**Educational Researcher Journal**
ISSN: 3064-500x (e)
Year, Vol. 3, No. 2, page 25-36
https://edurj.com/index.php/edurj

OPEN ACCESS

# THE USE OF SIMULATED ANALOG CLOCKS TO IMPROVE TIME-READING SKILLS IN MATHEMATICS LEARNING FOR SECOND-GRADE STUDENTS AT SDIT ARRAUDHOH

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**ABSTRACT**

The low ability of second-grade elementary students at SDIT Ar Raudhoh in reading analog clocks is caused by abstract mathematics instruction and limited use of concrete learning media, which creates a gap between learning needs and classroom practice. This study aimed to improve students' ability to read time using an analog clock model through a Hands-On Learning approach. The research used Classroom Action Research based on the Kemmis and McTaggart model, conducted in two cycles involving 12 students. Data were collected through observation and learning achievement tests. The results showed a significant improvement in students' learning outcomes. The percentage of mastery increased from 16.7% in the pre-cycle stage to 41.7% in Cycle I, and reached 91.7% in Cycle II with an average score of 89.2. These findings indicate that the use of a student-made analog clock model effectively helps students understand the concept of time in a more concrete and meaningful way. The improvement also reflects higher student engagement and motivation during learning activities. This study contributes to mathematics education by providing an alternative practical learning strategy that supports early-grade students' conceptual understanding of time and can be applied by teachers to improve learning quality in elementary schools.

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**ARTICLE INFO**

***Keywords:***
mathematics learning; analog clock; hands-on learning; elementary school; classroom action research; time reading skills

***Article History:***
Received: 9 June 2026
Revised: 20 June 2026
Accepted: 15 July 2026
Published: 31 July 2026

***How to Cite in APA Style:***
Zahra, S. Z., & Siti Kamilah, K. (2026). The THE USE OF SIMULATED ANALOG CLOCKS TO IMPROVE TIME-READING SKILLS IN MATHEMATICS LEARNING FOR SECOND-GRADE STUDENTS AT SDIT ARRAUDHOH. *Educational Researcher Journal*, *3*(2), 25–36. https://doi.org/10.71288/educationalresearcherjournal.v3i2.154

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https://doi.org/10.71288/educationalresearcherjournal.v3i2.154

## Introduction

Mathematics is one of the core subjects that plays a crucial role in developing students' logical, critical, systematic, and creative thinking skills. These skills are essential for helping students solve various problems in daily life and serve as a foundation for learning more complex concepts at higher educational levels. Therefore, mathematics instruction in elementary school must be designed effectively to build a strong conceptual understanding from an early age (L. Maharani, R. Arie Rakhmat, 2025).

Nevertheless, mathematics remains one of the subjects that many elementary school students find difficult. Many mathematical concepts are abstract in nature, making them difficult for students to grasp if presented solely through verbal explanations or lecture-style methods. This situation causes students to struggle with understanding the learning material and results in low mathematics achievement (D. Tiya Cahyani, 2023). Therefore, teachers need to implement learning strategies and media that align with the developmental characteristics of elementary school students.

According to Piaget's theory of cognitive development, elementary school students are in the concrete operational stage. At this stage, students find it easier to understand concepts through direct experiences involving real, physically manipulable objects (Imanulhaq & Ichsan, 2022). Concrete learning experiences allow students to build conceptual understanding gradually, making previously abstract concepts easier to grasp. Therefore, the use of concrete learning media is essential in mathematics instruction.

Learning media play a crucial role in helping teachers deliver content more effectively and engagingly. Appropriate media can enhance students' attention, motivation, and engagement throughout the learning process. Additionally, learning media can help students understand difficult material through visualization and hands-on practice (Wulandari et al., 2023);(Febriana et al., 2024). The use of concrete media is one alternative that teachers can implement to improve the quality of mathematics learning in elementary schools.

One of the math topics that often poses difficulties for elementary school students is time measurement, particularly the ability to read an analog clock. The ability to read a clock is a crucial basic skill because it relates to students' daily activities, such as knowing their study schedule, school start and end times, and managing their daily activities independently (Rozikin & Febryan, 2023). This skill also contributes to the development of discipline and a sense of responsibility in time management (Astuti & Astriani, 2024).

