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The Effectiveness of Fraction Wheel Media in Improving Mathematics Learning Outcomes among Third-Grade Primary Students

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ABSTRACT

This study aims to improve student learning outcomes in fractions through the use of the Fraction Wheel media in grade 3 at MI Thoriqul Huda Randupadangan. The research method used is Classroom Action Research (CAR) based on the Kemmis and McTaggart model, conducted in two cycles. The research subjects were 25 third-grade students consisting of 14 male students and 11 female students. Data collection techniques used observation of activities, learning outcome tests, and student response questionnaires. The results showed a very significant increase in learning outcomes, where the class average score increased from 52.8 in cycle I to 85.8 in cycle II. The percentage of classical learning completeness increased sharply from only 8% in cycle I to 96% in cycle II. This increase was also accompanied by a strengthening of teacher activity, which reached 96%, and student activity, which reached 87.5% at the end of the cycle. The Fraction Wheel Media proved to be effective in transforming abstract mathematical concepts into interactive concrete visualizations, thereby increasing positive responses and student learning motivation to 87,63. Thus, the use of fraction wheel media has been proven to optimally improve mathematics learning outcomes and provide an innovative and enjoyable learning solution for madrasah ibtidaiyah students.

INTRODUCTION

Mathematics education at the Madrasah Ibtidaiyah (MI) level plays a strategic role in laying the foundation for students' numeracy and logical thinking skills. One of the most crucial basic competencies in grade 3 is mastery of simple fractions. As part of a curriculum that demands deep understanding, mathematics is expected to train students to solve problems through observation and reasoning. This is in line with Piaget's cognitive development theory, which states that elementary school/MI children (7-11 years old) are in the concrete operational stage, where they need physical representations to understand abstract concepts (Susanto & Wulandari, 2024).

The ideal conditions for mathematics learning have not been fully reflected in grade 3 at MI Thoriqul Huda. The current learning pattern has a negative impact on student learning outcomes, as evidenced by the fact that around 40% or 10 out of 25 students have great difficulty mastering the basic concepts of fractions. Based on formative test scores, most students have not been able to achieve the predetermined learning objective achievement criteria (KKTP). The facts on the ground show that there are quite serious conceptual obstacles, with many students still often confusing the numerator and denominator. In addition, students experience significant difficulties when comparing the values of two different fractions. This phenomenon indicates that the process of delivering learning messages has not been effective, so that students' understanding of basic mathematical logic has not been firmly established. These low learning outcomes emphasize the need to improve instructional patterns so that fractions are not merely considered confusing numbers, but can be fully understood by all students.

The specific problem that is the root cause of low learning outcomes is the conventional, teacher-centered learning pattern. Fractions are often taught only through verbal explanations and static images on the blackboard, making it difficult for students to relate fractions to physical reality. As a result, students tend to be passive, quickly become bored, and simply memorize mathematical algorithms without understanding the philosophical meaning of dividing parts from the whole.

Various studies show that the use of manipulative and interactive learning media in the context of basic education is still less than optimal, especially when compared to the needs of students who require visual and kinesthetic learning experiences. For example, the results of a study in a thesis show that The use of learning media in the classroom is still minimally implemented by teachers, causing students to easily become bored and less independent in their learning. This can be seen from the low variety of media used by teachers in elementary schools in the learning process, for example, manipulative or interactive media, which has not varied significantly. (Sakdah, 2023).

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The use of innovative learning media plays an important role in improving the effectiveness of learning in Madrasah Ibtidaiyah. Media designed to actively engage students can help learners understand concepts more meaningfully, not only through procedural memorization, but also through concrete learning experiences (Agustin, 2021). In addition, visual and manipulative media have been proven effective in bridging abstract concepts with students' real experiences, thereby increasing students' focus, motivation, and readiness to learn at the elementary level (Insiyyah et al., 2025). Furthermore, teachers' ability to develop and utilize learning media creatively contributes to the creation of contextual, engaging, and student-centered learning, which ultimately has a positive impact on mathematical concept understanding (Agustin et al., 2023).

