

Indexed



Article History

Vol. 4, No. 2, 2025

Subject Areas:

Mathematics Education

Keywords:

Development, Miniature Clock Media, Flat Shape, Mathematics Learning

Author for correspondence:

M Muthma'innah

Email:

muthmainnah@institutridayatullahbatam.ac.id

DOI:

<https://doi.org/10.24036/rmj.v4i2.72>

How to Cite:

Muthma'innah, M. (2025). Development of Flat Clock Miniature Learning Media in 5th Grade of Elementary School Mathematics Learning. *Rangkiang Mathematics Journal*, 4(2), 61-67. <https://doi.org/10.24036/rmj.v4i2.72>

Development of Flat Clock Miniature Learning Media in 5th Grade of Elementary School Mathematics Learning

M Muthma'innah¹

¹ Institute Agama Islam Hidayatullah Batam

Abstract- Learning mathematics in elementary school often presents difficulties for students, particularly in understanding the abstract concepts of flat shapes. Students tend to struggle with geometric and spatial reasoning, especially when lessons are delivered without concrete and systematic learning aids. To address this issue, innovative learning media are needed to enhance conceptual comprehension and engagement. This study focuses on the development of a Flat Clock Miniature as a learning medium for fifth-grade elementary students. The purpose of this design-based research is to develop a prototype of a miniature flat clock that can facilitate students' understanding of plane geometry. Data were collected through documentation, including books and relevant journal articles concerning the use of manipulative learning media in mathematics, particularly on flat shapes for elementary learners. Additionally, the researchers designed the flat clock miniature using simple and readily available materials to ensure accessibility and practicality. The analysis employed a descriptive qualitative approach to explain the development process, structure, and instructional function of the medium. The results show that the Flat Clock Miniature, supported by the use of a projector-based display, can potentially improve students' comprehension of flat shapes and make mathematics learning more interactive and less monotonous. The study concludes that the effective use of innovative media by teachers can bridge the gap between teaching objectives and students' understanding, thereby improving learning outcomes in elementary mathematics.

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1. Introduction

Mathematics is a deductive, axiomatic, formal, hierarchical, abstract science, a symbolic language rich in meaning, and a system that can solve real-world problems (Muthma'innah, 2025). Many people believe that mathematics is a science that studies numbers and flat shapes. This is a reaction from society because it is influenced by their experience of learning mathematics or arithmetic at school (Magdalena et al., 2022; Rahayu & Aryani, 2024).

Mathematics is a science that trains students to think systematically. In accordance with this understanding, mathematics does play a very important role for elementary school students in developing students' cognitive knowledge and with the development of an era where technology is advancing rapidly in this era, the role of mathematics is suitable for elementary school children to learn (Amelia & Napitupulu, 2024; Apriandi & Ayuningtyas, 2022; Muthma'innah, 2025; Wasono et al., 2024; Willemsen et al., 2024).

Mathematics is a subject studied in elementary school with abstract concepts, generally disliked by students and always a problem discussed among students, teachers and parents (Iriawan et al., 2024; Rahayu & Aryani, 2024). However, mathematics is known as a difficult subject by some students, from elementary school to college. In mathematics, students are required to understand concepts, solve problems and mathematical operations. When students have understood a mathematical concept, they can move on to a higher level (Hidayat & Ritonga, 2023; Muthma'innah, 2023; Novia Sari & Yeni Yuniarti, 2023).

Mathematics learning in general always tends to be about the activity of presenting the concept in several questions given by the teacher. This certainly illustrates that students become passive objects, thus hindering the development of their skills in learning mathematics (Dirgantara et al., 2023). Therefore, teacher needs to be learning media that can help to instill mathematical concepts according to the objectives of mathematics to improve students' learning outcomes (Muthma'innah, 2024; Nurhafizah, 2018). Media as a teaching aid is developing rapidly in accordance with technological advances (Nurhafizah, 2018). The variety and types of media are also quite numerous so that they can be utilized according to conditions, time, finances, or the material to be achieved. Learning media can be understood as anything that can convey or channel messages from a source in a planned manner, so that a conducive learning environment is created where the recipient can carry out the learning process efficiently and effectively (Nurhafizah, 2018).

Flat clock miniature in mathematics learning are media that teachers strive for and teachers/educators hope can help students understand mathematics learning more easily and feel fun, so that with this miniature clock, students' difficulties in understanding flat shapes will be easily overcome. The results of whether students understand or not, researchers make an evaluation at the end of learning by presenting a quiz and using the powerpoint application. This powerpoint application was created by researchers to determine students' understanding of flat shape mathematics. This evaluation is in the form of questions that have been made by the teacher with questions that have previously been explained by the teacher during the explanation and use of miniature flat shape tools/media.