However, various studies indicate that the ability to read analog clocks remains one of the challenges frequently faced by elementary school students. Students often struggle to distinguish the functions of the short and long hands, determine the exact time, and understand the relationship between hours and minutes (Aisyah, 2023). The results of studies by Fauziah et al., 2025 and Bilbina et al., 2026 also indicate that difficulties in reading analog and digital clocks remain a problem linked to the low numeracy literacy skills of elementary school students.

The same problem was identified based on the results of preliminary observations conducted in the second grade at SDIT Ar Raudhoh. Of the 12 students who were the subjects of the study, only 2 students (16.7%) were able to read an analog clock correctly, while the other 10 students (83.3%) still had difficulty. Most students were not yet able to accurately distinguish the functions

of the hour and minute hands. Furthermore, the learning process was still dominated by the use of textbooks and teacher explanations without the support of concrete media that would allow students to practice directly. These conditions resulted in low student engagement and poor learning outcomes regarding the topic of telling time.

Previous studies have shown that the use of concrete media can help improve elementary school students' understanding of mathematical concepts. (Kurniawati, 2022) found that the use of concrete learning media can improve students' mathematics learning outcomes. Research by Nur et al. (2025) indicates that the use of a time board can significantly improve student learning outcomes. Furthermore, studies by Taspiyah (2022), Dwirahayu & Irdamurdin (2021), and Maulida et al., (2023) demonstrate that the use of analog clocks or mock clocks can help students understand the concept of time more easily and meaningfully.

Although various studies have demonstrated the effectiveness of analog clock media in mathematics education, most research still focuses on the use of such media as teaching aids operated by teachers. Research integrating the use of mock analog clocks with a hands-on learning approach in which students actively create and use the media independently remains relatively limited. Furthermore, no previous research has been conducted on the use of simulated analog clock media among second-grade students at SDIT Ar Raudhoh. This situation indicates a research gap that warrants further investigation.

Based on the above, this study aims to examine the process of using simulated analog clock media to enhance second-grade students' time-reading skills at SDIT Ar Raudhoh and to determine the improvement in learning outcomes achieved following the implementation of this media. This study argues that the use of simulated analog clock media based on Hands-On Learning can improve time-reading skills because it provides students with the opportunity to learn actively through direct experience in manipulating the position of the clock hands. This study is important because it can provide a theoretical contribution regarding the use of concrete media in mathematics learning and serve as a practical alternative solution for teachers in improving the time-reading skills of elementary school students.

## Method

This study employed the Classroom Action Research (CAR) method based on the model developed by Stephen Kemmis and Robin McTaggart. This model was chosen because it features systematic, cyclical stages, thereby enabling continuous improvement in learning. Each cycle consists of four stages: planning, acting, observing, and reflecting. The study was conducted over two cycles, with each cycle consisting of two sessions. The results of the reflection in each cycle were used as the basis for improving actions in the next cycle.

The research was conducted during the even semester of the 2025/2026 academic year at SDIT Ar Raudhoh. The research subjects were all 12 second-grade students, consisting of 5 boys and 7 girls. The object of this study was the use of simulated analog clock media in mathematics learning to improve students' time-reading skills. The selection of the second grade was based on the results of initial observations showing that most students still had difficulty understanding the concept of reading analog clocks.

The research procedure followed the stages of the Kemmis and McTaggart action research model. During the planning stage, the researcher identified the problem, developed a Lesson Plan (RPP), prepared mock analog clock materials, and designed research instruments in the form of observation sheets and evaluation tests. The action phase was carried out by implementing the simulated analog clock media in the learning process so that students could directly manipulate the position of the clock hands according to the specified time. During the learning process, observations of teacher and student activities were conducted using the prepared observation sheets.

The reflection phase involved analyzing test results and observational data to evaluate the effectiveness of the implemented actions. The results of the reflection were used as the basis for improvements in the next cycle if the success indicators had not been met. The success indicators for the study were established based on two criteria: the average score for students' ability to read a clock must reach at least 75, and the learning achievement rate must reach at least 80% of the total number of students. These criteria were used to determine the success of implementing the simulated analog clock as a teaching aid in improving students' ability to read time.

## Results

### *Pre-Cycle Conditions*

Based on the results of initial observations conducted before the instructional intervention was implemented, the ability of second-grade students at SDIT Ar Raudhoh to read analog clocks was still relatively low. Instruction during the pre-cycle phase still relied on the lecture method, supported by textbooks and a blackboard. The teacher explained the concept of telling time verbally, while students merely listened and took notes without having the opportunity to interact directly with the learning materials. This situation caused students to struggle with understanding the abstract concept of time, particularly in distinguishing the function of the short hand as the hour hand and the long hand as the minute hand.

