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Effect of RME-based straw and cup media on multiplication and division learning outcomes

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ABSTRACT

Low Mathematics learning outcomes, especially in multiplication and division, remain a persistent challenge in elementary schools. Observations at SDN Susukan 04 Pagi revealed that many third-grade students struggle with understanding abstract concepts due to limited use of concrete and contextual learning media. This study aimed to examine the effectiveness of straw and cup media based on the Realistic Mathematics Education (RME) approach in enhancing students' Mathematics learning outcomes. A quasi-experimental method with a posttest-only control group design was used, involving 64 students selected through saturated sampling. The instrument was a 10-item essay Post-Test, tested for validity (product-moment) and reliability (Cronbach's Alpha). Data analysis included normality (Shapiro-Wilk), homogeneity (Levene's test), independent t-test, and effect size calculation. The results showed that the experimental group significantly outperformed the control group. The effect size analysis indicated a strong practical impact. The use of RME-based straw and cup media helped students better visualize and contextualize multiplication and division problems, promoting active learning and deeper conceptual understanding. These findings confirm that concrete media integrated with meaningful learning models can significantly improve student performance in Mathematics.

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ABSTRAK

Rendahnya hasil belajar Matematika, khususnya pada materi perkalian dan pembagian, masih menjadi permasalahan yang dihadapi peserta didik sekolah dasar. Hasil observasi awal di SDN Susukan 04 Pagi menunjukkan bahwa banyak peserta didik kelas III mengalami kesulitan dalam memahami konsep abstrak karena minimnya penggunaan media konkret dan kontekstual. Penelitian ini bertujuan untuk mengetahui efektivitas media sedotan gelas berbasis Realistic Mathematics Education (RME) terhadap hasil belajar Matematika peserta didik. Metode yang digunakan adalah quasi eksperimen dengan desain posttest-only control group. Sampel terdiri dari 64 peserta didik yang dipilih melalui teknik saturated sampling. Instrumen berupa Post-Test dengan 10 soal uraian, yang telah diuji validitasnya (product moment) dan reliabilitasnya (Alpha Cronbach). Analisis data dilakukan melalui uji normalitas (Shapiro-Wilk), homogenitas (Levene's test), uji-t, serta perhitungan effect size. Hasil penelitian menunjukkan bahwa kelompok eksperimen memperoleh hasil belajar yang secara signifikan lebih tinggi dibanding kelompok kontrol, dengan nilai effect size yang menunjukkan pengaruh besar. Media sedotan gelas berbasis RME terbukti membantu peserta didik memvisualisasikan dan mengaitkan konsep perkalian dan pembagian dengan konteks nyata, serta mendorong pembelajaran aktif dan pemahaman konseptual yang lebih mendalam.
Kata kunci: *efektivitas pembelajaran; hasil belajar; Matematika; media konkret; Realistic Mathematics Education (RME)*

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INTRODUCTION

Education plays a strategic role in developing quality human resources. In Undang-Undang Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional, education is defined as a conscious and planned effort to create a learning environment in which students actively develop their potential. Education does not occur only in schools but is a lifelong process that unfolds across various life contexts (Aulia & Salbiah, 2025). The objectives of national education, as stated in Pasal 3 Undang-Undang Sistem Pendidikan Nasional, are to develop individuals who are faithful, pious, noble, healthy, knowledgeable, skilled, creative, independent, democratic, and responsible. Therefore, every educational process requires appropriate direction and strategies to achieve these goals, particularly in the context of learning in elementary schools (Pasaribu, 2017).

Mathematics is a fundamental subject in the elementary school curriculum. However, in reality, mathematics learning, especially in arithmetic operations such as multiplication and division, is often still carried out in a monotonous manner, oriented towards memorization, and lacking innovation in learning methods and media (Sihombing *et al*., 2023)—less contextual learning results in low understanding and active involvement of students in the learning process. In fact, for elementary school-aged children, a concrete approach is needed to ensure that abstract concepts are understood properly (Yolanda *et al*., 2024). In this case, the role of teachers is crucial, not only as facilitators but also as innovators who can select learning media appropriate to students' needs and the characteristics of the teaching material (Indrawati *et al*., 2022).

Previous studies have shown the effectiveness of using concrete media in mathematics learning. One of them concerns the use of straws in mathematics instruction, which has been shown to improve students' mathematics learning outcomes (Nisa, 2023). The application of a cooperative learning model combined with concrete media has also been shown to improve elementary school students' mathematics learning outcomes (Suwarningsih, 2021). Similarly, the use of multiplication boards has been shown to improve student learning outcomes (Wahyuni, 2022). These findings confirm that concrete media have significant potential in supporting the understanding of mathematical concepts at the elementary level.

Previous studies, in general, have not explicitly integrated the Realistic Mathematics Education (RME) approach in their use. Therefore, this study offers a new contribution by examining the effect of glass-straw media, based on the RME approach, on student learning outcomes in multiplication and division. By emphasizing concrete objects that students can manipulate directly, this medium is expected to bridge the understanding of abstract concepts and to build connections between mathematics and students' daily lives.

Mathematics learning in elementary schools often struggles to develop students' conceptual understanding, particularly in multiplication and division. Based on observations and initial interviews conducted at SDN Susukan 04 Pagi, the learning outcomes of third-grade students in these subjects remained below the Minimum Mastery Criteria (KKM). Of the 32 students, approximately 40% achieved a KKM score of 70. This finding reflects a gap between curriculum expectations and students' actual achievements, which may be attributable to a learning approach that is not contextual and not fully meaningful to students.

To address these issues, learning innovations are needed that bridge the abstract concepts of mathematics with students' real-world experiences. One potential alternative is the use of concrete media in the form of straws developed using the RME approach. This approach emphasizes the importance of linking mathematical material to real-world situations so that students can actively construct their understanding through relevant and familiar contexts (Apriyanti *et al*., 2023). Thus, learning becomes more meaningful and encourages optimal cognitive engagement of students.

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Based on the problems described above, this study aims to determine whether the use of RME-based glass straw media affects students' learning outcomes in mathematics, specifically in multiplication and division. This problem formulation serves as the basis for empirically testing the effectiveness of the RME approach in improving students' understanding of abstract mathematical concepts. To that end, two hypotheses were established for testing, namely the null hypothesis (H_0), which states that there is no positive effect of the application of RME-based glass straw media on the mathematics learning outcomes of third-grade students at SDN Susukan 04 Pagi in the subject of multiplication and division, and the alternative hypothesis (H_1) which states that there is a positive effect of the application of this media on improving student learning outcomes in the same material.

The purpose of this study is to determine the effect of using RME-based glass straw media on mathematics learning outcomes in multiplication and division for third-grade students at SDN Susukan 04 Pagi. This study is hoped to contribute, both theoretically and empirically, to the development of mathematics learning strategies in elementary schools. Theoretically, the results of this study are expected to enrich the study of the effectiveness of concrete media based on the RME approach in mathematics learning. Practically, this study provides benefits for students by creating enjoyable and easy-to-understand learning materials, for teachers by serving as a reference for selecting effective learning media, and for researchers by providing a basis for further studies aimed at improving the quality of mathematics learning at the elementary level.

LITERATURE REVIEW

The Concept of Learning and Teaching Mathematics

Learning is a process that requires students' active involvement in constructing new knowledge and understanding through experience, practice, and reflection. Learning is not merely memorizing information, but rather a cognitive transformation process that leads to changes in behavior and more adaptive mindsets. In the context of education, these changes are relatively permanent and can be measured through improvements in students' knowledge, skills, and attitudes toward learning materials (Anidar, 2017; Ilma *et al*., 2025). Mathematics learning requires an approach that is both theoretical and contextual. This is due to the abstract, symbolic, and hierarchical nature of mathematics, which better supports students' understanding when accompanied by real media and contexts (Sarnoko *et al*., 2024). Mathematics requires not only numeracy skills but also logical thinking, problem-solving, and reasoning (Iswanda, 2025). Therefore, the mathematics learning process should be designed in a meaningful way so that students can relate the material they learn to their daily lives. Furthermore, the success of mathematics learning is greatly influenced by the methods, media, and strategies used by teachers. When students are presented with abstract concepts without supporting media, they are likely to have difficulty understanding basic concepts, such as multiplication and division (Nurhaswinda & Parisu, 2025). Therefore, an approach that combines concrete and contextual elements is highly recommended, so that students do not merely memorize algorithms but also understand the meaning behind the procedures (Mailani *et al*., 2025).

Students' Difficulties in Multiplication and Division Operations

Arithmetic operations, especially multiplication and division, often pose a major challenge for elementary school students. These difficulties can be caused by various factors, such as poor understanding of number concepts, errors in using algorithms, and limitations in applying efficient calculation strategies. Most students rely solely on memorization without truly understanding the meaning of these mathematical operations (Mailani *et al*., 2025; Nugroho *et al*., 2023; Nurhikmah *et al*., 2025). This makes it difficult for

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students to answer questions that assess their understanding, such as story problems that require applying multiplication or division in real-life contexts. This indicates that students' conceptual understanding remains limited, and the learning approach employed does not yet effectively bridge from the abstract to the concrete. Common mistakes made by students include misinterpreting the meaning of operations, placing numbers incorrectly, and mismatching strategies and questions (Febria & Rofiqi, 2025; Hidayatullah & Zainil, 2025; Lestari *et al*., 2025). Student motivation and engagement also play an important role in the learning process (Hadiapurwa *et al*., 2021; Haque *et al*., 2024). Learning that is too monotonous, without interesting media or activities, makes students less enthusiastic and tends to be passive in the learning process. This exacerbates the lack of conceptual understanding because students lack sufficient space for exploration that would help them develop their own understanding (Kanda & Rustini, 2024).

Realistic Mathematics Education (RME) as a Contextual Approach

Realistic Mathematics Education (RME) is a learning approach that emphasizes the importance of relating mathematics to the real world and to learners' experiences. In this approach, learners are encouraged to rediscover mathematical concepts through exploration and problem-solving based on familiar situations (Rahayu *et al*., 2025). RME does not make teachers the sole source of information; rather, it positions them as facilitators who guide students in building their own mathematical understanding. RME has three main principles, namely: 1) guided reinvention and progressive mathematization, which encourage students to rediscover mathematical ideas gradually; 2) didactical phenomenology, which involves selecting relevant real-world phenomena as a learning context; and 3) self-developed models, which involve the use of visual or concrete models developed by the students themselves as a bridge to abstract concepts (Nurlatifah *et al*., 2025). This approach is well-suited to teaching multiplication and division because it provides a more meaningful learning experience that is closely related to students' daily lives. By using contexts familiar to students, such as dividing candy into bags or counting the number of glasses in a row, students can understand division as a process of grouping or measuring, rather than merely a mechanical formula (Pratiwi *et al*., 2019).

The Effectiveness of Concrete Media Such as Straws and Plastic Cups in Mathematics Learning

Concrete media, such as straws and plastic cups, can be effective tools for mathematics learning, particularly for explaining the concepts of multiplication and division. The use of these media allows students to see, manipulate, and imagine abstract concepts more concretely. For example, in multiplication, straws can be used to form groups of equal numbers, helping students visually understand the basic concept of repeated addition (Daulay, 2024; Nisa, 2023). In terms of division, cups enable the concrete simulation of the process of distribution or grouping. Dividing straws into cups helps students understand division as the equal distribution of items or as the measurement of the number of groups. Learning experiences like this not only reinforce concepts but also help develop social skills such as cooperation, communication, and group discussion (Daulay, 2024). Empirical studies show that students who learn using concrete media tend to have higher learning outcomes than students who learn without media. This is due to increased student engagement in the learning process and to multisensory experiences that strengthen long-term memory (Daulay, 2024; Nisa, 2023). In addition, the use of concrete media can increase students' interest and motivation to learn, as the learning process becomes more interactive and enjoyable (Winanda *et al*., 2024).

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METHODS

The study employed a quantitative quasi-experimental design comparing two classes: the experimental class (III-B), which received treatment with glass-straw learning media, and the control class (III-A), which used conventional learning methods. The research design employed a Posttest-Only Control Group Design, in which learning outcomes were measured only after the treatment was administered. This research was conducted at SDN Susukan 04 Pagi, East Jakarta, during the even semester of the 2024/2025 academic year, specifically from March to May 2025. The research subjects comprised all third-grade students at SDN Susukan 04 Pagi, and the study employed saturated sampling, in which the entire population served as the sample. The total sample comprised 64 students, divided into two classes: 32 in the experimental class and 32 in the control class.

Table 1. Research Design

Group	Treatment	Post-Test
Experimental Class	X	Q_1
Control Class	-	Q_2

Source: Research (2025)

Description:
Q1: Post-test in the experimental class
Q2: Post-test in the control class
X: Treatment given, namely the use of glass straws
-: No treatment given using glass straws

The learning media used in this study were straws designed based on the RME approach. This media aimed to make it easier for students to understand the concepts of multiplication and division of whole numbers through concrete representations, while also increasing students' active participation in the learning process. Data were collected via a post-test comprising 10 essay questions administered to two classes. The test instruments underwent validity and reliability testing. Validity was tested using the product-moment correlation technique, while reliability was tested using the Cronbach's Alpha method. The assessment of student learning outcomes was based on a scoring rubric with a range of 1 to 5, considering the accuracy of the answers and the quality of the students' reasoning.

Data analysis began with prerequisite tests, namely normality tests using the Shapiro-Wilk method and homogeneity tests using Levene's Test. If both requirements were met, a t-test was conducted to determine the difference in learning outcomes between the experimental class and the control class. In addition, an effect size calculation is performed to measure the extent of the influence of using glass straws in learning. The interpretation of the effect size is divided into three levels: low ($ES < 0.2$), moderate ($0.2 \leq ES < 0.8$), and high ($ES \geq 0.8$). The statistical hypotheses tested in this study included H0 (there is no effect of the use of glass straw media on student learning outcomes) and H1 (there is a positive effect of the use of glass straw media on the mathematics learning outcomes of third-grade students at SDN Susukan 04 Pagi).

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RESULTS AND DISCUSSION

Results

Straws and cups are used as teaching aids in the process of learning mathematical operations. These media were chosen because they can represent abstract concepts in a concrete form that is easy for students to understand. The use of straws and cups in the learning process is designed to facilitate students' understanding of multiplication as repeated addition and division as repeated subtraction. The following documents learning activities using this medium.

Figure 1. Multiplication and division using drinking straws
Source: Research (2025)

Figure 1 shows learning activities involving straws. First, straws are used to explain the concept of multiplication through the problem 3 × 2. There are three glasses, each containing two straws, so that students can see that 3 × 2 means 2 + 2 + 2, which equals 6. This representation helps students understand that multiplication is a form of repeated addition. Next, the same medium is used to explain the concept of division, illustrated by the example 12 ÷ 4. Twelve straws are grouped into four straws per group. This grouping process yields three groups, enabling students to conclude that 12 ÷ 4 = 3. Through this concrete approach, students learn that division can be understood as the process of dividing evenly into groups until no remainder remains.

Instrument Validity and Reliability Test

The instruments used in this study comprised 10 questions designed to measure mathematics learning outcomes. All questions had been tested for validity through product-moment correlation analysis. Based on the calculation results, the following r-count values were obtained: question number 1 was 0.804, question number 2 was 0.784, question number 3 was 0.841, question number 4 was 0.869, question number 5 was 0.872, question number 6 was 0.843, question number 7 was 0.802, question number 8 was 0.875, question number 9 was 0.801, and question number 10 was 0.872. With a table r at a significance level of 5% of 0.367 and a total of 31 students participating in the pilot test, all questions were declared valid because the calculated r was greater than the table r. **Table 2** shows the validity test for the questions.

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Table 2. Validity Test of 10 Questions

Variable	Statement	r - Calculate	r - Table 5%	Description
10 Questions	X1	0,804	0,367	Valid
	X2	0,784	0,367	Valid
	X3	0,841	0,367	Valid
	X4	0,869	0,367	Valid
	X5	0,872	0,367	Valid
	X6	0,843	0,367	Valid
	X7	0,802	0,367	Valid
	X8	0,875	0,367	Valid
	X9	0,801	0,367	Valid
	X10	0,872	0,367	Valid

Source: Research 2025

In addition to validity testing, reliability was assessed for the learning outcome and satisfaction measurement instruments using Cronbach's alpha. The test results showed that the learning outcome instrument had a reliability coefficient of 0.951, while the satisfaction instrument showed a reliability coefficient of 0.942. Both values exceeded the minimum threshold of 0.60, indicating that the instruments used in this study were reliable and suitable for measuring the variables in question.

Post-Test Results Description

This section presents the results of the Post-Test conducted for both groups: the experimental class that used RME-based straw and cup media and the control class that used conventional methods. The Post-Test data were analyzed descriptively to determine the distribution of scores and learning trends in each group.

Table 3. Description of Post-Test Results Data

	Experimental Class Learning Outcomes	Control Class Learning Outcomes
N	32	32
Mean	86,875	78,063
Median	86	80
Modus	86	80
Std. Deviation	7,820	9,165
Minimum	62	54
Maximum	100	92

Source: Research 2025

As shown in Table 3, the number of students in each class, both experimental and control, was 32. The average learning score of students in the experimental class was 86.875, while in the control class it was 78.063. This shows that the average score in the experimental class was higher than in the control class. The median score, representing the midpoint of the distribution, was 86 for the experimental class and 80

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for the control class. The mode, which is the most frequently occurring score, was also 86 in the experimental class and 80 in the control class. This indicates a consistent dominant value trend with the median score in each group.

In terms of data distribution, the standard deviation of the experimental class was 7.820, while the control class had a standard deviation of 9.165. This indicates that the distribution of scores in the experimental class was more even and less varied than in the control class. In the experimental class, the minimum score is 62, and the maximum is 100; in the control class, the minimum score is 54, and the maximum is 92. This range of scores indicates that students in the experimental class tend to have higher scores and a more even distribution than those in the control class.

Normality and Homogeneity Tests

This section presents the results of data analysis from the Post-Test administered after the treatment was applied to each group. The experimental group learned using straws and cups based on the RME approach, whereas the control group received conventional instruction without these media. Before further analysis, statistical assumptions, namely normality and homogeneity of data, were tested to ensure that the data met the requirements for parametric analysis. The normality test was conducted to determine whether the Post-Test data from both groups were normally distributed. Meanwhile, the homogeneity test was used to assess whether the variances of the two groups were equal.

Table 4. Normality Test

No	Group	A	N	$L_{Calculate}$	p-value (sig.)	Description
1.	Experimental Class	0,05	32	0,939	0,069	Normally Distributed
2.	Control Class	0,05	32	0,944	0,096	Normally Distributed

Source: Research 2025

Table 4 shows the results of normality testing using the Shapiro–Wilk method. The calculated L value for the experimental class was 0.939 with p = 0.069, and for the control class, it was 0.944 with p = 0.096. Since both p-values are greater than 0.05, it can be concluded that the data distribution in both groups does not deviate from the normal distribution (p > 0.05). Thus, the normality assumption is satisfied for further parametric analysis.

Table 5. Homogeneity Test

No	Group	N	$F_{Calculate}$	F_{Table}	p-value (sig.)	Description
1.	Experimental Class	32	0,809	3,98	0,372	Homogeneous population
2.	Control Class					

Source: Research 2025

Table 5 presents the results of the homogeneity test using Levene's Test. The calculated *F value* is 0.809, with *p* = 0.372 (greater than 0.05), indicating that there is no significant difference in variance between the experimental group and the control group. Therefore, it can be concluded that the variance of the data from both groups is homogeneous (p > 0.05), thus fulfilling the requirements for further parametric testing.

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Hypothesis Testing and Effect Size

This section presents the results of hypothesis testing to determine whether RME-based glass straw media have a significant effect on students' mathematics learning outcomes in multiplication and division. To reinforce the findings, effect-size calculations were also performed to quantify the magnitude of the treatment effect.

Before discussing the statistical test results, the following are the hypotheses used in this study:

H_0 : There was no positive effect of applying Realistic Mathematics Education (RME)-based strategies on mathematics learning outcomes in multiplication and division in grade III at SDN Susukan 04 Pagi.

H_1 : There is a positive effect of applying Realistic Mathematics Education (RME)-based strategies on learning outcomes in mathematics, specifically multiplication and division, in grade III at SDN Susukan 04 Pagi.

To test this hypothesis, a t-test was conducted on mathematics learning outcomes for the experimental and control groups. The test results are presented in **Table 6** below.

Table 6. Hypothesis Testing

No	Group	N	Dk	$T_{calculate}$	t_{table}	p-value (sig.)	Description
1.	Experimental Class	32	62	4,138	2,000	0.000	There is an influence
2.	Control Class						

Source: Research (2025)

Table 6 shows that the t-test yielded a t-value of 4.138 (df = 62) with a significance level **(p = 0.000)**. Because the **t-value > t-table** (4.138 > 2.000) and **p < 0.05**, **H_0 is rejected** and **H_1 is accepted**. This indicates a significant difference between the experimental and control groups in mathematics learning outcomes for multiplication and division. Thus, the use of RME-based glass straw media has a positive effect on student learning outcomes. To determine the strength or magnitude of this effect, an effect size calculation was performed, as presented in **Table 7** below.

Table 7. Effect Size Test

No	Group	*Cohen's d*
1.	Experimental Class	1,04
2.	Control Class	

Source: Research (2025)

Table 7 presents Cohen's d value of 1.04 for the experimental group. This value falls into the large effect size category, based on Cohen's interpretation that d ≥ 0.80 indicates a large effect. Thus, in addition to being statistically significant, the use of RME-based glass straw media has a substantial practical impact on student learning outcomes.

Discussion

The findings of this study indicate that the use of learning media in the form of glass straws, based on the RME approach, significantly improves third-grade students' mathematics learning outcomes, particularly

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in multiplication and division. The post-test scores of students in the experimental class were consistently higher than those in the control class. The average score for the experimental class was 86.875, while the control class only scored 78.063. This difference was not coincidental, as supported by a t-test with a t-value of 4.138 and a p-value of 0.000, indicating statistical significance.

Learning multiplication and division in mathematics provides new experiences in the learning process. Theoretically, this finding is in line with the concept of learning as an active process that involves cognitive transformation of students through experience and reflection (Anidar, 2017; Ilma *et al*., 2025). In the context of abstract and symbolic mathematics learning, active student engagement with concrete materials, such as straws, facilitates deeper conceptual understanding (Sarnoko *et al*., 2024; Wathoni, 2024). RME, as a contextual approach, emphasizes the importance of using real experiences to facilitate understanding of mathematical concepts (Rahayu *et al*., 2025; Safari & Syafawani, 2025). In this study, the use of straws and cups allowed students to visualize multiplication as repeated addition and division as a process of distributing numbers evenly. This aligns with the principle of self-developed models in RME, in which concrete models serve as a bridge to abstract understanding (Nurlatifah *et al*., 2025).

The effect size of 1.04 in this study indicates that the concrete media-based approach is not only statistically significant but also has a substantial impact on educational practice. This finding reinforces previous studies showing that concrete media, such as multiplication boards and Balinese congklak, can significantly improve student learning outcomes (Wahyuni, 2022; Sholihah *et al*., 2024). In addition, integrating concrete media into mathematics instruction can gradually improve learning outcomes (Suwarningsih, 2021). This reinforces the argument that concrete learning media enhance the learning process of elementary school students, particularly in challenging subjects such as multiplication and division (Mailani *et al*., 2025; Nugroho *et al*., 2023).

From a learning psychology perspective, the use of concrete media, such as straws and glasses, supports a multisensory approach that engages learners' visual, auditory, and kinesthetic modalities. Activities such as touching, grouping, and moving concrete objects not only strengthen long-term memory but also foster self-confidence through active exploration (Hermawan & Dewi, 2024; Kanda & Rustini, 2024). This is important, given that most students have difficulty understanding the concepts of multiplication and division when taught symbolically (Febria & Rofiqi, 2025; Hidayatullah & Zainil, 2025). From a pedagogical perspective, the use of concrete media provides teachers with the flexibility to organize learning in ways that suit students' abilities and characteristics. Teachers can adjust the number of straws, the question context, and the presentation format to accommodate diverse learning needs. This approach also supports differentiated learning and stimulates social interaction among students in work groups, thereby strengthening the affective and psychomotor dimensions of learning (Winanda *et al*., 2024).

Overall, the findings of this study confirm that integrating the RME approach with concrete media, such as straws, not only significantly improves students' understanding of mathematical concepts but also strengthens their motivational, social, and emotional aspects. Therefore, elementary school mathematics teachers are advised to develop a range of RME-based concrete media tailored to local contexts and students' needs to create effective, meaningful, and enjoyable learning experiences. The implications of this study suggest that learning approaches utilizing RME-based concrete media can be integrated into routine learning practices in elementary schools, particularly in delivering abstract mathematical concepts such as multiplication and division.

Concrete media, such as straws, not only serve as visual and manipulative aids but also as a means of connecting mathematical concepts to realities close to students' daily lives. Thus, the learning process is not only procedural, but also meaningful and constructive. Furthermore, the results of this study make an important contribution to the development of a more exploratory, contextual, and learner-centered learning model. Learning activities designed through the RME approach encourage learners to think critically, solve problems, and build understanding gradually through direct experience. This approach aligns with 21st-

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century learning principles that emphasize higher-order thinking skills, active student engagement, and the integration of academic concepts and the real world (Baroya, 2018; Zubaidah, 2016). RME is an innovative approach that supports students' cognitive and affective learning outcomes and provides a basis for the development of mathematics education practices (Abdurohim *et al*., 2025).

CONCLUSION

The Realistic Mathematics Education (RME) approach using drinking straws has been shown to improve the mathematics learning outcomes of third-grade students in multiplication and division at SDN Susukan 04 Pagi. The validity and reliability analyses indicated that the research instruments were of high quality and reliable for measuring learning outcomes. The normality and homogeneity tests showed that the data were normally distributed and had homogeneous variance, thus meeting the requirements for parametric analysis. The t-test showed a significant difference between the experimental and control groups, with the straws group achieving higher learning outcomes than the control group. This is supported by the effect-size calculation, which quantifies the magnitude of the association between media use and learning outcomes. Thus, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted, which means that there is a positive effect of using RME-based glass straw media on mathematics learning outcomes. These findings are in line with the literature stating that the RME approach encourages students to build their understanding of mathematics through real-world contexts and concrete media, thereby increasing participation, conceptual understanding, and learning outcomes. This study also reinforces previous findings that concrete learning media can bridge students' understanding of abstract concepts in basic mathematics. However, this study has several limitations. First, the scope of the study was limited to one elementary school with a limited sample size, so the results need to be generalized with caution. Second, the effectiveness of learning media was only measured in the context of multiplication and division, so its impact on other mathematics subjects is unknown. