

The Influence of Flipped Classroom Learning Assisted by Plickers on Student Motivation and Learning Outcomes

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Abstract: This study objectives are (1) to analyze the effect of the *Flipped Classroom* Learning model with online-based assessment on the learning motivation of elementary school mathematics in Cluster Gunung Agung, Mijen District, Demak Regency. (2) Analyzing the effect of the *Flipped Classroom* Learning model with online-based assessment on the learning outcomes of elementary school mathematics in Cluster Gunung Agung, Mijen District, Demak Regency. This study uses an experimental method with a Quasi-Experimental model with a simple experimental design (Pretest and Posttest Control Group Design). The population of this study were 6th grade students of Public Elementary School in the Gunung Agung Cluster, Mijen District, Demak Regency. The sample in this study were 6th grade students of SD Negeri Gempolsongo as the experimental class (flipped classroom) and 6th grade students of SD Negeri Bermi as the control class. The sampling technique that will be used in this study is purposive sampling. The research variable is the flipped classroom learning model as the independent variable (X) while the dependent variable is learning motivation (Y1) and learning outcomes (Y2). The research instruments are tests and questionnaires. Data analysis used data descriptions, prerequisite tests included normality tests and homogeneity tests, while hypothesis testing used the Manova test (Multivariate Analysis of Variance).

Keywords: Flipped Classroom, learning outcomes, motivation, Plickers

1. Introduction

During the pandemic and post-pandemic Covid-19 have introduced unforeseen difficulties in the education sector, as the Indonesian government has mandated a suspension of in-person teaching and learning activities. In this policy the government temporarily stops face-to-face teaching and learning activities for an undetermined time and recommends carrying out learning from home. It cannot be denied that many teachers feel nervous and awkward about this new thing because many teachers are used to conventional face-to-face learning, suddenly have to carry out distance learning activities (Shoukat et al., 2024).

An evaluation of student performance across various elementary schools in the Gunung Agung Cluster, Mijen District, Demak Regency, reveals a decline in academic achievement among the students. In the 6th grade mathematics content, it is clear that the difference in final semester achievement results from the implementation of offline mode where the percentage of learning completeness reaches 82% drops drastically to below 70% during the online learning period. In addition, Tinjić and Nordén (2024) agreed that although Master's students had a harder time adapting to the digital shift in the university environment. Thus, each education level has difficulties to adapt the changes of learning mode.

Fiuza-Fernández et al. (2022), quoted that it's important to adapt and develop digital strategies for the creation of learning, generate motivational synergies that connect with the interest of this new generation of students and stimulate meaningful learning. The digital native generation is described as multitaskers, they feel comfortable being involved in several tasks simultaneously. Another characteristic of digital natives is their high curiosity in obtaining information and knowledge, being adaptive and expecting an instant response. This is particularly true in the research written by Brown and Lewis (2022) whereby the young adults: 48% of 18- to 29-year-olds say they go online "almost constantly".

For instance, implementing the Flipped Classroom model can enhance collaborative learning by allowing students to develop their knowledge through group interactions, with prior guidance from educators. This approach not only

supports shy students by facilitating interpersonal engagement but also fosters a diversity of perspectives and understanding among learners (Zhonggen, 2019).

Numerous online assessment tools are available, including Plickers. Plickers is an interactive response system that enables teachers to collect student responses through mobile devices, computers, and cards, utilizing QR codes for efficient data collection (Khapper et al., 2024). To increase students' motivation in learning, researchers use online-based assessments. Based on the various things that have been described above, the writer wants to examine "The Influence of Flipped Classroom Learning Assisted by Plickers on Student Motivation and Learning Outcomes".

This study objectives are 1) to analyze the effect of the Flipped Classroom Learning model with online-based assessment on the learning activities of elementary school mathematics in Cluster Gunung Agung, Mijen District, Demak Regency; and 2) Analyzing the effect of the Flipped Classroom Learning model with online-based assessment on the learning outcomes of elementary school mathematics in Cluster Gunung Agung, Mijen District, Demak Regency.

Based on the results of observations and interviews with several colleagues, student activity in participating in the teaching and learning process is still low, only a handful of students are willing to ask questions. The observation results also show that the learning carried out is not optimal, this is supported by the results of the end of semester tests which have decreased quite significantly, especially in the mathematics lesson content for 6th grade elementary school. Therefore, a learning model is needed that is able to facilitate students to ask questions and consult about the difficulties they face in the learning material being discussed.

Flipped Classroom is a learning model that uses e-learning as a learning medium. Adhami and Taghizadeh (2022); Karagöz et al. (2024) explored students' perceptions of flipped classroom, Edmodo, and Google Docs for improving their academic writing performance among undergraduate students. Face-to-face activities with students in class can be filled with discussion activities about material that students do not yet understand, quizzes, practicums or other things related to the material being studied (Zainuddin et al., 2024; Gómez-Carrasco et al., 2020; Bergmann & Sams, 2012).

In the learning process using the Flipped Classroom, according to Lepkova et al. (2024) and Bergmann (2012) students go through the following stages: 1) Learning outside of school. Activities at this stage students access e-learning and watch videos that have been presented. Next, students work on worksheets to find out how learning activities outside of school can be implemented; 2) Learning at school. Activities at school use a scientific approach which begins with the stages of observing, asking, collecting information, associating and communicating.

