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Implementation of Flipped Classroom Learning Model Based Information and Communication Technology (ICT*)* to Improve Learning Outcomes

Nuril Huda[1*], Hanifah Fitriani[2]
Universitas Islam Negeri Maulana Malik Ibrahim Malang; Gajayana Street No.50, Dinoyo, Lowokwaru District, Malang City, East Java 65144
e-mail: [1]***nurilhuda26@uin-malang.ac.id, [2]fhanifah166@gmail.com**

Abstract: This study departed from the low student learning outcomes in the topic of mathematics subject comparison VII grade at MTs Almaarif 02 Singosari. From the initial analysis, only 62.5% of students could achieve the Criteria for Achievement of Learning Objectives (KKTP), while 37.5% of other students were not complete. This study aims to describe the implementation of a flipped classroom learning model based on ICT in improving student learning achievement. The research method applied is classroom action research (PTK: *Penelitian Tindakan Kelas*) following the Kemmis and McTaggart model. The data collection tools used include learning outcome tests and student learning activity observation sheets. Data analysis techniques were carried out quantitatively with descriptive statistics to measure learning completeness and qualitative analysis through student activity observations. The results showed an increase in the percentage of students who achieved KKTP from 62.5% to 83.3%. Student learning activities also increased from 70.8% to 87.5%. Thus, the flipped classroom learning model based on ICT (Information and Communication Technology) is said to be effective in improving the learning outcomes of seventh-grade students at MTs Almaarif 02 Singosari on comparison material and becomes an alternative solution in improving the quality of learning in the classroom.

Keywords: Flipped Classroom; ICT; Learning Outcomes; Comparison Material

A. INTRODUCTION

The world of education continues to experience significant changes, especially with the emergence of educational technology that allows the learning process to be more dynamic and responsive to student needs (Arikarani & Ameeruddin, 2021). The use of information and communication technology provides a great opportunity to improve the quality of education by providing wider access for students to various learning resources. Learning that is carried out with a focus on students, or what is often referred to as student-centered learning, is one of the approaches that later emerged due to the phenomenon of these conditions. Among the applications of the student-centered learning approach is the use of a blended learning model, which combines face-to-face learning with online learning (Kurniawati et al., 2019).

In this context, a learning model that can be applied with a student-centered learning approach based on blended learning is needed. Furthermore, the researcher chose the flipped. The classroom learning model is to be applied because students obtain learning materials independently before face-to-face sessions, and when in-class time is used for discussion, collaboration, and application of concepts that have been learned online. The flipped classroom is a learning model that reverses the traditional learning paradigm, where students receive learning materials outside the classroom, often through online platforms such as the internet, before engaging in classroom activities (Masitoh et al., 2021). In this study explores the application of the flipped classroom model

in ICT-based learning. According to B. Williams and S. Stacey, ICT is a technology that integrates computing with communication networks that transmit data, audio, and visuals (Wungguli & Yahya, 2020). The utilization of ICT can be an option to make learning more interesting because of the active involvement of students by using various senses during the learning process so that success in learning can be achieved.

A student is considered successful in learning if they can achieve learning achievements or have good learning outcomes. The results of learning are often used as an indicator to assess the extent to which a person understands and masters the material taught (Disai *et al.,* 2018). Based on the results of a review that has been conducted on the results of mathematics learning carried out in seventh-grade students at MTs Almaarif 02 Singosari, show the ability in comparison material to obtain learning outcomes that are said to be quite low. Researchers understand that creating innovative learning models is crucial for improving student learning outcomes, which serves as a benchmark for successful educational implementation. Considering these factors, the flipped classroom model was implemented using ICT to improve learning outcomes by merging face-to-face and online learning, allowing students to take an active role in their process.

In line with previous research conducted by Ario & Asra (2018), Maulidina (2020), (Wihinda et al., 2020), (Masitoh et al., 2021), and (Efendi & Maskar, 2022), shows that the flipped classroom learning model has a significant impact on improving student learning outcomes. This model allows students to engage with instructional materials independently before class, fostering a deeper understanding of the content. In-class time is then utilized for collaborative problem-solving and active learning, further strengthening their grasp of the subject matter. The increased student engagement and effective use of classroom time have been proven to enhance both conceptual understanding and overall academic performance.

Based on the explanation that has been conveyed, researchers are interested in conducting research related to the application of the flipped classroom learning model-based ICT which includes the use of learning resource videos, QR-Code, e-LKPD, and word wall platforms to improve student learning outcomes in class VII comparison subjects at MTs Almaarif 02 Singosari. Thus, the researcher chose the title "Implementation of Flipped Classroom Learning Model Based ICT to Improve Learning Outcomes", so that the hope is that it can be used as a reference in overcoming these problems and afterward it can to serve as one of the strategies to improve student learning outcomes in mathematics.

B. METHODS

The research conducted adopted quantitative and qualitative approaches with a research model in the form of class action. This form of classroom action research method allows teachers to systematically make changes in the learning process to improve classroom teaching (Yusuf & Pujiastutik, 2017). The Classroom Action Research method that follows the Kemmis and McTaggart model consists of four main stages, namely planning, implementation, observation, and reflection. The implementation of this research will be carried out by repeating these cycles several times and will be stopped after reaching the predetermined criteria. In addition, another similar model presented by Suharsimi regarding the PTK method is described in the following chart (Lekitoo et al., 2019).

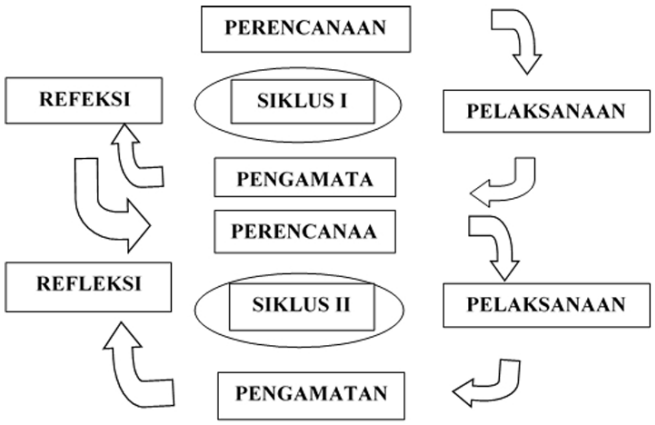


Figure 1. Suharsimi's PTK model

This study used the subject of class 7A students at MTs Almaarif 02 Singosari totaling 26 students, and student learning outcomes as the object of the study. The techniques chosen and used for data collection include the use of tests to evaluate student learning outcomes at the end of the cycle, as well as observation sheets used during the learning process. The data that has been collected is then analyzed quantitatively and qualitatively. A quantitative analysis was carried out with descriptive statistics to analyze the changes in student learning outcomes before and after the implementation of the action, including measuring classical completeness or the percentage of students who were able to penetrate the criteria for achieving the learning objectives set by MTs Almaarif 02 Singosari. The formula used to find the average percentage of students who reach KKTP is: $\% = \frac{\sum The\ number\ of\ students\ who\ reach\ KKTP}{\sum The\ total\ number\ of\ students} \times 100\%$

Table 1. Criteria for Achievement of Learning Objectives (KKTP)

KKTP	Description
$\geq$ **75**	Complete
$<$ **75**	Not Completed

In the context of this research, learning is considered successful if 75% or more of the students achieve a minimum score of 75 in the evaluation of mathematics learning outcomes (Buasim, 2019). The research cycle will be stopped if the percentage of students meeting the achievement of learning completeness scores can exceed 75% based on predetermined criteria

Data analysis was conducted qualitatively by observing student learning activities using observation sheets as a basis. The analysis was then carried out interactively based on the results of the development by Miles and Huberman, which consisted of the stages of data reduction, presentation, and conclusion

In this study, the researcher further set the criteria that the research would stop when:

1. 75% of students can achieve KKTP $\geq$ 75
2. 75% of students implement 7 out of 10 indicators on the observation sheet

C. RESULT & DISCUSSION

1. Research Result

a. Flipped Classroom

The flipped classroom model was introduced by Aaron Sams and Jonathan Bergmann in around 2007. They define the fundamental concept of the flipped classroom as a departure from traditional teaching methods (Eko Murtiasih, 2022). In conventional learning, teachers present material during class time and assign homework for students to complete at home. In contrast, in the flipped classroom model, students learn independently at home through pre-prepared resources, and in class, they are actively involved in discussions and given tasks to apply the concepts they have

learned (Mujiono, 2021). The application of the flipped classroom model can be utilized in the learning process with the use of technology. Educators can use technology as an educational tool, granting students access to learning resources online (Atmadinata et al., 2019).

Based on Steel's opinion in Adhitiya (2015), states that the flipped classroom learning model consists of four steps, namely: 1) students learn independently by listening to learning videos while at home, 2) students attend class and carry out learning activities and work on assignments given according to the video, 3) students apply their understanding through group discussions, 4) furthermore, the form of student understanding is evaluated at the end of learning

According to Kathleen Fulton, the advantages of the flipped classroom are that students have the opportunity to adjust learning to their own pace of understanding, as they can repeat material if necessary; homework that is usually given will be completed in class with various forms of completion, allowing students to ask questions on parts that have not been understood; learning occurs effectively due to the active role of the teacher and students; and teachers who choose to implement the flipped classroom tend to achieve higher learning outcomes when compared to traditional learning methods (Yildirim, *Et. Al.* 2016).

From the description presented, the flipped classroom learning model can be interpreted as a model in which students learn the material at home and apply it through discussions and activities in class, and usually utilize technology to access material online.

b. ICT

Information and Communication Technology (ICT) can include the definition of various tools or technologies such as computers, cell phones, software, networks, the internet, and other digital media used to access, disseminate, and manage information in various formats such as data, audio, and visual. To help students understand mathematical concepts, information and communication technology (ICT) can be utilized in learning mathematics more visually and interactively (Retnodari et al., 2020). Some ICT-related utilizations that can be used in learning, such as video learning resources, QR-Code, e-LKPD, and word wall platforms.

From this description, ICT is defined as technology that includes digital tools and media to access, manage, and disseminate information, which can also be utilized in learning.

c. Learning Outcomes

Student learning outcomes are what students get through the thinking process and develop their ability to master, know, understand, learn, and practice in daily life (Masripah, 2021). Learning outcomes refer to students' achievements after their involvement in learning activities. These achievements include cross-dimensional abilities, including students' knowledge, attitudes, and skills as a result of undergoing the learning process (Rahman, 2021).

From the description presented, it can be concluded that learning outcomes represent the ability as a result of what students get through the learning process. The effectiveness of the learning process can be proven through students' abilities and skills in understanding the material taught

2. Discussion

In the early stages of the research, researchers analyzed student learning outcomes to find the appropriate learning model. After analyzing the learning outcomes, researchers then chose the flipped classroom learning model based on ICT because, in this modern era, human life is inseparable from the use of technology, including students. Thus, the learning process is carried out by utilizing technology and the implementation can be done independently when at home.

Researchers prepared learning tools including teaching modules, and mission sheets in the form of tasks that must be completed at home which include learning resource videos contained in QR-Codes and e-LKPD links that can be accessed by students, group and individual quizzes in the form of games that utilize the word wall platform, and evaluation test questions to measure the results of understanding at the end of learning.

The next step is to plan for the learning that will be applied in the research cycle. Follow this instruction for the rest of the steps.

a. Students are provided with learning materials to study independently at home before attending class. They are given mission sheets containing QR codes linked to videos of learning resources, as well as e-LKPD links, which can be accessed to facilitate independent learning and must be completed at home.



