

The Effectiveness of The Short Card Game Media in Improving Mathematics Learning Outcomes of Islamic Elementary School Students

Aminatur Rohmatillah¹⁾, Mar'atus Sholihah²⁾, Rizqiyah Ratu Balqis³⁾, Yahaya Niwae⁴⁾

^{1, 2, 3)} Program Studi PGMI, Fakultas Tarbiyah, Universitas Al-Falah As-Sunniah, Jember, Indonesia

⁴⁾ Univesitas Fatoni, Pattani, Thailand

*e-mail corespondency: aminatur@uas.ac.id

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ABSTRACT

This study aims to analyze changes in mathematics learning outcomes after implementing the Short Card game media on the topic of fraction conversion at a Islamic Elementary School (Islamic elementary school). The article presents a reanalysis of research whose field data were collected during the 2022/2023 academic year; 2026 is the year of article preparation, not data collection. The study employed a quantitative approach with a one-group pretest–posttest design. The subjects comprised 30 fifth-grade students at Islamic Elementary School in Jember. The instrument was a 20-item test covering conversion of common fractions to mixed numbers, mixed numbers to common fractions, and common fractions to percentages. Analysis included descriptive statistics, prerequisite tests, and a paired-sample t-test. Individual data showed a mean pretest score of 45.50 and a mean posttest score of 70.80, yielding an average increase of 25.30 points. The normality test on residuals produced Asymp. Sig. = 0.200 > 0.05. The paired-sample t-test yielded $t = -21.071$, $df = 29$, and Sig. (2-tailed) = 0.000. These results indicate a significant difference between scores before and after learning using Short Card. However, documentation of the original study contains inconsistencies in reporting validity tests and interpreting reliability; the recorded Cronbach's Alpha was 0.466, so this article does not claim that the instrument has high reliability. The findings suggest the potential of card-game media as an active, simple, and still relevant strategy for mathematics learning in current educational contexts..

Keywords: Learning Media, *Short Card*, Learning Outcomes, Mathematics, Fraction Conversion, Islamic Elementary School.

A. INTRODUCTION

Mathematics learning at the elementary school level internationally is not only directed toward mastery of calculation procedures, but also toward the development of conceptual understanding and the ability to use multiple mathematical representations. This is particularly important in fraction learning because students need to understand the relationships between symbols, quantities, and visual representations. Tunç-Pekkan (2015), through research with 4th and 5th grade students, showed that students' ability to understand fractions can differ based on the form of representation used, including area and number line representations. These findings suggest that fraction understanding cannot be adequately developed through symbol and procedure mastery alone, but also requires the ability to interpret fractions through diverse representational formats.

Difficulties in connecting these representations have also been found in more recent research. Herreros-Torres et al. (2026) showed that elementary school students may still experience difficulties when solving fraction tasks presented through arithmetic and graphical representations. These findings demonstrate that the ability to transition between and connect various representations is an

essential component of fraction learning. On the other hand, the use of game-based activities has become one of the approaches examined in mathematics education. Through a systematic review, Hui and Mahmud (2023) showed that game-based learning in mathematics education is related to students' cognitive and affective aspects. These findings provide a basis for incorporating games into mathematics learning, particularly when play activities are aligned with clear learning objectives and meaningful mathematical tasks.

These international research findings provide context that fraction learning for elementary school students needs to incorporate multiple representations while also providing learning activities that enable active student engagement. This context is relevant to mathematics learning at the elementary school level in Indonesia, which is not only oriented toward computational ability, but also toward conceptual understanding, connecting various representations, and applying knowledge to solve problems. At the elementary school level, mathematics learning forms the foundation for understanding mathematical concepts in subsequent stages of education. However, mathematics is still often perceived as a difficult subject when instruction positions the teacher primarily as the source of information and students as passive recipients. This condition can reduce student engagement and negatively impact learning achievement. Nurjannah et al. (2025), for example, demonstrated that learning centered on student activities can yield better mathematics learning outcomes compared to conventional instruction. In that study, the average post-test score for the project-based learning group reached 86.10, while the conventional group achieved 74.40.