In addition, an international systematic review shows that although physical and virtual manipulatives have strong benefits for student engagement and conceptual understanding in elementary schools, their implementation still faces challenges such as availability of resources, teachers' technical skills, and access to these media, which leads to suboptimal utilization in daily learning practices (Fathicha & Agustin, 2025).

In the context of interactive media, a number of cross-elementary school/Islamic elementary school studies indicate that learning is still dominated by conventional approaches that do not sufficiently involve powerful interactive media, so that student learning outcomes and motivation are not maximized without the integration of more innovative media (Ochugboju & Díez-Palomar, 2025).

Foundation for understanding advanced mathematics, including decimals, percentages, and mixed calculations. An incomplete understanding of these basic concepts has the potential to cause ongoing learning difficulties and affect students' attitudes and interest in mathematics. Therefore, a form of learning intervention is needed through the use of media that can bridge the characteristics of students' abstract thinking towards a more concrete understanding.

The solution offered in this study is the application of a fraction wheel. This media is designed as an interactive circular teaching aid that can be rotated to visually show the comparison between fractions. Through the spinning wheel mechanism, students not only act as listeners but also as active participants in experimenting to determine the value of fractions. This media is expected to balance the involvement of male and female students through a learning-by-doing approach.

A number of previous studies have shown that spinning wheels or fraction boards are effective in improving learning outcomes in mathematics for fraction material. Dwiyanti reported an increase in the average student score from 70.33 in cycle I to 82.33 in cycle II, accompanied by an increase in classical mastery from 53.3% to 86.7% (Dwiyanti et al., 2025). Similar results were found by Faot, who showed an increase in learning completeness from the pre-cycle condition, with 82.1% of students not meeting the minimum competency standard, to 71% in cycle I, and reaching 100% in cycle II. (Faot, 2024). Afendi also noted a significant increase in learning outcomes from an average of 70.52 to 88.00, with 100% learning completeness after the implementation of interactive learning media (Afendi et al., 2025). Furthermore, Kadir and Wahdaniah proved that the use of rotating media assisted by the Rotation Trio Exchange (RTE) model was able to increase teacher and student activity by up to 100% and raise the average student score from 66 to 79 with classical completeness increasing from 53% to 82% (Kadir & Wahdaniah, 2025). These findings are reinforced by research conducted by Nengtyas and Salwah, which shows an increase in learning outcomes from 62.96% in cycle I to 81.48% in cycle II. It can therefore be concluded that consistent use of spinning wheels has a positive impact on improving student learning outcomes (Nengtyas & Salwah, 2023).

Based on the above description, this study aims to measure the extent of improvement in students' mathematics learning outcomes after the implementation of the fraction wheel media, as well as to describe changes in student learning activities during the learning process. Therefore, the researcher is interested in conducting classroom action research entitled “The Effectiveness of Fraction Wheel Media in Improving Mathematics Learning Outcomes among Third-Grade Primary Students.”

LITERATURE REVIEW

Mathematics is often considered difficult because of its abstract and hierarchical nature. At the Madrasah Ibtidaiyah (MI) level, mathematics learning is not merely a transfer of information but a process of constructing logic. According to Susanto in Novianti, mathematics in elementary school aims to enable students to develop problem-solving skills through observation and reasoning (Novianti et al., 2020). However, there is a gap between the abstract nature of mathematics and the cognitive stage of third-grade students. Based on Piaget's theory of cognitive development, children aged 7-11 years are in the concrete operational phase, where they are not yet able to think logically without physical representations or the help of real objects. Therefore, teachers need to bridge mathematical abstraction using sensory experiences.

The basic concept of fractions represents parts of a whole, symbolically expressed as a/b, where a is the numerator and b is the denominator. Heruman in Marita emphasizes that understanding fractions requires mastery of the meaning of fair division (Marita et al., 2025). Common learning obstacles, such as those experienced by students at MI Thoriqul Huda, include the inability to distinguish between the numerator and denominator functions. Students tend to treat them as two separate integers rather than as a single value. Nurhayati stated that without visualization, it would be difficult for students to understand that the larger the denominator value in the same numerator, the smaller the value of

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the fraction (Nurhayati et al., 2025).