Based on the explanation above, researchers are interested in studying more deeply about "Development of Flat Clock Miniature Learning Media in Class V Elementary School Mathematics Learning". The aim of this article is to describe the development of flat clock miniature learning media in 5th grade of Elementary School mathematics learning.

2. Methods

This article is library research, namely research in the form of library research and designing simple designs related to flat clock miniature learning media. The data collection technique that the researcher carried out was in the form of documentation both from books and journal articles related to the use of flat clock miniature learning media in class V SD/MI mathematics learning on flat shape material. Apart from that, the researchers also designed flat clock miniature learning media using simple tools and materials. The data analysis technique used is descriptive data analysis technique, namely describing the design of the flat clock miniature learning media in class V SD/MI mathematics learning on the Flat Shape material.

3. Results and Discussion

Teacher achievement is said to be successful if it can be seen from the evaluation or measuring the extent of students' understanding in understanding learning, besides that teachers must also pay attention to the comfort of students in understanding learning such as creating media in learning, by looking at the various benefits of media, in general media has benefits:

1. Clarify the message so that it is not too verbalistic
2. Overcome limitations of space, time, energy and sensory power.
3. Arouse enthusiasm for learning, more direct interaction between students and learning resources
4. Allow children to learn independently according to their talents and visual, auditory and kinesthetic abilities.
5. Provide the same stimulation, equalize experiences and create the same perception (Marsa & Desnita, 2020).

(a) Design Stage

This stage aims to design learning devices, so that examples of learning devices are obtained. Activities at this stage are as an initial description in making a miniature clock design and a powerpoint application as an evaluation of students' understanding of mathematical flat shapes. This design stage includes:

1. Designing a miniature clock frame with a 3-dimensional flat shape

This design is in the form of an overall picture of a miniature flat clock to see how the teaching aids that will be used as a medium for learning mathematics for grade 5 elementary school look.

2. Preparation of tools and materials used to make a miniature flat clock

In this step, the researcher will prepare the materials needed to make a miniature clock like in Figure 1.

The tools and materials are:

a. Tools

- 1) Scissors
- 2) Glue

b. Materials

- 1) Cardboard
- 2) Colored Paper
- 3) Safety Pins
- 4) HVS Paper
- 5) Origami Paper



Figure 1. Prepare making flat clock miniature media

3. Steps for Making a Flat Clock Miniature

The steps for making a flat clock miniature for grade 5 elementary school mathematics are as follows:

- a. Cut the cardboard and cut the colored paper into a large circle shape, like in Figure 2.



Figure 2. Step 1 making flat clock miniature media

- b. Then glue both of them as the background of the clock, like in [Figure 3](#).



Figure 3. Step 2 making flat clock miniature media

- c. Make a hole in the middle of the cardboard and colored paper.
 d. Make a clock hand using the remaining cardboard and colored paper as a guide to understand flat shapes, like in [Figure 4](#).



Figure 4. Step 3 and 4 making flat clock miniature media

- e. Provide paper to create material for each shape, like in [Figure 5](#).

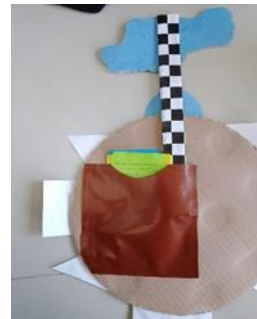


Figure 5. Step 5 making flat clock miniature media

- f. Make a flat shape using bound paper, glue and adjust the size to be placed as a replacement for the clock letters, like in [Figure 6](#).



Figure 6. Step 6 making flat clock miniature media

- g. And finally, make a large text or title on the miniature like the text flat shape in the picture, like Figure 7.



Figure 7. Step 7 making flat clock miniature media

4. How to apply a miniature clock

How to apply a miniature clockwork can be done with guidance from the teacher, so that the teacher can directly interact with students and explain it. Teachers and students simply open the explanations of the material that is already available for each flat shape in the form of paper that has been made. In this miniature hour the teacher can form groups into 4 groups with 5 students in each group or adjust the number of students in the class. First, the teacher explains the material contained in the miniature clock, then the teacher gives questions to groups that have been determined to answer the questions by turning the clock hands randomly, then the students answer the questions already contained in the miniature clock. In this miniature hour, students are more likely to work together to answer questions or explain material that has been explained by the teacher.

5. Making quizzes using the Powerpoint application

At this stage, the teacher attempts to determine the quiz questions that have been taught through miniature mathematical flat-shape visual aids, such as asking about the meaning of flat shapes themselves and questions or quizzes that have been taught by the teacher through the props used. Illustrations/examples of quiz images using a projector application, like in Figure 8.

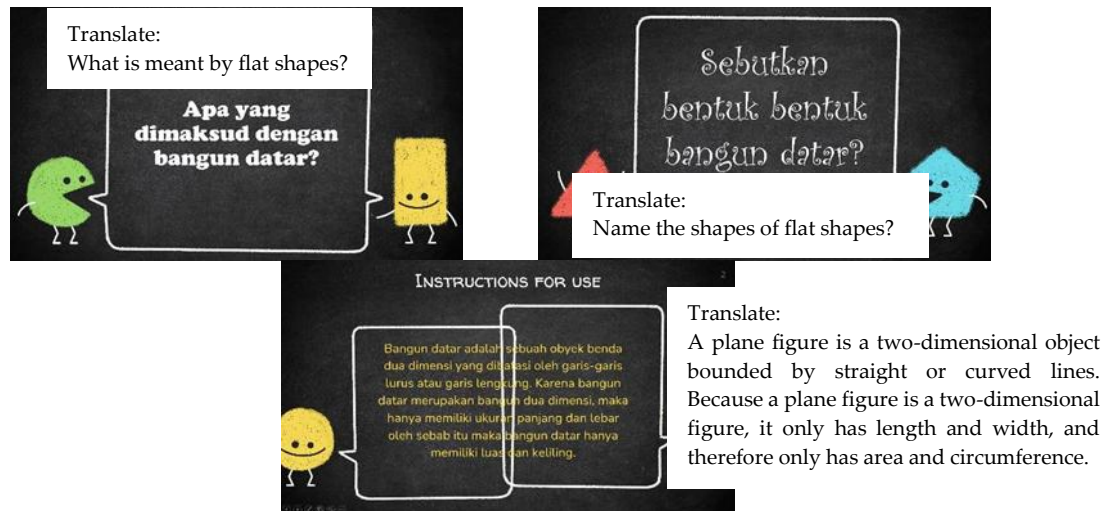


Figure 8. Making quizzes using the powerpoint application

The use of this media design is not only used for mathematics learning, but can also be used with other learning such as science, social studies, physical education, English or other learning. Miniature clock media and projector applications can be adjusted to other learning because this miniature clock and projector media really allows educators to provide interesting media in learning. One example is in English learning, in this learning teachers can replace flat shapes with English material such as mentioning animal names and replacing flat shapes with animal pictures. And other learning can be adjusted to the material to be delivered.

The powerpoint application in this design is made as a form of quiz that has been made by the teacher according to the material that has been studied or delivered by the teacher. Furthermore, in this powerpoint application, students no longer work with their group members, students answer questions by themselves as evaluation material and independent tasks for students whether they have understood the material that has been given.

(b) Advantages and Disadvantages

The use of each media certainly has advantages and disadvantages:

1. Advantages

- 1) Cultivate students' interest in learning because the lessons become more interesting.
- 2) Clarify the meaning of the lesson material so that students can understand it more easily
- 3) Teaching methods will be more varied so that students will not get bored easily
- 4) Make more active in doing learning activities such as: observing, doing and demonstrating and so on.
- 5) Change the perspective of students who say that mathematics is a fairly difficult and boring lesson.
- 6) Students are active and cooperate with each other.

2. Disadvantages

- 1) Teaching using teaching aids requires more from teachers.
- 2) Much time is needed for preparation
- 3) A willingness to make material sacrifices is required
- 4) Teachers must be more extra in managing learning time so that learning is effective.
- 5) Special skills are needed for teachers so that the media created is also in accordance with the learning objectives and the material to be delivered.

4. Conclusion

Based on the analysis and discussion, it can be concluded that this design is a plan or description of the media that will be tested on 5th grade elementary school students with mathematics subjects regarding learning flat shapes. This design stage includes: a) Designing a miniature clock frame with a 3-dimensional flat shape; b) Preparation of tools and materials used to make a miniature flat clock; c) Steps for Making a Flat Clock Miniature; d) How to apply a miniature clock; e) Making quizzes using the

Powerpoint application. The miniature clock hands and the use of this projector application are expected to be the development of students in understanding the material that has been delivered by the teacher/educator using media. So that with the existence of these teaching media, students will feel that learning mathematics is not boring and monotonous. In this case, educators must also be able and good at using the teaching media that have been made, so that the level of achievement between the teacher's target and students' understanding in learning mathematics on flat shapes is in accordance with the learning objectives.

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