students to learn anywhere and anytime. The video can be repeated until the student fully understands the material. Likewise with research conducted by (Janatin, 2019) which states that flipped classroom models can improve students' understanding of concepts compared to using conventional learning models. Judging from the average value of N-Gain for the experimental class of 0.744 with the category "High" and the control class of 0.409 which is categorized as "Medium". Another study by Gumilar (2021) proves that there is an influence of the Learning model (flipped classroom) to students' concept comprehension ability and problem-solving ability.

Saviti & Meilana (2022) in their research stated that the flipped classroom learning model is an appropriate and effective learning model to apply to increase students' understanding of concepts. Applying the Flipped Classroom learning model to learning activities has a significant influence on students' mastery of concepts. The Flipped Classroom model provides opportunities for students to interact both inside and outside the classroom. In addition, it is estimated that students become better, more active and responsible individuals in groups when solving problems, and also their confidence to channel ideas is also increasing (Yanah, et al., 2018).

CONCLUSION

The Edmodo-assisted flipped classroom model was successful in increasing the understanding of the concept of sound waves among students in the experimental class. For future researchers who are researching the same problem, they should choose a comprehensive material, such as sound and light waves, to ensure that students have a better understanding. Additionally, during face-to-face sessions, teachers should check student notebooks before starting the lesson and monitor students to assess their learning, so that students become accustomed to learning independently.

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