Learning media are all forms of tools, means, or intermediaries used to convey learning messages from teachers to students in order to stimulate students' minds, feelings, attention, and interest in learning during the learning process (Hamidah & , Februesty Maya Lestari, 2022). Learning media functions as a message conveyor to stimulate students' minds and attention in the learning process (Muryaningsih & Utami, 2021). Learning media is also understood as a learning component that serves to clarify material so that it is easier for students to understand, especially abstract concept (Insiyyah et al., 2025). Similarly, learning media acts as an educational communication tool that can create a more concrete, meaningful, and interactive learning experience (Fithriyah, 2024). In addition to functioning as a tool, learning media can also increase learning motivation and encourage active student involvement in the learning process (Rohmah, 2025).

Spinning wheel media are included in the category of manipulative media that can be touched, moved, and played with by students. Theoretically, this media supports Jerome Bruner's learning theory, particularly the iconic (visualization of images) and enactive (direct manipulation) stages. Rotating wheels provide a visual representation of a proportionally divided circle, while their rotating mechanism incorporates elements of gamification that reduce math anxiety and increase students' kinesthetic engagement.

Learning outcomes are behavioral changes that encompass cognitive, affective, and psychomotor domains after participating in the learning process (Agustin, 2023). In the context of this study, the main focus is on improving cognitive learning outcomes as measured by formative tests. A synthesis of various theories shows that the use of spinning wheels can change the learning pattern from teacher-centered to student-centered, which ultimately improves students' conceptual understanding and learning outcomes.

METHOD

This study used the Classroom Action Research (CAR) model developed by Kemmis and McTaggart, which was conducted in two cycles using a repeated cycle design. Each cycle consisted of four integrated stages: planning, acting, observing, and reflecting (Siregar, 2025). The research was conducted at MI Thoriqul Huda Randupadangan, Menganti, Gresik with 25 third-grade students as research subjects, consisting of 14 male and 11 famale. The data collection methods used were systematic observation, multiple-choice and essay tests, student response questionnaires, and documentation. Data analysis techniques were performed quantitatively using descriptive statistics to measure learning completeness and qualitatively using the Miles and Huberman model, which includes data reduction, data presentation, and conclusion drawing in Qomaruidin and Sa'diah (Qomaruddin & Sa'diyah, 2024). The PTK flow can be seen in the diagram below:

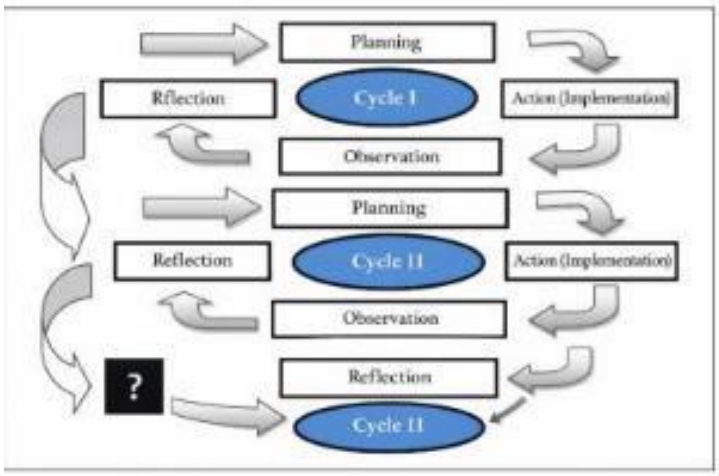


Figure 1. Model Kemmis dan McTaggart (Siregar, 2025)

The formula used to obtain the results of teacher and student activities is as follows:

$$NP = \frac{R}{SM} \times 100$$

NP = Percentage value sought
R = The score obtained by the student
SM = Maximum score

The formula used to determine the level of student learning achievement on a classical basis is as follows:

$$NA = \frac{A}{B} \times 100$$

NA = Classical learning completeness score
A = Total score obtained by the student

