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THE IMPLEMENTATION OF CANVA-ASSISTED FLIPPED CLASSROOM MODEL TO IMPROVE MATHEMATICS LEARNING OUTCOMES

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ABSTRACT

This study is motivated by the importance of utilizing innovative teaching models to improve students' mathematics learning outcomes. One such model is the Flipped Classroom, supported by interactive media like Canva. The purpose of this study is to determine the difference in mathematics learning outcomes between students taught using the Flipped Classroom model assisted by Canva interactive media and those taught using the direct instruction model with the same media. The research method used is experimental, employing a Post-test only control group design. Cluster random sampling was used for sampling. The instrument used was a learning outcome test in the form of an essay (post-test). Hypothesis testing was conducted using a t-test, which resulted in a t_calculated value of 2.59, while the t_table value with 60 degrees of freedom at a 0.05 significance level was lower. By comparing these values, the null hypothesis was rejected, and the alternative hypothesis was accepted. Additionally, the calculation of the effect size using Cohen's d formula yielded a value of 0.66, indicating a medium effect. In conclusion, the use of the Flipped Classroom model assisted by Canva interactive media not only resulted in a statistically significant difference but also had a moderate practical effect on improving students' mathematics learning outcomes.

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INTRODUCTION

Mathematics is one of the disciplines that can enhance critical thinking and argumentation skills, contribute to solving everyday problems and in the workplace, and support the development of science and technology (Gompi, et al., 2022). The development of learning models that are engaging and relevant to students' daily lives is crucial to improving mathematics learning outcomes (Liando, 2022). Therefore, efforts to improve the quality of mathematics education must involve various learning models that can encourage active student engagement in the learning process.

Mathematics, as a part of science, is a body of knowledge acquired through the learning process. The abstract nature of mathematics makes this subject difficult to understand (Laksana, et al., 2021). Mathematics is often considered one of the most difficult subjects by students, which negatively impacts their learning outcomes. Many students face difficulties in understanding mathematical concepts, causing them to feel frustrated and tend to give up before truly grasping the material (Setyani, 2022). This is exacerbated by the lack of support and effective teaching models, leading students to feel alienated and incapable in this subject (Sari & Widiyawati, 2023). Therefore, it is important to develop learning models that can help students overcome these difficulties and improve their learning outcomes in mathematics.

Mathematics learning outcomes can be used as a reference to assess how well students have acquired mathematics learning and developed their thinking from what they have gained in the mathematics learning process (Kue, et al., 2022). The low mathematics learning outcomes among students have become a serious concern in the education sector in Indonesia. Learning outcomes can serve as a benchmark to determine the level of success of students in knowing and understanding a subject, usually expressed in numerical or letter grades (Hasan, et al., 2020). Research shows that one of the factors contributing to low mathematics learning outcomes is the lack of student engagement in the learning process, which directly affects their understanding of the concepts (Wali et al., 2020). Additionally, factors such as the learning environment, including the interaction between students and teachers, also significantly influence mathematics learning outcomes, where students with a high interest in learning tend to show better results (Cahyani & Sowanto, 2021). One of the causes of low student learning outcomes is the use of inappropriate teaching models (Taha et al., 2022).

High mathematics learning outcomes are essential not only for academic success but also for fostering these skills, which are necessary in everyday life and the workplace. Improving students' mathematics learning outcomes is crucial to preparing them for future challenges and for contributing to the advancement of various fields of knowledge. However, Low mathematics learning outcomes are also evident at SMP Negeri 1 Tilango, Gorontalo Province. Based on the daily test results for the system of linear equations with two variables (SPLDV) material in the 2023/2024 academic year, the number of students who met the Minimum Mastery Criteria (KKTP) was no more than 30%. This indicates that most students are still struggling to understand the SPLDV concept, which impacts the low average class score and the increasing number of students who have not yet achieved mastery.

Based on interviews with mathematics teachers at SMP Negeri 1 Tilango regarding the learning activities, it was found that most students do not know what material will be studied at the beginning of the lesson. As a result, students are not well-prepared to start learning and tend to be passive in class. In the classroom, teachers predominantly use the direct instruction model (lecturing), which is teacher-centered, and teachers rarely use media that could be utilized in teaching. As a result, many students find mathematics boring. Often, teachers spend a lot of time just explaining the material, which leads to insufficient time for discussing practice questions due to limited class time. This situation affects the next session, where teachers end up using the beginning of the class to review students' homework rather than continuing with the material that should have been taught.