Fraction material constitutes an important component of elementary school mathematics learning because students are required not only to recognize fraction symbols, but also to understand the relationships between numerators, denominators, fraction values, and various forms of representation. Understanding of fractions can be developed through learning experiences that allow students to engage with concepts more concretely. Therefore, the use of instructional media becomes one alternative that can help bridge abstract mathematical concepts with more observable learning experiences. Ratnasari et al. (2024) explained that instructional media can make the learning process clearer, more engaging, and interactive, as well as enhance students' attention and learning motivation. Visual media can also assist learners in understanding and retaining messages conveyed through images or symbols. These findings indicate that instructional media not only function as tools to support teachers in delivering content, but can also create more active learning experiences. In the study by Ratnasari et al. (2024), the use of instructional media was associated with improvements in students' learning motivation following treatment. The reported results showed an increase in mean scores from 105.4 on the pretest to 117 on the posttest. Although that study focused on learning motivation, its findings suggest that media use can play an important role in creating more engaging mathematics learning that encourages student involvement.

In contemporary learning contexts, the use of media and game activities does not necessarily require digital applications. Debrenti (2024) explained that mathematics games, both non-digital and digital, can serve as pedagogical resources to help students build, reinforce, and connect multiple representations of mathematical concepts. Deng et al. (2020) showed that digital games in elementary mathematics learning can increase student engagement and interest, but integrating games with classroom activities still requires deliberate teacher strategies. Therefore, games should be embedded within well-defined tasks connected to learning objectives. The selection of varied methods appropriate to material characteristics is also a hallmark of innovative learning (Fathurrohman, 2015).

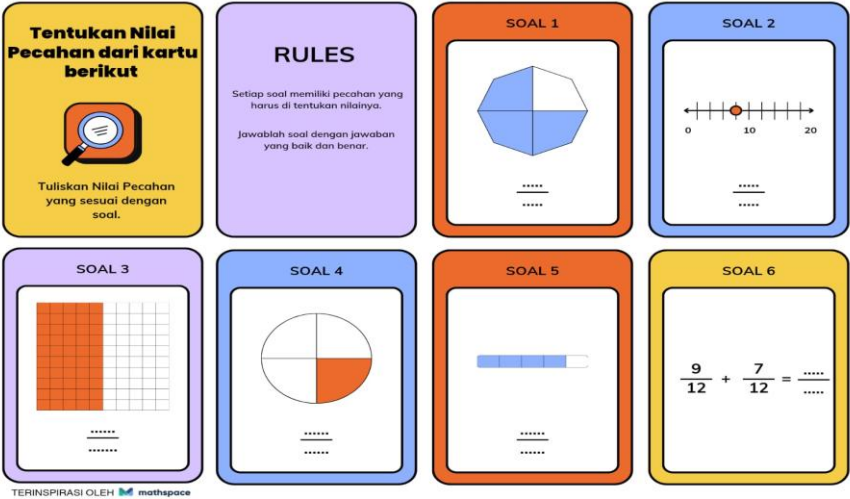
The development of digital media has diversified game-based learning approaches. Kusuma et al. (2025) demonstrated that Android-based mathematics media can be systematically developed through the ADDIE model. However, this digital advancement does not render concrete media such

as cards obsolete. Debrenti (2024) emphasized that non-digital games can serve as valuable pedagogical resources in elementary mathematics learning. Thus, concrete media remain relevant in mathematics instruction, particularly when designed to provide active and purposeful learning experiences. In fraction learning, this becomes crucial because students need to simultaneously understand relationships between visual and symbolic forms. Media presenting only one representational format may not adequately support students in connecting multiple ways of understanding fractions. Therefore, media are needed that not only provide playful activities, but also offer multiple fraction representations within a coherent learning experience.

One form of concrete media that can be employed is the Short Card game. Based on the media design used in this study, Short Card presents fraction problems through multiple visual representations. The cards contain images of shaded areas, number lines, grid models, circles, bar models, and fraction operation problems. This variation provides students with opportunities not only to read fractions in symbolic form, but also to examine part-whole relationships, fraction positions on number lines, and visual fraction representations. Thus, Short Card can be positioned as concrete game-based media that combines play with practice in understanding fraction representations.

The inclusion of multiple representations in Short Card is important because fraction learning requires students' ability to translate across different representational forms. For instance, students can determine fraction values from shaded diagrams, locate fractions on number lines, identify shaded portions in area models, and connect visual forms with symbolic notation. On other cards, students are directed to solve fraction addition problems. Thus, the game incorporates elements of activity and competition while guiding students toward mathematical tasks aligned with learning objectives.

Figure 1. Short Card game materials on fraction content



Previous research has demonstrated that the Short Card strategy can improve learning outcomes across various subjects and educational levels. Recent literature expands this perspective. Es-Sajjade and Paas (2020) emphasized the importance of aligning educational game design with learning theory to ensure games extend beyond entertainment. McFeetors and MacDonald (2020) similarly showed that games can be effectively utilized as contexts for mathematics learning. These findings support the development of simple game-based media not merely as recreational activities, but as means to foster more active and meaningful mathematical engagement. Consequently, the use of Short Card in fraction conversion instruction aligns with elementary mathematics learning needs that emphasize student engagement, representational fluency, and concrete learning experiences. Unlike digital media

requiring technological devices, Short Card can be implemented directly in classroom interactions. This media also enables teachers to organize activities according to learning objectives and student ability levels. This aligns with evidence that innovative learning success remains influenced by teachers' capacity to design purposeful activities. Although numerous studies have examined instructional media, mathematics games, and active learning to enhance engagement and achievement, research specifically analyzing Short Card games for fraction conversion with Islamic Elementary School (Islamic elementary school) students remains limited. Therefore, this study positions Short Card not merely as game media, but as a vehicle for providing fraction learning experiences through multiple representations and mathematical activities.

This study aims to examine changes in mathematics learning outcomes among 5th grade Islamic Elementary School students on fraction conversion material following instruction using the Short Card game. Specifically, this study seeks to analyze differences in student learning outcomes before and after implementing Short Card game-based instruction on fraction conversion. The use of Short Card is grounded in fraction learning needs that emphasize not only procedural skills, but also concrete learning experiences through observing, determining, matching, and discussing solutions. In fraction conversion instruction, these activities are expected to help students connect different fraction forms with their equivalent representations. Practically, this study is expected to provide teachers with an accessible game-based alternative for fraction conversion instruction. Academically, this research contributes to the literature on concrete game media use in mathematics learning at the Islamic Elementary School level.

B. METHOD

This article reports a quantitative study conducted at MI in Jember. The research subjects were 30 fifth-grade students. Accordingly, the year 2026 indicated in the article refers to the year of manuscript preparation, not the year of data collection. The research design employed a one-group pretest-posttest experiment. Students completed a test before treatment (pretest), then participated in learning using the Short Card game method, and subsequently completed a test after treatment (posttest). This design was used to examine changes in student learning outcomes before and after treatment (Sugiyono, 2011).

The original study stated that the instrument was developed based on content indicators and used a 1–100 scoring scale. The instrument comprised 20 items grouped into three indicators: (1) converting common fractions to mixed fractions; (2) converting mixed fractions to common fractions; and (3) converting common fractions to percentages. Data analysis in the original study included validity, reliability, normality, and paired sample t-test. In this article, quantitative data analysis was conducted based on individual pretest and posttest scores, including descriptive analysis, prerequisite tests, and hypothesis testing. These analyses were used to determine changes in student learning achievement following instruction (Siyoto & Sodik, 2020). Learning outcome assessment was used to examine changes in student achievement after learning (Nana Sudjana, 2017).

In this article, the primary analysis of learning outcomes was based on individual pretest and posttest data listed in the report. Descriptive calculations were reviewed from individual scores. Hypothesis testing was reported according to the original study's output, namely paired sample t-test with $N = 30$ and $df = 29$. **Data quality note.** The original document contains inconsistencies in reporting validity and reliability tests. In one section, r -table is stated as 0.361 with 20 items, but the list of valid and invalid item numbers in the text shows repetition and discrepancies. Additionally, the Cronbach's Alpha output shows a value of 0.466, while the report describes it as reliable based on a threshold different from the criteria previously stated. Since this article does not have complete raw

output to reanalyze the instrument, these figures are reported as-is and are not used to make claims that the instrument has high reliability. This study used data collected during the 2022/2023 academic year. The research was conducted with permission from relevant parties at the research site and involved students as learning participants. Participant identities were used in accordance with available research documentation. This article does not add procedures or ethics approval numbers not included in the original research documentation.

C. RESULTS

1. Pretest and Posttest Score Characteristics

The research report states that the total number of students at Madrasah Ibtidaiyyah in the 2022/2023 academic year was 102 students, with 30 students in grade V. These thirty students became the research subjects. Research data show that pretest scores ranged from 40–52, while posttest scores ranged from 58–79.

