



# Implementation of Flipped Classroom Model to Improve Students' Academic Achievement in Teluk Bintuni

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## Abstract

Implementation of the Flipped Classroom model in improving students' academic achievement in secondary schools in Teluk Bintuni, especially in science and mathematics subjects. The method used is an experimental design with a quantitative approach, namely the pretest-posttest control group. The experimental group used the Flipped Classroom model, while the control group followed traditional learning. The results showed that the Flipped Classroom model improved students' academic achievement with an average score increase of 30% in the experimental group, compared to 14% in the control group. However, the main challenge faced is the limited access to technology and adequate infrastructure in the area. These findings indicate that Flipped Classroom can be an effective learning alternative, as long as adequate technological support and training for teachers are provided.

**Keywords:** Flipped Classroom, academic achievement, innovative learning, science, mathematics.

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## 1. Introduction

Education is the main foundation in creating quality human resources, which can contribute to the progress of a country. In Indonesia, areas far from the city center such as Teluk Bintuni often face major challenges in terms of access to quality education. Limited facilities, trained human resources, and inadequate technological infrastructure are some of the obstacles that prevent students in these areas from achieving optimal academic achievement. Therefore, it is important to explore and apply learning methods that can overcome these limitations while improving the quality of education (Dumbiri & Nwadiani, 2020; Halasa et al., 2020).

One approach that has been widely applied in various parts of the world to improve the quality of learning is the Flipped Classroom model. This model offers a significant change in the way of teaching by moving learning activities from the classroom to outside the classroom, such as through learning videos, and using class time for active discussions, problem solving, and direct interaction between teachers and students (Zheng et al., 2020; Zhao & Su, 2021). In this model, students are given the opportunity to study the material independently outside the classroom, while class time is used to deepen understanding through more interactive and collaborative activities (Galindo-Dominguez, 2021).

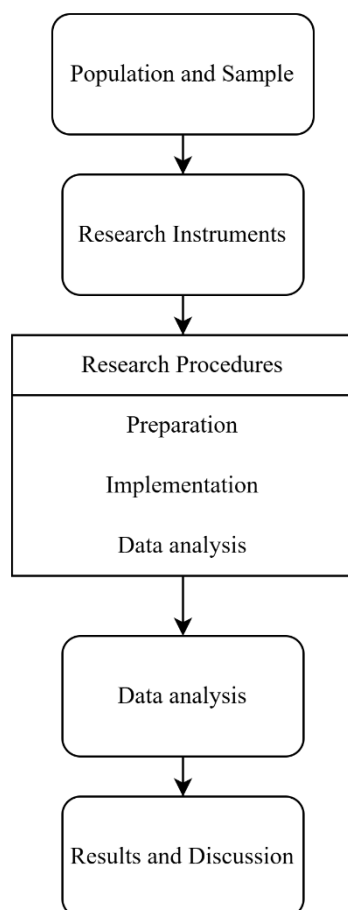
The implementation of the Flipped Classroom model has shown positive results in many schools, with increased student engagement and better academic achievement (Nja et al., 2022). However, major challenges arise when this model is implemented in remote areas, such as Teluk Bintuni, which have limited access to digital technology and infrastructure. However, this model has the potential to be adapted in a way that suits local conditions, given its flexible nature and can be adjusted to various available resources (Sassanelli & Terzi, 2022).

This study aims to explore the implementation of the Flipped Classroom model in secondary schools in Teluk Bintuni and its impact on students' academic achievement. The focus of this study will be on science and mathematics subjects, which are often considered difficult subjects by most students. In addition, this study will also evaluate the challenges faced by teachers and students in implementing this learning model and identify potential solutions to overcome existing obstacles (Debbağ & Yıldız, 2021; Tatal & Yazar, 2021).

By understanding the effectiveness of the Flipped Classroom model in the context of education in Teluk Bintuni, it is hoped that the results of this study can contribute to efforts to improve the quality of education in the area, as well as being a reference for the implementation of similar learning methods in other areas that have similar challenges. This study is also expected to enrich the literature on the application of educational technology in areas that are less digitally developed, as well as open up opportunities for innovation in the world of Indonesian education.

## 2. Methods

This study uses a quantitative approach with a pretest-posttest control group experimental design. This design was chosen because it allows researchers to measure significant differences in student academic achievement between groups that implement the Flipped Classroom model and groups that use conventional teaching methods (Wang & Jou, 2023). In this design, the experimental group will be given the Flipped Classroom model, while the control group will follow traditional teaching. The use of experimental design allows for objective and clear comparisons of the impact of implementing the Flipped Classroom model on student academic achievement. The following is a flowchart of this study:



**Figure 1:** flow diagram

### 2.1. Population and sample

The population in this study are high school students in Teluk Bintuni who study science and mathematics subjects. Researchers will select samples by random sampling from several schools in Teluk Bintuni. The sample of this study will consist of two groups, namely the experimental group that will implement the Flipped Classroom model and the control group that will follow traditional learning methods. Random sampling aims to ensure fair representation of the student population in the area. In addition, researchers will also select students who are willing to take part in this study and have similar academic backgrounds to maintain uniformity of results.