Furthermore, the use of the Canva-assisted Flipped Classroom model can also enhance the interaction between students and teachers, as well as among the students themselves, especially in learning probability. With the material already studied beforehand, students can be better prepared to engage in discussions and ask questions in class, creating a more collaborative learning environment (Adesta & Khasanah, 2022). Canva provides various interactive features, such as visualizing probability concepts through infographics, animations, and interactive quizzes, which help students understand abstract concepts more concretely. Research shows

that a positive and interactive learning environment contributes to improved student learning outcomes (Cahyani & Sowanto, 2021). Therefore, it is essential for teachers to continue innovating in their teaching methods, including utilizing technology like Canva, to create a more enjoyable and effective learning experience for students in mathematics (Bahar & Juhrianto, 2022).

As a solution to improve mathematics learning outcomes at SMP Negeri 1 Tilango, the implementation of the Flipped Classroom model assisted by Canva can create a more engaging and interactive learning environment. With this approach, students are expected to be more motivated to study independently and actively in class, leading to improved mathematics learning outcomes. The use of technology such as Canva also helps develop students' critical thinking skills.

This study is motivated by the importance of utilizing innovative teaching models to improve students' mathematics learning outcomes. One such model is the Flipped Classroom, supported by interactive media like Canva. The purpose of this study is to determine the difference in mathematics learning outcomes between students taught using the Flipped Classroom model assisted by Canva interactive media and those taught using the direct instruction model with the same media.

METHOD

The method used in this study is the experimental research method. According to Arifin, Z (2020:3), the experimental research method is conducted to determine the effect of a specific treatment. The design used is the Post-test Only Control Group Design. Two treatment groups are used, namely the experimental class group and the control class group. In the experimental class, the researcher uses the Flipped Classroom model assisted by Canva Interactive Media, while the control class will use the Direct Instruction model assisted by Canva Interactive Media. The research was conducted in the even semester of the 2024/2025 academic year at SMP Negeri 1 Tilango in class VIII, which consists of two classes. Sampling was carried out using cluster random sampling, with two classes selected: the experimental class, which is class VIII.2 consisting of 32 students, and the control class, which is class VIII.1 consisting of 30 students.

The data in this study are students' learning outcomes in the cognitive domain. Data collection techniques used a final test (Post-test) in the form of an essay. This test is conducted to measure students' learning outcomes on data presentation material. Before the learning outcomes test is given to the students, the instrument is first tested for validity and reliability. The validity test of the instrument consists of two stages: expert validity (construct) and empirical validity using the Product Moment formula expressed by Pearson, while the reliability test uses Cronbach’s Alpha formula. The data analysis techniques used in this study are descriptive statistical analysis (mean, median, mode, and standard deviation) and inferential statistical analysis, including the normality test of the data using the Liliefors test and the homogeneity of variance test using the F-test for equality of two variances. After all prerequisites are met, the data are tested using the t-test to determine the difference in the average learning outcomes of students taught using the flipped classroom model assisted by Canva Interactive Media compared to the average learning outcomes of students taught using the direct instruction model assisted by Canva Interactive Media. Then, to measure the magnitude of the effect, Cohen’s d effect size formula is used.

RESULTS AND DISCUSSION

Results

The data in this study were collected in the form of a mathematics learning outcomes test, specifically a final test in the form of an essay, which was conducted after the learning process in the experimental class (class VIII.2 with 32 students) and the control class (class VIII.1 with 30 students). The material used in this study was the system of linear equations with two variables (SPLDV), where the experimental class used the Flipped Classroom model assisted by Canva Interactive Media, while the control class used the direct instruction model assisted by Canva Interactive Media. The test used in this study consisted of 6 valid questions. A description of the learning outcomes data for both groups is presented in Table 1.

Table 1. Description of Learning Outcomes Data

Data	Class	N	Min. Score	Max. score	Mean ($\bar{X}$)	Median (Me)	Mode (Mo)	SD
Post-test	E	32	53	87	70,5	70	70	7,41
	K	30	47	83	65,5	67	67	7,65

Based on Table 1 above, it can be seen that the average score of the experimental class is higher, at 70.5, compared to the control class, which is 65.5.

From the post-test results of 32 students in the experimental class, it was found that the highest score achieved was 87, while the lowest score was 53. The data distribution is presented in the following histogram:

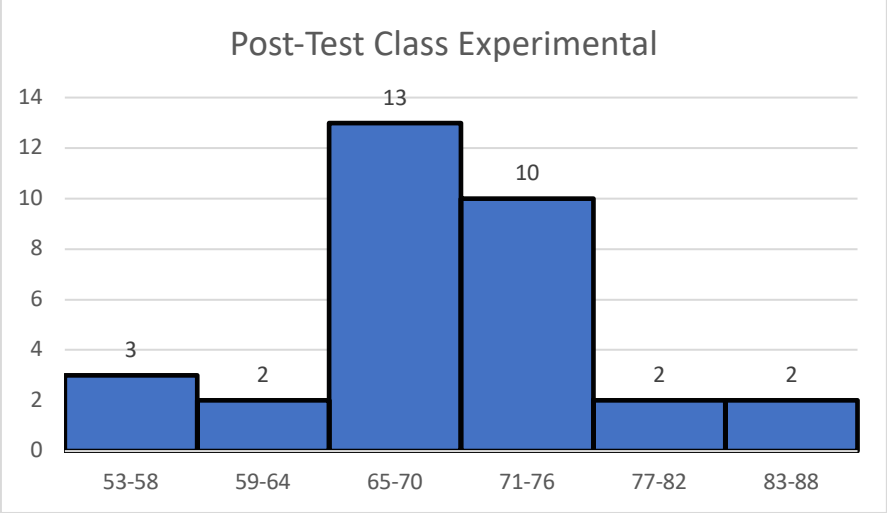

Figure 1. Histogram of mathematics learning outcomes scores using the Flipped Classroom model

Meanwhile, based on the post-test results of 15 students in the control class, it was found that the lowest score was 47, while the highest score reached 83. The data distribution is illustrated in the following histogram:

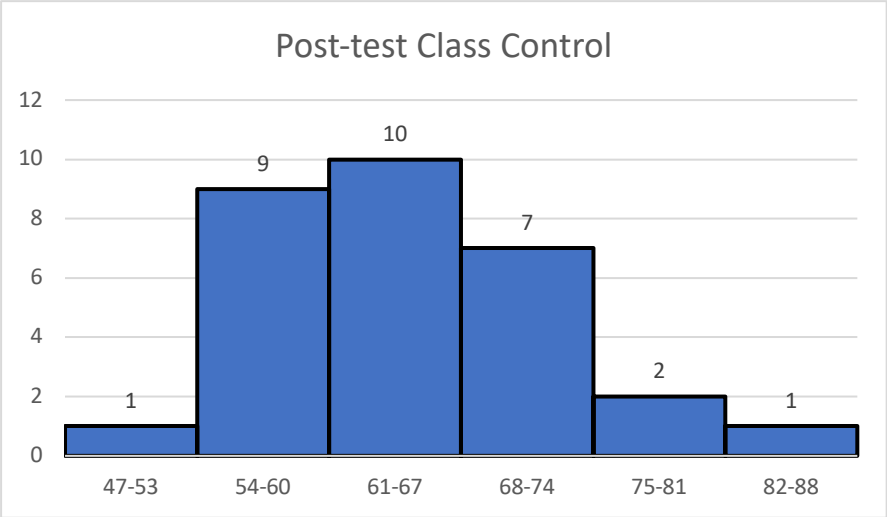

Figure 2. Histogram of mathematics learning outcomes scores using the direct instruction model

The next prerequisite analysis to be conducted is the normality test and the homogeneity test of the data. In this study, the normality test used is the Liliefors test with the following testing criteria: The null hypothesis (H_0) states that the data are normally distributed, while the alternative hypothesis (H_1) states that the data are not normally distributed. The decision for the test is based on the comparison between the L-calculated and L-table where H_0 is accepted if L_calculated ≤ L_table and H_0 is rejected if L_calculated > L_table, at a significance level (α) of 0.05.

Table 2. Results of the Data Normality Test.

Class	Data	N	L_calculated	L_table	Criteria
Experimental	Post-test	32	0,105369901	0,156624	H_0 accepted
Control	Post-test	30	0,098039231	0,161	H_0 accepted

Table 2 shows that the L calculated value from both data sets is smaller than the L table value, so the null hypothesis is accepted, meaning both data sets come from normally distributed data.

After both data groups are declared to be normally distributed, the next step is to conduct a variance homogeneity test. The purpose of the variance homogeneity test is to assess whether the characteristics and capabilities of both classes are homogeneous. The homogeneity test is performed on the post-test data of the experimental class and the control class using the F-test formula. The summary of the results can be seen in the table below:

Table 3. Results of the Data Normality Test.

Data	Class	N	Variance	F_calculated	F_table	Criteria
Post-test	Experimental	32	54,96673387	1,064823775	1,835	H_0 accepted
	Control	30	58,52988506			H_0 accepted

Based on the calculations in Table 3, where the F_calulated value from the experimental class and control class data is smaller than the F_table value, the null hypothesis is accepted, meaning the post-test data from the experimental and control classes used as samples in this study have homogeneous variances.