Table 1. Descriptive Statistics of Pretest and Posttest Scores

Statistic	Pretest	Posttest
N	30	30
Minimum	40	58
Maximum	52	79
Mean	45.50	70.80
Mean difference	—	25.30 points

Figure 2. Comparison of mean pretest and posttest scores.

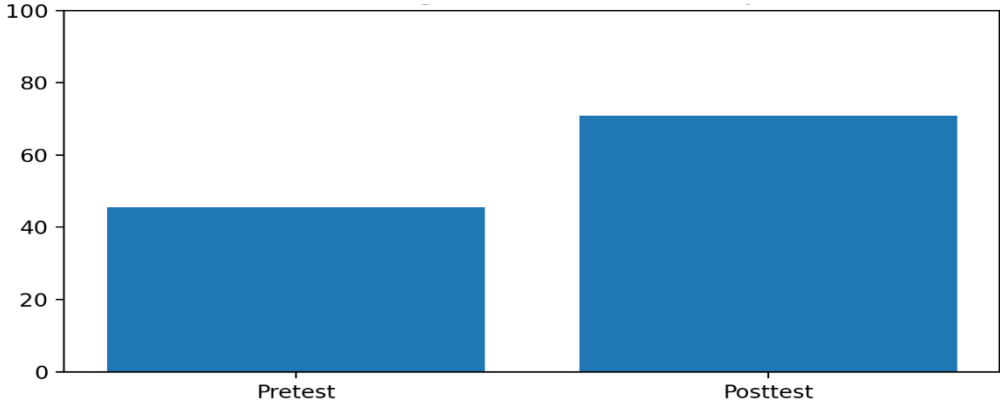


Table 2. Individual Pretest and Posttest Scores

No.	Student	Pretest	Posttest	Δ
1	A1	49	70	21
2	A2	46	73	27
3	A3	49	76	27
4	A4	52	73	21
5	A5	49	70	21
6	A6	43	70	27
7	A7	46	76	30
8	A8	52	70	18
9	B1	46	73	27
10	B2	43	70	27
11	D1	43	73	30

12	E1	43	73	30
13	F1	43	76	33
14	F2	40	73	33
15	F3	46	76	30
16	H1	49	73	24
17	H2	46	64	18
18	J1	49	67	18
19	J2	46	70	24
20	M1	49	79	30
21	N1	49	76	27
22	N2	49	76	27
23	P1	40	61	21
24	R1	40	61	21
25	R2	40	70	30
26	S1	40	76	36
27	S2	40	79	39
28	S3	40	58	18
29	T1	49	58	9
30	Z1	49	64	15

All students experienced score increases from pretest to posttest. Individual improvements ranged from 9 to 39 points. This finding shows that the direction of score changes was consistent across all research participants.

2. Normality Test Results

The One-Sample Kolmogorov-Smirnov output in the report shows $N = 30$, test statistic = 0.130, and Asymp. Sig. (2-tailed) = 0.200. Since the significance value is greater than 0.05, the tested data meet the normality assumption for parametric analysis. The original report mentions the Shapiro-Wilk test, but the table displayed is actually One-Sample Kolmogorov-Smirnov output. This article uses the test name according to the available output.

Table 3. Normality Test Results

N	Test Statistic	Asymp. Sig.	Interpretation
30	0.130	0.200	Meets normality assumption

3. Difference Between Pretest and Posttest Scores

The paired sample t-test was conducted to examine the difference between students' pretest and posttest scores. The analysis produced a mean difference of -25.300, a standard deviation of 6.577, and a standard error of the mean of 1.201. The 95% confidence interval ranged from -27.756 to -22.844. The test resulted in a t-value of -21.071 with 29 degrees of freedom and a significance value of 0.000.

Table 4. Paired Sample t-test Results

Variable	Mean Diff.	SD	SE	95% CI	t	df	Sig.
Pretest– Posttest	-25.300	6.577	1.201	-27.756 to - 22.844	- 21.071	29	0.000

Since Sig. (2-tailed) = 0.000 < 0.05, there was a significant difference between the pretest and posttest scores. The direction of the difference indicates that the posttest scores were higher than the pretest scores. Thus, based on the research design used, the results indicate an increase in student learning outcomes following instruction using Short Card.