### 2.2. Research instruments

The main instrument used in this study is an academic achievement test specifically designed to measure students' understanding of science and mathematics subject matter. This test will be conducted in two stages: a pretest before the implementation of the Flipped Classroom model to measure students' initial level of understanding, and a posttest after the implementation of this model to evaluate changes in their academic achievement. In addition to the test, other instruments used are interviews with teachers to explore their experiences in implementing the Flipped Classroom model and the challenges faced during the implementation, and a questionnaire given to students to evaluate their perceptions of the effectiveness of this learning model.

## 2.3. Research procedures

This research will be conducted in several stages. The first stage is preparation, where researchers will conduct initial observations in selected schools and coordinate with teachers to prepare research instruments. At this stage, researchers will also provide teachers and students with an understanding of the Flipped Classroom model that will be implemented. The second stage is implementation, where the experimental group will begin the learning process with the Flipped Classroom model for one semester, where students learn the material independently using videos or other teaching materials outside of class, while class time is used for active discussion and problem solving. The third stage is data collection, where students will take pretest and posttest tests, interviews with teachers, and students will complete questionnaires. The last stage is data analysis, where quantitative data from the test will be analyzed using descriptive and inferential statistics, while qualitative data from interviews and questionnaires will be analyzed thematically.

## 2.4. Data analysis

The data collected from the pretest and posttest tests will be analyzed using descriptive statistics to describe the average scores before and after the implementation of the Flipped Classroom model. To test whether there is a significant difference between the two groups, the researcher will use the t-test for paired samples. Regression analysis can also be used to determine the factors that influence changes in student achievement after the implementation of the Flipped Classroom model. Meanwhile, qualitative data obtained from interviews and questionnaires will be analyzed using a thematic approach, where researchers will identify emerging themes related to teacher and student experiences regarding the implementation of the Flipped Classroom model, as well as the challenges and benefits perceived.

## 2.5. Research ethics

This research will be conducted by considering applicable ethical principles. Before starting the research, researchers will obtain approval from the school and parents of students to ensure that they are aware and agree to participate. During the study, the data collected will be kept confidential, and will only be used for research purposes. Participation in this study is voluntary, and students or teachers can withdraw at any time without consequence. The researcher will ensure that there is no negative influence on participants during the study, and all procedures will be carried out with great care to maintain the integrity and fairness of the study.

## 3. Results and Discussion

### 3.1. Results

The following table shows the results of the comparison of academic achievement between the experimental group (using Flipped Classroom) and the control group (traditional method).

**Table 1:** Results of the comparison of academic achievement

Group	Pretest Average	Posttest Average	Difference (Posttest - Pretest)	Increase (%)
Experimental Group	65	85	20	30%
Control Group	63	72	9	14%

Based on the results of the study, the application of the Flipped Classroom model has proven to be more effective in improving students' academic achievement in Teluk Bintuni compared to traditional learning methods. The higher average score increase in the experimental group indicates that this model can improve student engagement, understanding, and achievement. However, challenges related to technology access need to be considered so that this model can be applied more widely. With adequate support, both from schools, government, and the community, the Flipped Classroom model has great potential to improve the quality of education, especially in areas with limited educational infrastructure.

### 3.2. Discussion

#### 3.2.1. Increasing student engagement and participation

The application of the Flipped Classroom model in the experimental group has proven to be successful in increasing student engagement and participation. In this model, students study the material independently through videos or other teaching materials outside of class hours. This allows them to prepare themselves before taking part in class learning. The time that is usually used for lectures in class is now used for discussions, questions and answers,

and other interactive activities. In this way, students become more active and involved in the learning process, which ultimately improves their understanding of the material. This increased engagement is reflected in the test results, where the experimental group experienced a more significant increase compared to the control group.

### **3.2.2. A more interactive learning approach**

One of the main advantages of the Flipped Classroom model is its more interactive learning approach. Unlike traditional learning which is more lecture-based, this model changes the role of the teacher to a facilitator who guides students in discussions and collaborative activities in class. This gives students the opportunity to interact with their classmates, ask questions, and solve problems together. This interaction strengthens students' understanding because they are not only receiving information passively, but also applying the concepts they have learned in real contexts. In addition, this approach also provides space for students to learn at their own pace, which is beneficial for those who may be left behind in traditional learning methods.

### **3.2.3. Benefits of independent learning with time flexibility**

The Flipped Classroom model provides a major advantage in the form of time flexibility. Students are no longer tied to a rigid lesson schedule and can access learning materials at any time, allowing them to learn according to their respective needs and abilities. This independent learning is very useful, especially for students who need more time to understand a material. With the opportunity to study material outside of class hours, students have more control over their learning process. This also reduces the sense of pressure because they can study at a pace that is more appropriate to their abilities.