Learning mathematics circle material using the Flipped Classroom model based on online Plickers assessment is used to increase student activity and learning outcomes (Menino et al., 2024; Egara & Mosimege, 2024). Through this learning model, students are led to explore the material to be taught by watching videos that have been presented by the teacher through e-learning, then in class students are required to explore their knowledge by discussing with friends or teachers. The purpose of this study is to 1) examine the impact of the Flipped Classroom Learning model with online-based assessments on the learning activities of 6th-grade mathematics students, and 2) assess its effect on their learning outcomes in the Gunung Agung Cluster, Mijen District, Demak Regency.

2. Methodology

This study employs a Quasi-Experimental approach with a Pretest-Posttest Control Group Design. The research instruments include tests and questionnaires to collect data on student performance and perceptions. The analysis involves both descriptive and inferential statistics. Initially, the data is subjected to descriptive analysis, followed by prerequisite tests such as normality and homogeneity tests to ensure the data meets the necessary assumptions for further analysis. Hypothesis testing is conducted using the Multivariate Analysis of Variance (MANOVA) to examine the effects of the intervention on multiple dependent variables simultaneously.

The population for this study comprises 6th-grade students from public elementary schools in the Gunung Agung Cluster, Mijen District, Demak Regency. The sample consists of 6th-grade students from SD Negeri Gempolsongo, who are assigned to the experimental group (flipped classroom), and 6th-grade students from SD Negeri Bermi, who serve as the control group. The sampling technique used is purposive sampling, selecting specific schools and classes that best fit the research objectives. This method ensures that the sample is representative of the population while allowing for a focused investigation of the flipped classroom model's impact. The study aims to provide insights into the effectiveness of this instructional approach in enhancing student learning outcomes.

3. Results and Discussion

Based on the results of research that has been carried out on class 6th students at Public Elementary School of Gempolsongo with the application of the flipped classroom learning model assisted by plickers in order to determine the effect on students' motivation and learning outcomes on the circle element material. Data was obtained through multiple choice tests and questionnaire tests. The learning motivation questionnaire test can be said to be high if it has a score of more than the total score of the class and is categorized as low if it gets a score below the average or less than the average total score of the class used as the sample in the study.

Data was taken based on the motivation and learning outcomes of students in the experimental class and control class. The following are the average value of the pretest and posttest learning outcomes of students in the experimental

class and control class. In the posttest score, the learning outcomes of the experimental class were greater than those of the control class, the data obtained also showed differences in the learning outcomes of students on the circle element material. An increase in average learning outcomes can be calculated by subtracting the average posttest score from the pretest. The increase in the average value of the control class was 14.56 while the experimental class was 42.8. In the posttest score, the learning outcomes of the experimental class were greater than those of the control class, the data obtained also showed differences in the learning outcomes of students on the circle element material. An increase in average learning outcomes can be calculated by subtracting the average posttest score from the pretest. The increase in the average value of the control class was 14.56 while the experimental class was 42.8.

Table 1. Learning results for control class and experimental class

	Statistics		
	Pretest learning outcomes		Posttest learning outcomes
	Experiment	Control	Experiment
Valid	31	30	31
Missing	0	1	0
Mean	42.68	52.43	85.48
Median	45.00	55.00	82.00
Mode	45	45	82
Minimum	9	27	64
Maximum	64	82	100
Sum	1323	1573	2650

Based on the learning motivation table, it can be seen that there is a difference in the average value of learning motivation between the control class and the experimental class. In the experimental class the average is higher than the control class. This proves that there is an influence on learning motivation after treatment. Previous scholars using experimental technique by Septiani et al. (2024), which the primary objective was to investigate whether the adoption of flipped classrooms, combined with technology utilization, could potentially enhance students' reading proficiency. To achieve this goal, an experimental research design was employed, comprising both an experimental group and a control group. Pre-tests and post-tests were conducted for both groups, with the experimental group receiving the flipped classroom intervention, while the control group experienced traditional classroom methods. The findings indicated that the experimental group exhibited superior performance compared to the control group.

Table 2. Results of the control class and experimental class learning motivation questionnaire

	Statistics	
	Control class learning motivation	Experimental class learning motivation
N Valid	30	31
Mean	39.97	54.97
Median	41.00	55.00
Mode	42	58
Minimum	33	47
Maximum	45	64
Sum	1199	1704

4. Conclusion

The conclusion in this study is that there's an influence of the flipped classroom learning model assisted by pickers on the motivation and learning outcomes of 6th Grade Public Elementary School students in Cluster Gunung Agung, Mijen District, Demak Regency. After determining the conclusions of the research that has been carried out, the researcher can provide the following suggestions: 1) Educators should be adaptive to developments in technology and information so that they can keep up with students belonging to the digital native group who were born and raised along with rapid technological advances; 2) Schools should provide adequate facilities and infrastructure needed by teachers to implement learning models that are varied and that have never been applied before in order to improve the quality of learning; and

3) Today's students are digital natives who are very aware of technology and gadgets, so they are expected to be able to apply their abilities to develop their knowledge independently.

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