Figure 2. Home Mission Sheet



Figure 3. E-LKPD

b. When learning in class, students are given assignments in the form of individuals or groups to evaluate students' understanding after learning independently. The assignment is in the form of practice questions or quizzes by utilizing the Wordwall platform to test the understanding of the results of student learning that has been done independently at home.



Figure 4. Implementation of Quiz with Wordwall Platform

c. Next, the teacher guides students to conduct a discussion and ends with a conclusion.
d. The teacher gives evaluation questions to measure and see the extent to which the learning material that has been learned can be understood, besides that the evaluation questions are also used for assessment.

The test results before being given class action in the form of applying the ICT-based flipped classroom model can be seen from the description in Table 2 below.

Table 2. Test Results Before Action

KKTP	Frequency	Percentage (%)	Description
≥ 75	15	62.5%	Complete
< 75	9	37.5%	Not Finished
Sum	24	100%	

At the time of the research implementation, 2 students did not participate due to absence. Based on Table 2, the test results show that there were 15 students with a percentage of 62.5% who reached KKTP ≥ 75. Meanwhile, 9 students with a percentage of 37.5% did not reach KKTP < 75. The results of observations or observations based on observation sheets of student learning activities in the learning process as qualitative data can be seen from the description in Table 3 below.

Table 3. Observation Results of Learning Activities Before Action

Indicator	Frequency	Percentage (%)	Description
≥ 7	17	70.8%	Complete
< 7	7	29.2%	Not Completed
Sum	24	100%	

Based on Table 3, the observation results show that student learning activities are declared complete with a percentage of 70.8% and unfinished with a percentage of 29.2%

In the next stage, students were assigned tasks within the framework of a flipped classroom learning model based on ICT, where independent learning took place at home through assignments or missions that involved watching instructional videos and completing practice questions. During classroom sessions, discussions, quizzes, and practice exercises were conducted to evaluate students' comprehension of the material studied at home. The test results after being given class action in the form of applying the flipped classroom learning model based on ICT can be seen from the description in Table 4 below.

Table 4. Test Results After Action

KKTP	Frequency	Percentage (%)	Description
≥ 75	20	83.3%	Complete
< 75	4	16.7%	Not Completed
Sum	24	100%	

Based on Table 4, the test results obtained after the action detail that 20 students with KKTP ≥ 75 showed complete information with a percentage of 83.3%, therefor there was an increase from the test results taken before the action was given. Meanwhile, KKTP < 75 which states that it is not complete is owned by 4 students with a percentage of 16.7% which shows an incomplete statement.

The results of observations or observations obtained based on observation sheets regarding student learning activities during the learning process as qualitative data reviewed after the action of the flipped classroom learning model based on ICT. The results of the review can be seen in Table 5 below.

Table 5. Observation Results of Learning Activities After Action

Indicator	Frequency	Percentage (%)	Description
≥ 7	21	87.5%	Complete
< 7	3	12.5%	Not Completed
Sum	24	100%	

Based on Table 5, the observation results show student learning activities after class action with the application of the ICT-based flipped classroom model which is declared complete with 21 students shown as a percentage of 87.5% and has not been said to be complete by 3 students shown as a percentage of 12.5%. Thus, an increase in the results of completeness was obtained after the action was taken. Since the implementation of actions in cycle one has met the predetermined criteria, the researcher decided to conclude the study. The testing was considered successful, indicating that the goal was achieved, namely, an improvement in the learning outcomes of students who received treatment through the use of an ICT-based flipped classroom learning model.

In line with previous research conducted Ario & Asra (2018), Maulidina (2020), (Wihinda et al., 2020), (Masitoh et al., 2021), and (Efendi & Maskar, 2022), snow that the flipped classroom learning model significantly enhances student learning outcomes.

D. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the application of flipped classroom learning model-based ICT is effective in improving student learning outcomes. This is evidenced by an increase in the percentage of students who successfully achieved the KKTP target ≥ 75 with a complete description in the review based on the test results achieved a change of 20.8%, as well as observations on student learning activities before and after implementing class actions achieved a change of 16.7%.

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