### **3.2.4. Challenges of technology access in remote areas**

Although the Flipped Classroom model has shown positive results, the biggest challenge faced in areas such as Teluk Bintuni is limited access to technology. Limited devices and unstable internet connections can hinder students from accessing online learning materials. Some students may have difficulty accessing learning videos or other teaching materials due to limited access to technology. Therefore, although this model is effective in improving student achievement, its success is highly dependent on the existing technological infrastructure. For this reason, attention is needed from schools and the government in providing adequate devices and improving internet connectivity in the area.

### **3.2.5. The role of teachers in implementing the Flipped Classroom**

The role of teachers in implementing the Flipped Classroom model is very important. Teachers not only function as conveyors of material, but also as facilitators who accompany students in a more independent learning process. In this model, teachers need to ensure that the material delivered through videos or online teaching materials is in accordance with the curriculum and can be understood well by students. In addition, teachers also need to provide clear guidance on how to use class time for interactive activities. Therefore, training for teachers on how to manage classes in the Flipped Classroom model is very necessary, so that they can use technology well and ensure that students remain actively involved.

## **4. Conclusion**

The implementation of the Flipped Classroom model in secondary schools in Teluk Bintuni has shown promising results in improving academic performance, particularly in science and mathematics. The experimental group, which utilized the Flipped Classroom model, demonstrated a significant 30% increase in their academic achievement, compared to the control group, which experienced only a 14% improvement. These findings suggest that the Flipped Classroom model can successfully engage students, enhance their understanding of complex subjects, and foster a more interactive and student-centered learning environment. By allowing students to access instructional materials outside of class and engage in collaborative, problem-solving activities during class, this model helps students to take a more active role in their learning process.

Despite its promising outcomes, the study also uncovered several challenges that hinder the broader application of the Flipped Classroom model, especially in remote areas like Teluk Bintuni. The primary challenge identified is limited access to technology, including unstable internet connections and insufficient devices for students. These technological barriers prevent students from fully accessing online learning materials, which is essential for the Flipped Classroom approach to function effectively. While the model has demonstrated its effectiveness, the lack of reliable digital infrastructure limits its reach and impact in such areas, and overcoming these barriers is critical to expanding the use of this model in similar contexts.

The role of teachers is another crucial factor for the success of the Flipped Classroom model. Teachers need to transition from the traditional role of content delivery to becoming facilitators of learning. In this new role, teachers guide students through interactive discussions and collaborative learning activities during class time. This shift requires teachers to be well-prepared and trained in managing the classroom environment and using digital tools

effectively. Therefore, providing teachers with appropriate training, resources, and ongoing support is essential for the successful implementation of the Flipped Classroom model. Teachers must also be equipped to handle the dynamic nature of student-centered learning and the diverse needs of students.

Overall, the Flipped Classroom model presents a valuable opportunity to enhance the quality of education in remote areas such as Teluk Bintuni. Despite the challenges faced in terms of technology access and teacher preparedness, the model has demonstrated its potential to improve student engagement and academic achievement. With the right infrastructure, resources, and training, the Flipped Classroom can be adapted to meet the needs of students in these areas. This study provides valuable insights for policymakers, educators, and researchers interested in innovative approaches to education in remote and underserved regions.

## **4.1. Recommendations**

### **4.1.1. Improvement in technological infrastructure**

A key challenge highlighted by this study is the limited access to technology, which significantly affects the effectiveness of the Flipped Classroom model. To address this, there must be a concerted effort from both the government and schools to enhance the technological infrastructure in remote areas like Teluk Bintuni. This includes providing students with devices such as tablets or laptops and improving internet connectivity, ensuring that all students have equal access to online learning materials. Schools should also invest in digital platforms that facilitate the distribution of educational content and enable seamless interaction between students and teachers.

### **4.1.2. Teacher training and support**

For the Flipped Classroom model to be successful, teachers must undergo thorough training to adapt to the role of facilitators in the learning process. This training should focus on how to effectively use technology, design engaging learning materials, and manage interactive classroom activities. Additionally, teachers need support in overcoming challenges associated with technology, such as troubleshooting technical issues and ensuring that all students can access digital resources. Ongoing professional development should also be prioritized to help teachers continuously improve their skills and adapt to evolving educational technologies.

### **4.1.3. Adapting to local context**

The Flipped Classroom model must be customized to fit the unique needs and circumstances of the community it is implemented in. In Teluk Bintuni, where access to technology may be limited, a hybrid approach could be considered, where students use offline learning materials when digital resources are unavailable. Teachers should also consider students' learning preferences and academic backgrounds, adapting the materials to ensure they are relevant and accessible. By considering the local context, including infrastructure and cultural factors, the implementation of the Flipped Classroom can be more effective and sustainable.

### **4.1.4. Ongoing research**

This study has laid the groundwork for further research into the potential of the Flipped Classroom model in remote areas. Future research should explore additional factors that may impact the effectiveness of this model, such as student motivation, parental involvement, and the long-term academic outcomes of students. It would also be valuable to investigate how students from diverse socio-economic backgrounds engage with this learning model and whether there are significant differences in performance based on these factors. This research will help refine the model and provide deeper insights into how to optimize its implementation in various educational contexts.

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