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B = Maximum score

To determine the improvement in student learning outcomes in each final test of the cycle, the class average score was calculated with reference to the minimum passing grade of 75 using the following formula:

$M = \frac{\sum x}{\sum n}$

M = Class average
∑x = Total scores obtained by students
∑n = Number of students

The formula used to determine student response to mathematics learning is as follows:

$$Rpd_n = \frac{R}{SM} \times 100$$

To determine the final result of the combined student responses, the mean was calculated.

$$Rpd = \frac{Rpd_1 + Rpd_2 + Rpd_3 + \ldots + Rpd_n}{n}$$

Description:
Rpd_n = Student response with n = 1,2,3,..., dst
Rpd = Combined average response of all students
R = Score obtained
SM = Maximum score
n = Number of students

Table 1. Learning Outcome Assessment Criteria

No	Success Rate	Criteria
1	80% - 100%	Excellent
2	70% - 79%	Good
3	60% - 69%	Fair
4	50% - 59%	poor
5	0% - 49%	Very Poor

Source: (Arikunto, 2021)

RESULT

Teacher activities play a very important role in determining the success of the learning process. Teachers who are able to design and implement learning in a focused manner, create meaningful learning experiences, and make optimal use of learning media will have a positive impact on increasing student activity and learning outcomes. Therefore, the quality of teacher activities is one of the main indicators in achieving learning objectives.

In this study, mathematics learning on fractions was carried out by utilizing a fraction wheel as a means to facilitate students' understanding of the concept. The assessment of teacher activities was conducted through observation using a 1-4 Likert scale, with criteria of 1 (poor), 2 (fair), 3 (good), and 4 (very good). The success indicator was determined if the results reached a minimum percentage of 80% with a very good category. The results of the observation of teacher activities in cycle I and cycle II are presented in Table 2 below:

Table 2. Teacher Activities in Cycles I and II

No	Indicator	Score	
		Cycle I	Cycle II
1	**Preliminary Activities**		
	The teacher begins the lesson with a greeting and prayer	4	4
	The teacher explains the learning objectives for basic fractions	3	4
	Teachers conduct apperception by relating basic fractions to everyday life	3	4
2	**Core Activities**		
	The teacher explains basic fractions using a fraction wheel	3	4
	The teacher explains how to use the fraction wheel	3	3
	The teacher gives students the opportunity to spin the wheel and read the fraction results	2	4
	The teacher facilitates discussion and questions and answers related to the fractions that appear	3	4
	The teacher gave each group a worksheet containing questions about basic	3	4

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	fractions		
	Teachers guide each group in filling out the LKPD	3	4
3	**Closing Activities**		
	The teacher guides students in summarizing the material on fractions	3	3
	Teachers provide feedback on student activities and results	2	4
	The teacher ends the lesson with a prayer and a greeting	4	4
	Amount	**36**	**46**
	Persentase	**75%**	**96%**

Based on the research results table, teacher activity in cycle I showed a percentage of 75% in the good category, but did not yet reach the predetermined success indicators. This shows that the use of fraction wheel media in mathematics learning in grade 3 at MI Thoriqul Huda Menganti Gresik has been implemented quite well, but its implementation still needs to be improved so that the media can be utilized more optimally in supporting the learning process.

In cycle II, teacher activity increased significantly, reaching 96% and falling into the excellent category. This increase shows that the use of fraction wheels can improve the quality of mathematics learning more effectively and purposefully, so that teacher activity was in line with the research success indicators and the action was stopped in cycle II.