The results of the initial test showed that most students had not yet met the Minimum Passing Criteria (KKM) set at 75. Of the 12 students who participated in the learning, only 2 students (16.7%) were deemed to have met the criteria, while 10 students (83.3%) had not yet achieved learning mastery. These findings indicate that students' initial ability to read analog clocks remains very low and requires remedial action through the use of learning media that is more concrete and appropriate for the developmental characteristics of elementary school students.

To provide an overview of the students' initial condition, the following is a summary of learning mastery at the pre-cycle stage.

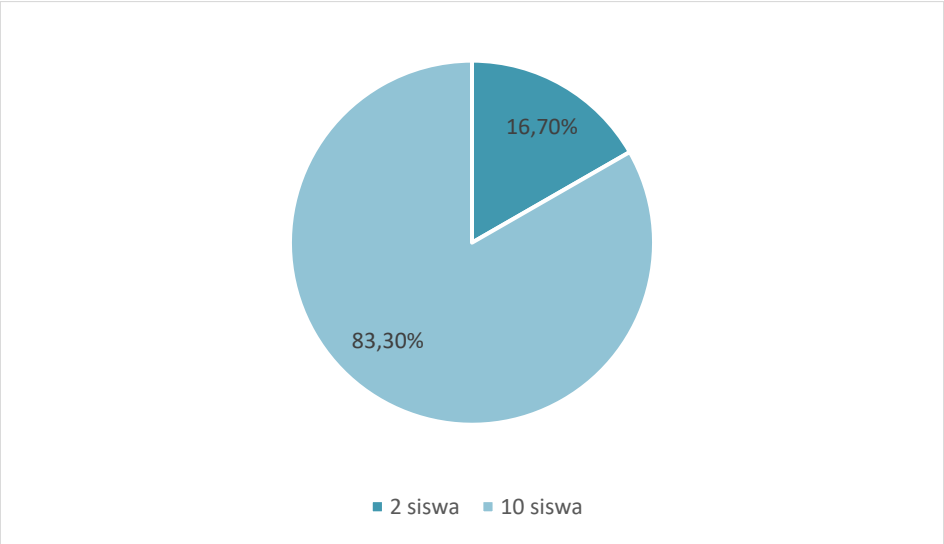


Figure 1. Graph of Student Learning Achievement Percentage Before the Cycle

***Results of Cycle I***

Cycle I was implemented using the Direct Instruction model combined with the use of an analog clock as a demonstration tool. The teacher explained how to tell time using the visual aid in front of the class and provided step-by-step examples of reading the time. Students were engaged in guided practice activities by stating the time shown on the analog clock used by the teacher.

Observation results showed positive changes compared to the pre-cycle conditions. Students began to show greater attention to the lesson and found it easier to understand the teacher's explanations due to the visual aids provided by the analog clock. However, student engagement remained limited because the learning material was used only by the teacher, so students had not yet gained direct experience in manipulating the clock hands.

Improvements in learning outcomes began to appear at the end of Cycle I. Of the 12 students, 5 students (41.7%) had achieved mastery, while 7 students (58.3%) had not yet mastered the material. The class average score reached 58.8. Although there was an improvement compared to the pre-cycle, the results were still below the established success indicators, namely a minimum class average of 75 and a minimum learning mastery of 80%. The following is a summary of student performance in Cycle I

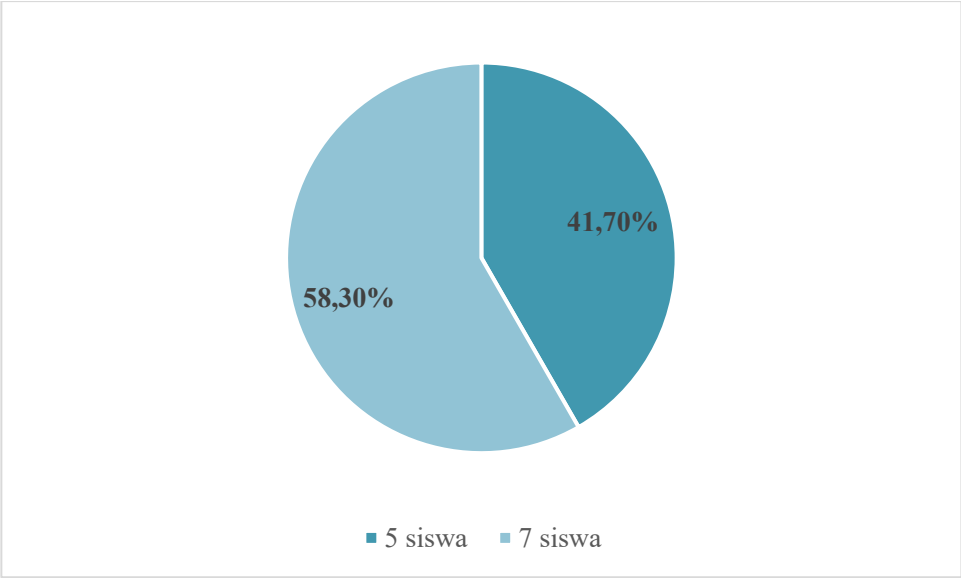


Figure 2. Graph of Student Learning Achievement Rates for Cycle I

Based on the results of the reflection, it was found that the low level of learning achievement in Cycle I was due to students' still suboptimal engagement. Some students still had difficulty distinguishing between the positions of the hour and minute hands because they had only observed the teacher's demonstration. Therefore, in Cycle II, improvements were made by implementing a hands-on learning approach through the creation of mock analog clocks by each student so that they could learn directly and more actively.

***Results of Cycle II***

The implementation of Cycle II focused on increasing students' active participation through activities involving the independent creation and use of mock analog clocks. Each student received materials to create their own learning tools, which they then used to complete various time-reading tasks. This approach provided students with the opportunity to manipulate the positions of the clock hands directly, making the learning process more concrete and meaningful.

Observation results showed a very significant increase in learning activity. Students appeared more enthusiastic, actively asked questions, and were able to follow the teacher's instructions well. The activity of making and using mock analog clocks made it easier for students to understand the relationship between the positions of the short and long hands in indicating the time. Additionally, the learning atmosphere became more interactive because all students were directly involved in every stage of the learning process.

Increased learning activity had an impact on student learning outcomes. At the end of Cycle II, 11 students (91.7%) achieved learning mastery, while only 1 student (8.3%) had not yet met the minimum passing score. The class average score increased to 89.2 and exceeded the established success indicator. These results indicate that the use of simulated analog clocks is effective in improving the time-reading skills of second-grade students at SDIT Ar Raudhoh. A summary of learning mastery in Cycle II is presented in the following graph.

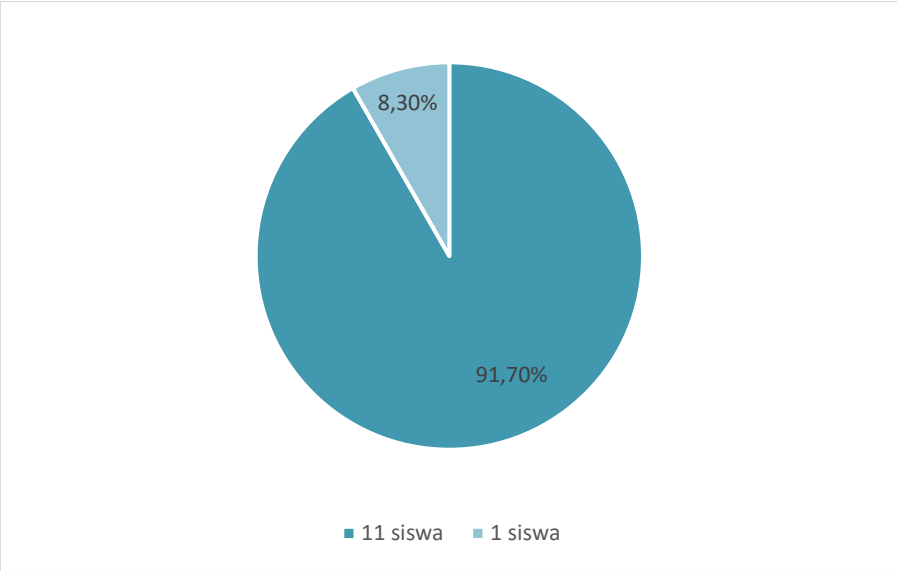


Figure 3. Graph of Student Learning Achievement Rates for Cycle II

Overall, the research results indicate an improvement in the ability to read analog clocks at each stage of the study. The learning achievement rate increased from 16.7% in the pre-cycle to 41.7% in Cycle I and reached 91.7% in Cycle II. This increase indicates that the use of simulated analog clocks combined with the Hands-On Learning approach was able to help students understand the concept of time more concretely, increase their engagement in learning, and achieve the established learning achievement targets.

## Discussion

The research findings indicate that the use of simulated analog clock media significantly improved the ability of second-grade students at SDIT Ar Raudhoh to tell time. In the pre-cycle phase, only 16.7% of students achieved mastery, while 83.3% of students still struggled with telling time on an analog clock. After implementing the analog clock media in Cycle I, the mastery rate increased to 41.7% with a class average score of 58.8. A more significant improvement occurred in Cycle II following the implementation of the Hands-On Learning approach, with learning mastery reaching 91.7% and a class average score of 89.2. These results indicate that the use of concrete media can help students understand the concept of time, which was previously abstract. These findings align with the research by Nur et al., (2025) which showed that the use of clock board media was able to improve student learning outcomes from 66.13% on the pretest to 87.5% on the posttest. These findings are also supported by Maulida et al., (2023) who state that the use of mock clock media can improve clock-reading skills among elementary school students. Additionally, Wulandari et al., (2023) explain that the use of learning media that actively engages students can enhance conceptual understanding and learning outcomes more effectively.

The greater improvement observed in Cycle II indicates that the hands-on learning approach is more effective than teacher-centered demonstration methods. When students construct and operate analog clock models independently, they gain a more meaningful learning experience, making it easier

for them to understand the relationship between the hour and minute hands. This finding aligns with Piaget's theory of cognitive development, which states that elementary school students are in the concrete operational stage and require tangible objects in the learning process (Imanulhaq & Ichsan, 2022). The results of this study are also consistent with the research by Taspiyah (2022), Dwirahayu & Irdamurdin, (2021), and Sa'diyah et al., (2025) which show that students' active involvement in learning can improve their understanding of the concept of time measurement.

In addition to improving learning outcomes, the use of mock analog clocks has also been shown to increase student motivation and participation during the learning process. All students appeared more enthusiastic about participating in learning activities, from the process of creating the teaching aids to practicing telling time on their own. This increased student engagement contributed to the achievement of the research success indicators, namely a class average score above 75 and a learning mastery rate of over 80%. Although there was still one student who had not met the minimum passing score in Cycle II, that student still showed an improvement in learning outcomes compared to the previous cycle. This finding reinforces the results of the research by Salsabila & Rahmawati (2024) which states that innovative learning media can increase students' enthusiasm for learning and active participation. Thus, the analog clock simulation media based on Hands-On Learning can serve as an effective, simple, and appropriate learning alternative for elementary school students in improving their time-reading skills.

This is also consistent with the views of (Musa'ad et al., 2025) who emphasize that the use of concrete and practical learning materials can significantly enhance students' engagement, motivation, and understanding of abstract mathematical concepts such as time measurement. Thus, analog clock simulation materials based on Practical Learning can serve as an effective, simple, and appropriate learning alternative for elementary school students to improve their ability to tell time.

## Conclusion

Based on the results of the Classroom Action Research conducted in the second grade at SDIT Ar Raudhoh, the use of mock analog clock media was proven to improve students' ability to tell time. This improvement was evident in the learning achievement rate, which increased in each cycle: from 16.7% in the pre-cycle phase to 41.7% in Cycle I, and reached 91.7% in Cycle II. Additionally, the class average score increased from 58.8 in Cycle I to 89.2 in Cycle II. These results indicate that the mock analog clock is effective in helping students understand the concept of time, particularly in distinguishing the functions of the hour and minute hands on an analog clock.

This improvement in learning outcomes is supported by the implementation of the Hands-On Learning approach, which provides students with the opportunity to create and use the mock analog clock directly. Students' active involvement in the learning process makes learning more meaningful, engaging, and aligned with the cognitive development characteristics of elementary school students. Thus, the Hands-On Learning-based mock analog clock can serve as an effective alternative mathematics learning tool to improve

time-reading skills among elementary school students, particularly those in lower grades.

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