Edu Sains
Jurnal Pendidikan Sains dan Matematika
p-ISSN : 2338-4387
e-ISSN : 2580-3247

MATHEMATICAL PROBLEM-SOLVING ABILITY WITH BLENDED LEARNING MODEL OF FLIPPED CLASSROOM TYPE ASSISTED BY LEARNING VIDEO

Nova Devi Yanti*, Andi Susanto[b], Nita Putri Utami[c]
Email: novadeviyanti61@gmailcom

[a]**Pendidikan Matematika, Universitas Islam Negeri Imam Bonjol Padang, Indonesia*

Abstract
This research aims to analyze the differences in students' mathematical problem-solving abilities using the Flipped Classroom Type Blended Learning model assisted by learning videos compared to scientific Learning. The study employed a quasi-experimental method with a Randomized Control group-only design. The research population comprised all 286 eighth-grade students at SMP Negeri 5 Padang. Samples were selected using a random sampling technique, with class VIII.5 as the experimental class and class VIII.4 as the control class. The research instrument was a mathematical problem-solving ability test. Data analysis used a t-test. The results showed that students' mathematical problem-solving abilities taught using the Flipped Classroom Type Blended Learning model assisted by learning videos were higher than those using scientific Learning. This is evidenced by the experimental class average score of 72.54 is higher than the control class at 67.85 and t count (2.95) > t table (1.67).

Keywords: blended LearningLearning, flipped Classroom, learning videos, solving mathematical problems

Abstrak
Penelitian ini bertujuan untuk menganalisis perbedaan kemampuan pemecahan masalah matematis peserta didik yang menggunakan model Blended Learning Tipe Flipped Classroom berbantuan video pembelajaran dengan pembelajaran saintifik. Penelitian menggunakan metode eksperimen semu dengan rancangan Randomized Control Group Only Design. Populasi penelitian adalah seluruh peserta didik kelas VIII SMP Negeri 5 Padang yang berjumlah 286 orang. Sampel dipilih menggunakan teknik random sampling, dengan kelas VIII.5 sebagai kelas eksperimen dan kelas VIII.4 sebagai kelas kontrol. Instrumen penelitian berupa tes kemampuan pemecahan masalah matematis. Analisis data menggunakan uji-t. Hasil penelitian menunjukkan bahwa kemampuan pemecahan masalah matematis peserta didik yang diajar menggunakan model Blended Learning Tipe Flipped Classroom berbantuan video pembelajaran lebih tinggi daripada yang menggunakan pembelajaran saintifik. Hal ini dibuktikan dengan nilai rata-rata kelas eksperimen 72,54 lebih tinggi dari kelas kontrol 67,85 dan thitung (2,95) > ttabel (1,67).

Kata Kunci: *blended learning, flipped classroom, video pembelajaran, pemecahan masalah matematis*

INTRODUCTION

A critical part of Learning is choosing a suitable model. A learning model is a form of learning learning that is illustrated from start to finish and presented characteristically by the educator (Helmiati, 2012). According to Indrawati (Isrok'atun, 2018), a learning model is a conceptual framework that describes systematic procedures for organizing learning experiences to achieve specific learning objectives.

The use of learning models can also be accompanied by appropriate learning media (Raztiani & Permana, 2019). According to Netriwati, learning media are materials or tools used in the teaching and learning process so that the learning process between educators and students can take place in an appropriate and effective manner (Khaidir et al., 2022). The use of learning media at its teaching orientation will significantly assist the effectiveness of the learning process and convey the message and content of the lesson at that time (Arsyad, 2016). With the media, students will be more motivated to learn, encourage students to write, speak, and imagine more stimulated (Tafonao, 2018).

Using suitable learning models and appropriate media, educators can also develop various abilities of students, one of which is mathematical problem-solving. Problem-solving is one of the essential and fundamental abilities that students must possess in learning mathematics (Utami et al., 2022). Problem-solving ability can be understood as an effort in the process of finding a way out of the problem problem (Fitri et al., 2020). Problem-solving skills do not merely require students to solve a problem presented by educators but rather to combine their abilities (Rahmatiya & Miatun, 2020).

Problem-solving ability is an ability that students need to have after participating in math learning activities. The benefits of problem-solving skills include being able to be applied to other sciences, as well as solving problems in everyday life that will be found by students in the future (Susanto & Syaveta, 2018). So important is the problem-solving ability of students, and problem-solving is one of the abilities that educators must master. However, the facts found in the field show that students' problem-solving skills are still low. Several factors, including the selection of an inappropriate learning model, influence this. In addition, the post-COVID-19 conditions have a considerable impact, especially in the field of education, making it challenging to apply learning models that can develop students' problem-solving skills.

Given the importance of problem-solving skills for students, it is necessary to improve the learning model. For this reason, a learning model is needed that supports student activities and has more flexible time in understanding learning material. An effective learning model to improve mathematical problem-solving skills is the Blended Learning Type Flipped Classroom model assisted by learning videos.

Blended LearningLearning is a mixture of online LearningLearning and in-person LearningLearning that utilizes learning media and learning theories (Hariadi, 2019). Furthermore, Kurtus also stated that Blended Learning is a mixture of various learning strategies and delivery methods that will optimize the learning experience for its users (Istiningsih & Hasbullah, 2015). Blended Learning assisted by learning videos has many advantages, including the fact that Learning can use media based on current technology and can be accessed online. This can attract students and eliminate the notion of boring and unpleasant Learning.

In this research, the Blended Learning used is the Flipped Classroom type. Hasanuddin and Fitrianingsih said that the Flipped Classroom model is reversing the learning method in the Classroom; reversing here means that students must read/learn in advance at home so that when in class, the teacher no longer explains/teaches the material (Sitanggang & Bintang, 2021). The fundamental characteristic of this model is to involve students when the class has not yet started, generally with reading assignments, watching videos or analyzing activities so that it is hoped that students can have concepts related to the material being taught before later being given problems in the Classroom during face-to-face meetings (Rohmatulloh & Nindiasari, 2022). This is supported by research (Khofifah et al., 2021), which states that flipped-modelled Learning is efficacious in improving students' concept understanding and problem-solving skills. In addition, according to Kusnandar (Fikri, 2019), the Flipped Classroom is a teaching technique that changes traditional culture into a form of media.

Several studies on the blended learning model flipped classrooms and several previous researchers have conducted learning videos. The results obtained showed that the blended learning model is efficacious in improving students' creative thinking skills (Rochmad & Ulinnuha, 2020), concept understanding ability (Sudiarta & Sadra, 2016), fluency in students' mathematical procedures (Nugraha et al., 2019) and students' learning outcomes (Payadnya & Prawestri, 2021). Furthermore, Flipped Classroom is also effective for improving students' attitudes and learning skills (Damayanti & Sutama, 2016), critical thinking skills (Alfina et al., 2021) and mathematical reasoning (Fedistia & Musdi, 2020). Based on the results of these studies, researchers conducted research with the aim of seeing how students' mathematical ProblemProblemproblem-solving skills can increase by using the Blended Learning model of the flipped classroom type assisted by learning videos. Research in an effort to improve students' mathematical ProblemProblem solving skills deliberately uses the Flipped Classroom type Blended Learning model with the help of learning videos for renewal from previous research.

METHOD

This type of research is a quick experiment with a Randomized Control group-only design.

Table 1. Randomized Control Group Only Design

Group	Treatment	Postest
Experiment	X	T
Control	Y	T

Source: modified from Suryabrata (2006:

Description:

X = Treatment/treatment (Blended Learning Type Flipped Classroom Model assisted by learning videos)

Y = Scientific learning treatment

T = Final test of problem-solving skills in experimental and control classes

The study population was all students of class VIII SMP Negeri 5 Padang, which included as many as 286 people. The sampling technique used random sampling, and the selected sample was class VIII.5 as the experimental class and class VIII.4 as the control class. The instrument used was a math test for ProblemProblem problem-solving ability. The final test data analysis technique used was the t-test.

RESULTS AND DISCUSSION

Based on research that has been conducted in class VIII.5 as an experimental class and class VIII.4 as a control class at SMP Negeri 5 Padang in the 2022/2023 school year, data on mathematical ProblemProblem problem-solving ability is obtained from the final test results with the subject matter of number patterns. The experimental class that applied the Blended Learning Type Flipped Classroom model assisted by learning videos was attended by 32 students. Thirty-two students participated in the control class with scientific Learning. The results of the data description based on the mathematical problem-solving ability test with KKM 75 can be seen in Table 2 below:

Table 2. Description of Final Test Data

Sample Class	N	$\bar{X}$	X_{max}	X_{min}	S_i	S_i^2	Completeness
Experiment	32	72,54	90,0	45,0	10,75	115,56	56%
Control	32	67,85	87,50	43,75	11,95	142,80	34%

Description:

Experiment: Using the Blended Learning Type Flipped Classroom model assisted by Learning Videos

Control: Using a scientific learning model

N: Number of students

X: Average ProblemProblem solving ability

X_{max}: Highest score

X_{min}: Lowest score

S_i: Standard

Problem-solving: Variance

Table 2 above shows that the average mathematical problem-solving ability of students in the experimental class is higher than that of the control class. Judging from the standard deviation, the experimental class has a more minor standard deviation than the control class, meaning that the value of students in the experimental class is more uniform than the control class. So, the value in the experimental class is higher than the control class.

Table 3. Grouping of Final Test Score of Problem-Solving Ability of Experimental Class and Control Class

No	Problem-Solving Indicator	Experiment	Control
1.	Understanding the ProblemProblem	89,06	85,31
2.	Develop a problem-solving plan	78,59	75,16
3.	Implementing the ProblemProblem solving plan	72,19	67,50
4.	Checking back	50,31	43,44
	Average	72,54	67,85

Table 3 explains that the average value of each indicator of mathematical ProblemProblemproblem-solving ability for experimental and control classes is different. The average score for each indicator of mathematical problem-solving ability of the experimental class is higher than that of the control class. From the results of this study, analytical requirements are tested, namely normality test, homogeneity test, and hypothesis testing. The normality test results are shown in Table 4 below:

Table 4. Sample Normality Test Analysis Results

No	Class	L_0	L_{tabel}	Description
1	Experiment	0,1323	0.1566	Normal
2	Control	0.0583	0.1566	Normal

The results of data normality testing using the Liliefors test with a significance level of 0.05 show that the Ltabel value is 0.1566. This indicates that the data distribution of the experimental class and control class is normally distributed. The results of the homogeneity test analysis with the F test can be seen in Table 6 below:

Table 5. Sample Homogeneity Test Results

No	Class	N	S^2	F_{itting}	F_{tabel}	Description
1	Experiment	32	155,75	1,08	1,84	Normally Distributed
2	Control	32	142,92			Normally Distributed

The Ftable value at the α=0.05 level is 1.84, then Fcount (1.08) < Ftable (1.84). So, it can be concluded that the two sample classes are homogeneous. Hypothesis testing is done to find out whether the Blended Learning Type Flipped Classroom model assisted by learning videos on students' mathematical problem problem-solving ability has a significant influence so that it can be known whether the research hypothesis is accepted or rejected. The results of hypothesis testing can be seen in Table 6 below:

Table 6. Sample Hypothesis Test Results

No	Kelas	N	Mean	T_{count}	T_{table}	Description
1	Experiment	32	72,50	2,95	1,67	H_0 reject
2	Control	32	67,97			H_1 accept

The test results carried out with a two-sample t-test obtained are tcount = 2.95 and ttable = 1.67, so it can be seen that the value of tcount> ttable is at a significance level of 0.05. This means that H0 is rejected and H1 is accepted, meaning that the mathematical ProblemProblemproblem-solving ability of students taught with Blended Learning Type Flipped Classroom assisted by learning videos is higher than the mathematical ProblemProblemproblem-solving ability of students taught with scientific Learning.

Understanding the ProblemProblem The indicator of understanding the ProblemProblem is expected to allow students to understand what is known and ask about the ProblemProblem given (Mawaddah & Anisah, 2015). Based on the results of the study, the indicator of understanding the problem of the experimental class is higher than the control class. This is because the experimental class is given additional material and examples of issues from learning videos provided by educators during online Learning. Providing learning videos can improve students' problem-solving skills. This is in line with Vika Palera's research, which states that learning videos can help real math learning to achieve goals, which include increasing concept understanding, reasoning, problem-solving skills and even high curiosity (Palera et al., 2020). In addition, one of the phases in the blended learning type flipped Classroom is that students are accustomed to exploring mathematical ideas (seeking information), which provides them with the freedom of thought to generate new ideas. Developing the habit of exploring ideas in solving problems can make learners understand the situation correctly.

Indicators of planning for completion are seen when students create or compile mathematical models, including the ability to Solve everyday situations in mathematics (Chotima et al., 2019). Based on the results of the study, the indicator of planning the solution of the experimental class is higher than the control class. This is because, in one of the phases in the Blended Learning Type Flipped Classroom model, students conduct discussion activities with their groupmates in the form of presenting mathematical ideas (actuation information) found previously. In addition, experimental class students were also given worksheets in the form of problem-solving problems. In the worksheet, the problems given make students curious and wonder how to solve them so that students identify as many questions as possible and design appropriate solution plans. This is reinforced by Long (Abidin, 2019). Flipped classroom learning is stated to make students active in class, increase cooperation between students, and facilitate students ' discussion of problems with educators.

Indicators of implementing a solution plan are seen when students choose and develop a solution strategy, including the ability to bring up various possibilities or knowledge that can be used in solving the problem (Mawaddah & Anisah, 2015). Based on the research results, the indicator of implementing the experimental class solution plan is higher than the control class. This is because experimental class students have become accustomed to choosing the right strategy to solve existing problems so that when working on the problem problem, students can solve it correctly. In addition, with the worksheets that have been given, students can cooperate and discuss with their groupmates; if there are obstacles in their work, students discuss it together to get the right solution so that students can solve various math problem-solving problems. By doing a lot of problem exercises, students' mathematical problem-solving skills will improve. This is in line with Rahmawati's research, which states that students' mathematical problem-solving skills are obtained from exercises carried out in class, starting from collecting learning theories related to the problem given (Rahmawati, 2019).

The process of checking back in solving problems is a person's steps to check the answers or results of understanding to prove the procedures used are correct, or the answers generated have answered the ProblemProblem (Setyawan, 2020). Based on the research results, the indicator of implementing the experimental class solution plan is higher than the control class. This is because, in the experimental class, students are accustomed to working on problems with problem-solving steps, where after completing a problem, students must re-examine their findings. Rechecking the answer is done to reduce the error of the final result of the student's answer. This is in line with Brook and Cai's research, which suggests that checking back answers aims to maximize learning outcomes in solving problems (Setyawan, 2020).

Based on the description above, the steps in a Blended Learning type Flipped Classroom can develop students' mathematical problem-solving abilities. In contrast to the control class, students are only given ordinary Learning. In the learning process, students are only given material and practice questions from the student handbook. The questions from the book do not contain non-routine problems (story problems), and students are also not given worksheets, so when given test questions in the form of non-routine problems (story problems), students experience difficulties because students are not familiar with the four steps in problem-solving.

This is in accordance with relevant research by Marita et al., the results obtained that the Blended Learning model using the Flipped Classroom method assisted by Google Classroom can improve students' problem-solving skills (Marita, 2022). Rahmawati and Anggria's research also found another thing it was found that the improvement in the mathematical problem-solving ability of students who received Learning using the cooperative script model and blended Learning was

better than scientific Learning from all students (Rahmawati, 2020). In addition, research conducted by Sinta et al. found that the critical thinking ability of students who use the Flipped Classroom-based project-based learning model is higher than that of students who use conventional models.

According to the researchers, several things cause mathematical problem problem-solving skills to increase by applying the Blended Learning model, including students being given learning videos in the form of material summaries and sample problems uploaded on YouTube. Learners in groups understand the material and solve math problems related to the real world.

As for the control class, students are only given ordinary Learning. In the learning process, students are only given material and practice problems from the student handbook. The questions from the book do not contain non-routine problems (story problems), and students are also not given worksheets, so when given test questions in the form of non-routine problems (story problems), students experience difficulties because students are not familiar with the four steps in problem-solving.

This is in accordance with relevant research by Marita et al. It was found that the Blended Learning model using the Flipped Classroom method assisted by Google Classroom can improve students' problem-solving skills (Marita et al., 2022). Rahmawati and Anggria's research also found another thing, it was found that the improvement in the mathematical problem-solving ability of students who received Learning using the cooperative script model and blended Learning was better than scientific Learning from all students (Rahmawati & Anggria Septiani Mulbasari, 2020). In addition, research conducted by (Suci Sintia et al., 2022) found that the critical thinking ability of students who use the Flipped Classroom-based Project Based Learning learning model is higher than students who use conventional models.

CONCLUSION

This study concludes that there is a difference between the mathematical problem-solving ability of students who apply the Blended Learning model and the mathematical problem-solving ability of control class students using scientific Learning in class VIII SMP Negeri 5 Padang. Suggestions for further researchers: The Blended Learning Type Flipped Classroom model, assisted by learning videos, needs to be followed up with research on other mathematics abilities or subjects.

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