D. DISCUSSION

The findings of this study indicate a clear change in students' mathematics learning outcomes following instruction using the *Short Card* game. The mean score increased from 45.50 in the pretest to 70.80 in the posttest, representing an increase of 25.30 points. All 30 students also demonstrated individual score improvements. These findings were further supported by the paired sample t-test, which produced a significance value of 0.000. The findings indicate that students' learning outcomes improved following the implementation of *Short Card* in the mathematics learning process.

1. Improvement in Students' Mathematics Learning Outcomes

The increase in learning outcomes can be understood from the characteristics of *Short Card* as a concrete game-based learning medium. The cards provide representations that can be moved, matched, grouped, and discussed. In the context of fraction conversion, these activities allow students to connect fraction representations with the results of their conversion. Thus, the cards do not merely function as game equipment but also become stimuli for students to engage in mathematical activities.

This interpretation is relevant to contemporary research on game-based learning in elementary mathematics. Debrenti (2024) explains that mathematics games can help students build, strengthen, and connect different representations of mathematical concepts. This perspective is consistent with the characteristics of *Short Card*, which enables students to connect fraction symbols with their corresponding converted forms. However, this theoretical relevance should be understood as support for interpreting the findings rather than as evidence that the *Short Card* used in this study was a digital learning medium. The *Short Card* in this study represents a concrete, non-digital form of game-based learning.

2. The Role of Discussion in Game-Based Learning

The findings can also be interpreted in relation to the role of discussion following game-based learning activities. Pan et al. (2025) showed that game-based learning can be strengthened through discussion activities conducted after gameplay. Their experiment compared a game condition accompanied by post-game group discussion with game-based intervention and paper-based practice. This finding suggests that game activities can become more meaningful when followed by discussion, reflection, or explanation of strategies. In the context of *Short Card*, this principle can be applied through a discussion session in which students examine their answers and explain the reasons or strategies used during the game.

The findings are also relevant to the broader discussion of digital and non-digital game-based learning. Research on digital game-based mathematics learning indicates that technology can increase engagement and interest, although it also presents challenges in balancing enjoyment with learning objectives. Deng et al. (2020) found that digital games could increase engagement and interest, while participants also expressed concerns and teachers faced challenges in balancing

enjoyment with learning. Debreñti (2024), meanwhile, demonstrates the pedagogical potential of non-digital games and reports different learning outcomes in the context of digital and non-digital game-based learning.

These findings provide an important interpretation of the present study because the use of *Short Card* demonstrates that active mathematics learning does not necessarily depend on digital technology. A concrete medium can provide opportunities for students to manipulate representations, make connections, discuss answers, and participate directly in learning activities. This characteristic may be particularly relevant in madrasah contexts where access to technological devices is limited or where teachers seek to maintain direct face-to-face interaction during mathematics learning.

3. Mathematical Activities Through Short Card

The findings further suggest that the learning value of *Short Card* lies not only in the game format but also in the mathematical activities that occur through its use. Students are involved in observing questions, determining answers, matching cards, and discussing the results. These activities provide opportunities for students to work with different representations of fractions and establish connections between visual and symbolic forms. Therefore, *Short Card* can be understood as a medium that facilitates active engagement with mathematical concepts rather than simply providing an entertaining activity.

In this context, the increase in student scores may be interpreted alongside the opportunity provided by the medium for students to interact directly with fraction representations. The physical characteristics of the cards allow students to manipulate and compare information during the learning process. Such activities are relevant to the learning of fraction conversion because students need to establish relationships between different forms of representation. The finding therefore extends the discussion of game-based learning by emphasizing the role of concrete mathematical representations within game activities.

The relevance of *Short Card* can also be extended to numeracy learning. The cards can contain everyday situations, pictures, fractions, percentages, and questions that require students to explain their reasoning rather than merely provide an answer. Such development can move the activity from simply matching answers toward activities involving mathematical representation, reasoning, communication, and reflection.

4. Theoretical Implications

Theoretically, this study provides additional evidence concerning the use of concrete game-based media in mathematics learning, particularly in fraction-conversion material among madrasah ibtidaiyyah students. *Short Card* provides a learning context in which students engage in observing, determining, matching, and discussing fraction problems. Therefore, game-based media can be positioned as part of mathematical activity rather than merely as a means of entertainment.

The presence of different forms of representation in *Short Card* also provides learning experiences that allow students to connect visual and symbolic forms in fraction learning. This contributes to an understanding of game-based learning in which the pedagogical value of the game is associated not only with student engagement but also with the mathematical activities embedded within the game. In this sense, the findings provide additional empirical support for the use of concrete game-based learning media in mathematics learning.