After conducting both tests, a two-sample t-test was performed to compare the average mathematics learning outcomes of students taught using the flipped classroom model assisted by Canva media with the average mathematics learning outcomes of students taught using the

direct instruction model assisted by Canva media. Based on the t-test, it was found that the calculated t value was 2.59, while the table t value was 1.67, with degrees of freedom (df) = 60, and the significance level used in this study was α = 0.05. The calculated t value was greater than the table t value, so the null hypothesis was rejected and the alternative hypothesis was accepted. Therefore, the average mathematics learning outcomes of students on the topic of the system of linear equations with two variables (SPLDV), who were taught using the flipped classroom model assisted by Canva media, were higher than those of students taught using the direct instruction model assisted by Canva media.

Next, the magnitude of the effect of the flipped classroom model assisted by Canva media was measured using Cohen's d formula, which showed a value of 0.66, falling within the moderate category. Therefore, the use of the flipped classroom model assisted by Canva media not only results in a statistically significant difference but also has a moderate practical effect on improving students' mathematics learning outcomes.

Discussions

This study aimed to determine the difference in mathematics learning outcomes between students taught using the Flipped Classroom model assisted by Canva interactive media and those taught using the direct instruction model with the same media, specifically on the topic of the system of linear equations with two variables (SPLDV). Based on the data analysis, it was found that the average score of the experimental group (Flipped Classroom with Canva) was 70.5, which was higher than that of the control group (Direct Instruction with Canva), which scored 65.5. The result of the independent samples t-test showed that the calculated t_value ($tvalue$ = 2.59) was greater than the critical t_table value ($ttable$ = 1.67), indicating a statistically significant difference between the two groups. This suggests that the application of the Flipped Classroom model assisted by Canva interactive media has a positive impact on improving students' mathematics learning outcomes.

Next, the magnitude of the effect of the flipped classroom model assisted by Canva media was measured using Cohen’s d formula, which showed a value of 0.66, falling within the moderate category. Therefore, the use of the flipped classroom model assisted by Canva media not only resulted in a statistically significant difference but also had a moderate practical effect on improving students' mathematics learning outcomes. It can be concluded that the implementation of the flipped classroom model assisted by Canva media results in higher mathematics learning outcomes statistically compared to direct instruction. Furthermore, it has a moderate practical effect on improving students' mathematics learning outcomes.

The results of this study are in line with previous research by Khoirotunnisa & Irhadtanto (2019) titled "The Effect of the Traditional Flipped Classroom Model on Students' Mathematics Learning Outcomes in the Material of Flat-Sided Space Figures." The results of this study show that the use of the traditional flipped classroom model has an effect on improving students' mathematics learning outcomes. This is demonstrated by the significant improvement in students' mathematics learning outcomes after using this model compared to the direct instruction model.

Furthermore, the research by Z. Walidah et al. (2020) also concluded that the flipped classroom model influenced the learning outcomes of students in class XI MA Raudhotul Ulum Klampis. This model provides an advantage for students, as they can watch the instructional videos provided by the teacher at home, allowing them to discover the concepts of the material on their own according to their understanding. Thus, this model not only enhances students' independent understanding but also provides the opportunity to learn the material more flexibly and at their own pace.

These findings are consistent with previous studies showing that flipped classroom provides a positive impact on students' learning outcomes, as this approach enables students to be more active in learning and gain a deeper understanding of the material. It also allows teachers to focus more on interactive and applicable learning during face-to-face sessions.

Additionally, the research by Rusnawati M. D. revealed that (1) there were higher learning outcomes in the application of the flipped classroom model in the subject of database administration in class XII RPL at SMK Negeri 1 Negara. The t-test analysis yielded a t_calculated value of 7.7497 and a t_table value of 1.66196 with 90 degrees of freedom (df) at a 5% significance level. Since t_calculated > t_table, the null hypothesis was rejected. (2) The students' motivation in the flipped classroom model was considered high, with an average motivation score for the experimental class of 98.30. (3) The students' responses to the application of the flipped classroom model in the subject of database administration were positive, with an average response score of 58.47.

These findings from Rusnawati's study further strengthen the evidence that the flipped classroom model can improve students' learning outcomes. In addition, it enhances students' motivation and positive responses to the learning approach, indicating that the flipped classroom not only improves learning outcomes but also creates a more engaging and interactive learning experience.

CONCLUSION

Based on the data analysis, the use of the Flipped Classroom model assisted by interactive Canva media not only resulted in a statistically significant difference but also had a moderate practical effect on improving students' mathematics learning outcomes. The experimental group, which was taught using the Flipped Classroom model and Canva, showed a higher average score compared to the control group taught using direct instruction with the same media. The results from the t-test confirmed that the difference in learning outcomes was statistically significant, and the effect size calculation indicated a moderate impact. This suggests that the integration of interactive media like Canva into the Flipped Classroom model enhances student engagement, promotes independent learning, and supports better comprehension of mathematical concepts.

It is recommended that teachers implement the Flipped Classroom model with Canva media to improve students' mathematics learning outcomes. Further research can explore its application in other subjects.

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