The results of student activities in mathematics learning through the fraction wheel media were observed and assessed using a structured observation sheet. The results of student activities in cycles I and II are presented in Table 3 below:

Table 3. Student Activities in Cycles I and II

No	**Indicator**	**Score**	
		Cycles I	**Cycles II**
1	**Preliminary Activities**		
	Students respond to greetings and pray before starting their studies	3	4
	Students pay attention to the presentation of learning objectives	3	4
	Students respond to teachers' perceptions of basic fractions in everyday life	1	3
2	**Core Activities**		
	Students listen to the teacher's explanation of basic fractions using a fraction wheel	2	3
	Students pay attention to the explanation of how to use the fraction wheel	2	4
	Students spin the fraction wheel in turn and read the fraction that appears	3	4
	Students actively participated in the ensuing discussion	2	3
	Each group receives and works on the worksheets from the teacher	3	4
	Students discuss with their groups to complete the worksheets	2	3
3	**Closing Activities**		
	Students participate in summarizing the material on fractions	2	3
	Students receive and understand feedback from teachers	2	3
	Students recite prayers and respond to greetings from teachers	3	4
	Amount	**28**	**42**
	Persentase	**58,3%**	**87,5%**

Based on the research results table, student activity in cycle I obtained a percentage of 58.3% in the moderate category, indicating that student activity in mathematics learning using the fraction wheel media had not yet reached the predetermined success indicators and still needed improvement in cycle II.

In cycle II, student activity increased to 87.5% and was categorized as very good. These results indicate that the use of fraction wheel media can increase student activity in mathematics learning, thereby achieving the success indicators of the study on third-grade students at MI Thoriqul Huda Menganti Gresik.

The use of fraction wheel media in mathematics learning on fraction material has an impact on improving student learning outcomes. This improvement can be seen through the results of evaluation tests in the form of multiple-choice and essay questions given by the teacher. Student learning outcomes in mathematics on fraction material can be seen in cycle 1 and cycle 2, as presented in Table 4 below:

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Table 4. Mathematics Learning Outcomes of Students in Cycle I and II

No	Name	Grade Results	
		Cycles I	Cycles II
1	Abdul Muiz	47	87
2	Akmal Firdaus	52	77
3	Aldi Nur Fauzi	42	82
4	Amanda Salsabila	61	79
5	Anindiya Putri Lestari	66	78
6	Anisatun Nabila	71	84
7	Arjuna Setiawan	42	92
8	Arya Putra Pratama	24	87
9	Ayra Syifa Khairunnisa	61	91
10	Celyn Az-Zahra	52	79
11	Dafa Al-Ghazali	52	88
12	Enzo Ardiansyah	42	89
13	Farhan Ramadhan	42	75
14	Hafid Nur Rohman	34	90
15	Ihsan Kamil	42	78
16	Kartika Sari	28	85
17	Keano Raditya	61	78
18	Milla Kamilatun Nuha	52	93
19	Muhammad Hafis	52	89
20	Muhammad Syihabuddin	66	86
21	Raisa Azzahra	90	98
22	Raisya Ica Fitriani	85	90
23	Reva Aulia Putri	33	83
24	Sofiatul Rahma	52	88
25	Yusuf Maulana	71	81
	Amount	**1320**	**2127**
	Average	**52,8**	**85,8**

The students' responses to mathematics learning through the fraction wheel media were observed and assessed using a questionnaire that had been prepared in advance. The students' responses in cycles I and II are presented in Table 5 below:

Table 5. Student Responses in Cycles I and II

No	Indicator	Score	
		Cycles I (%)	Cycles II (%)
1	**Student Interest**		
	I enjoy learning fractions using a fraction wheel	65,00	86,00
	The spinning wheel makes lessons more exciting	66,00	88,00
	I felt curious when spinning the wheel of fortune	64,00	87,00
	I became more enthusiastic about learning with the fraction wheel	64,50	89,00
2	**Understanding the Material**		
	I understand fractions better after using the fraction wheel	63,50	88,00
	I can clearly read the fractions that appear on the spinning wheel	64,00	87,50
	The spinning wheel helps me answer fraction questions	65,00	89,00
	I can connect fractions on a spinning wheel to everyday objects	63,00	86,50
3	**Student Engagement**		
	I actively participated when the teacher invited us to play the spinning wheel game	65,50	88,50

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I dare to step forward to spin the wheel of fortune	62,00	86,00
I will also answer about the fractions that appear	64,50	87,00
I enjoy working with friends when using the spinning wheel	66,00	89,00
Average	**64,42**	**87,63**

Based on the research results table, student response to mathematics learning of fractions using the fraction rotation method in cycle I showed an average percentage of 64.42 and was in the moderate category. These results indicate that students responded quite well to the learning, but did not meet the predetermined success indicators, so improvements need to be made to the implementation of learning in cycle II.