The findings also indicate that the use of concrete media can remain relevant within contemporary mathematics education. Digital technology can provide additional learning resources, but concrete media can continue to support direct interaction, manipulation, and

discussion. Therefore, the findings do not suggest replacing digital learning with concrete media or vice versa; rather, they indicate the potential pedagogical value of maintaining concrete learning experiences within mathematics instruction.

5. Practical Implications

Practically, *Short Card* can be used as an alternative learning medium for creating more active and interactive fraction learning. Teachers can incorporate activities such as observing problems, determining answers, matching cards, and discussing results into the learning process. Teachers can also develop cards according to different levels of difficulty and use students' performance during the activity to identify difficulties in fraction conversion.

The development of *Short Card* can be directed toward different levels of difficulty, beginning with the recognition of fraction concepts and progressing toward contextual problems. Such levels can allow teachers to adapt the use of the medium to students' abilities and learning development. This development maintains the main characteristic of *Short Card* as a concrete learning medium while allowing the content to become more varied and responsive to students' learning needs.

The content of the cards can also be developed into challenge cards that require students not only to determine answers but also to explain the reasoning or strategy used to solve a problem. Such activities may encourage mathematical reasoning and communication. The cards can further include everyday contexts, such as the use of fractions in monetary transactions, food distribution, measurement, and relationships between fractions and percentages. These contexts can help students understand that fractions are not limited to procedural calculations in the classroom but are also applied in everyday situations.

Another practical development is the inclusion of a simple reflection sheet after the game activity. Through reflection, students can identify the strategies they used, the difficulties they experienced, and the errors that occurred during the learning process. For teachers, this information can serve as a basis for providing feedback and determining subsequent learning activities.

The physical *Short Card* can also potentially be complemented by digital resources. For example, QR Codes could direct students to explanatory videos, additional exercises, answer discussions, or other learning resources. Such integration would allow the physical cards to remain the main concrete learning medium while digital resources function as complementary materials. Digitalization in this form would not be intended to replace direct interaction between teachers and students but to provide additional resources according to learning needs.

6. Significance

The empirical contribution of this study lies in providing additional evidence concerning the use of concrete game-based media in mathematics learning, particularly for fraction-conversion material among madrasah ibtida'iyyah students. The increase in the mean score from 45.50 to 70.80, together with the improvement experienced by all students, provides empirical evidence of changes in learning outcomes following instruction using *Short Card*.

The study also contributes practically by showing that a relatively simple concrete game medium can be incorporated into mathematics learning activities involving observation, matching, discussion, and problem solving. The findings provide a basis for considering *Short Card* as one alternative medium for active and interactive mathematics learning. At the same time, the contribution should be understood within the specific context and design of the study rather than generalized beyond the available evidence.

The significance of the study therefore lies in connecting concrete game-based learning with mathematical activities in a madrasah ibtida'iyyah context. The study adds empirical information concerning the use of game-based concrete media for fraction conversion and provides a basis for further development of the medium according to contemporary learning needs.

7. *Limitations*

Several limitations should be considered when interpreting the findings. First, the study used a single-group design without a control group. Therefore, the observed increase in scores cannot be exclusively attributed to *Short Card* with the same strength of causal inference that would be possible in a randomized controlled trial. Other factors associated with the learning process may also have contributed to the observed changes.

Second, the sample consisted of only 30 students from one madrasah. Consequently, the findings should be generalized to other schools and educational contexts with caution. Differences in student characteristics, school environments, teaching practices, and available learning resources may influence the implementation and outcomes of *Short Card*.

Third, the documentation of instrument validity and reliability in the original research report contains inconsistencies. The recorded Cronbach's Alpha value of 0.466 does not support a claim that the instrument has a high reliability category. This limitation needs to be reported transparently so that readers can appropriately assess the strength of the evidence provided by the study.

These limitations mean that the findings should be interpreted within the specific scope of the study. Nevertheless, the research provides practical information regarding the potential use of a simple concrete game medium in mathematics learning. The limitations also provide a basis for designing future research with stronger comparison designs, broader samples, and more complete instrument documentation.

8. *Future Research*

Future research can examine the use of *Short Card* in broader educational contexts by involving students from multiple schools and larger samples. Studies could also incorporate comparison groups to provide stronger evidence concerning the relationship between the use of *Short Card* and changes in learning outcomes. More complete documentation and testing of instrument validity and reliability should also be included to strengthen the quality of the evidence.

Further research can focus on developing *Short Card* through a Research and Development (R&D) approach. The ADDIE model, consisting of *Analyze*, *Design*, *Development*, *Implementation*, and *Evaluation*, can be considered for systematically developing the medium. Kusuma et al. (2025) is identified in the source material as an example of the use of the ADDIE model in developing Android-based mathematics learning media for elementary school students. A similar development approach could be considered for developing *Short Card* with contextual content and complementary technology.

Future development can include contextual problems, challenge cards, reflection activities, differentiated levels of difficulty, and complementary digital resources. A physical card could, for example, be connected to explanatory videos, enrichment exercises, or additional learning materials through QR Codes. Such development would preserve the concrete characteristics of *Short Card* while providing additional learning resources.

However, these proposed developments should be clearly distinguished from the intervention examined in the present study. QR Code integration, digital versions, challenge cards, reflection activities, and the ADDIE development process were not part of the treatment

implemented in the original study. They are recommendations for future research or implementation because the data analyzed in this article were collected during the 2022/2023 academic year.

Overall, the findings indicate that *Short Card* was associated with an increase in students' mathematics learning scores in the context examined in this study. The theoretical contribution concerns the role of concrete game-based media as part of mathematical activity, while the practical contribution concerns the potential use and further development of *Short Card* for active fraction learning. The limitations of the research design, sample, and instrument documentation indicate the need for further studies with broader participants, comparison groups, and stronger methodological documentation.

E. CONCLUSION

The study concludes that students' mathematics learning outcomes increased following the implementation of the Short Card game as a learning medium for fraction conversion. The mean score increased from 45.50 in the pretest to 70.80 in the posttest, with a mean increase of 25.30 points. The paired sample t-test showed a significant difference between pretest and posttest scores ($t = -21.071$, $df = 29$, $\text{Sig.} = 0.000 < 0.05$). These findings indicate the potential of Short Card as a concrete game-based medium for mathematics learning.

Teachers may consider using Short Card as an alternative medium for active mathematics learning, particularly for fraction-conversion material. Future development can focus on differentiated difficulty levels, contextual problems, and activities that encourage students to explain their reasoning. Further research should involve comparison groups and more diverse participants to provide stronger evidence regarding changes in learning outcomes.

F. DECLARATIONS

1. *Ethical Approval*

The study used research data collected during the 2022/2023 academic year at MI Wringinagung, Jombang, Jember. The research was conducted with permission from the relevant parties at the research site and involved students as learning participants. The available original research documentation does not include the name of an ethics committee or an ethics approval letter number. Therefore, no ethics approval number or institutional ethics committee is reported in this article.

2. *Conflict of Interest*

The authors declare that there is no conflict of interest, whether financial, personal, or institutional, that could influence the objectivity, process, or results of this research.

3. *Funding*

This research was conducted independently and did not receive specific funding from any institution or sponsor.

4. *Author Contributions*

Aminatur Rohmatillah: Conceptualization, methodology, data analysis, drafting of the original manuscript, and manuscript revision. Mar'atus Sholihah: Data collection, investigation, literature review, and manuscript editing. Rizqiyah Ratu Balqis: Data documentation, literature review, and manuscript editing. Yahaya Niwae: Review of the manuscript and final editing. All authors have read and approved the final version of the manuscript for publication.

5. *Data Availability*

The individual pretest and posttest scores analyzed in this article are reported in the manuscript. The research data were obtained from the original research report. Additional raw

research data are not publicly available because the original documentation does not provide a public data repository or data-sharing mechanism.

6. *AI Use/Disclosure*

AI-based tools were used during the preparation of this manuscript for language editing, translation, and assistance in organizing the manuscript according to the target journal template. The use of AI-based tools was limited to language and editorial assistance and did not replace the authors' responsibility for the research data, statistical results, interpretation, or scientific conclusions. The authors reviewed and approved the final manuscript.

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8. *Orcid ID*

Aminatur Rohmatillah : <https://orcid.org/0009-0007-8894-3642>
Mar'atus Sholihah : <https://orcid.org/0009-0002-6504-2052>
Rizqiyah Ratu Balqis : <https://orcid.org/0009-0007-8633-5213>
Yahaya Niwae : <https://orcid.org/0009-0002-5161-3686>

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