In cycle II, student response improved significantly, with an average percentage of 87.63, which is classified as excellent. This improvement shows that the use of fraction spinning wheels can maximize student response, thereby achieving the research success indicators.

DISCUSSION

The implementation of mathematics learning using fraction wheels showed an increase in teacher and student activity. Teachers acted as facilitators who directed the learning process, explained the objectives and steps for using the media, and guided students in gradually understanding the concept of fractions. Teachers were also able to manage the class well so that learning took place in a structured and conducive manner. Student activity during learning was also very good. Students are actively involved in learning activities both individually and in groups, such as trying out media, discussing, and answering questions from teachers. This active involvement creates an interactive and enjoyable learning atmosphere, so that students are more enthusiastic in participating in learning. This increase in activity is in line with the results of Ririn's research, which states that fraction wheel media can increase teacher and student activity in mathematics learning. (Ririn, 2024).

The use of fraction wheel media has a positive impact on the learning outcomes of third-grade students at MI Thoriqul Huda Menganti Gresik. This media helps students visualize abstract fraction concepts in a more concrete way so that they are easier to understand. This is in line with Arsyad's opinion in Mana, which states that visual learning media can bridge the limitations of elementary school students' abstract thinking by providing a more realistic learning experience (Mana, 2025). The results showed an increase in student learning outcomes in each cycle. After improvements were made to the learning process in cycle II, most students learning objective achievement criteria (KKTP). These findings are in line with the research by Iswinarno and Lutfi, which states that the use of appropriate and interesting learning media can significantly improve student learning outcomes (Iswinarno & Lutfi, 2024). In addition, research conducted by Atika also shows that the use of manipulative media in mathematics learning can improve understanding of fractions and learning completeness among elementary school students (Atika et al., 2023). Similarly, Diah's research confirms that educational game-based learning media, such as spinning wheels, are effective in increasing student engagement and mathematics learning outcomes (Diah Permata et al., 2024).

In addition to improving learning activities and outcomes, the use of fraction wheel media also received positive responses from students. Students felt happy, interested, and more motivated in participating in mathematics lessons because the media used was interesting and easy to understand. This condition is in line with the learning motivation theory proposed by Uno in Rahman, which states that the use of varied and enjoyable learning media can increase students' intrinsic motivation in learning (Rahman, 2022). This positive response had an impact on increasing students' interest and motivation to learn during the learning process. This finding is in line with Afendi's research, which states that students' positive response to the fraction wheel media in mathematics learning can increase learning motivation and influence the improvement of student learning outcomes (Afendi et al., 2025). Another study by Rachmawati also revealed that interactive learning media can create a pleasant learning atmosphere so that students are more active, focused, and motivated in participating in mathematics learning (Rachmawati et al., 2024).

CONCLUSION

Based on the entire series of classroom activities carried out systematically in two cycles, it can be confirmed that the use of fraction wheel media has a comprehensive impact on improving the quality of mathematics learning in grade 3 students at MI Thoriqul Huda Randupadangan Menganti Gresik, both in terms of the learning process and outcomes. This media not only functions as a visual aid, but also as a means of active learning that can direct the role of teachers to be more effective in planning, implementing, and evaluating learning, while encouraging students to be directly involved in each stage of learning activities. The increase in student activity, as seen in their enthusiasm for discussion, courage to express opinions, and ability to work together, shows that learning is participatory and student-centered. Cognitively, the concrete learning experience through the use of fraction spinners helps students build a gradual and meaningful understanding of fractions, thereby increasing the class average score and learning completeness that meets the criteria for success. In addition, the positive response of students who demonstrated through higher enthusiasm and motivation to learn reinforces the finding that a fun and non-monotonous learning atmosphere contributes greatly to learning success. Thus, the fraction wheel media has been proven effective as an

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alternative mathematics learning media that can improve the learning outcomes of elementary school students.

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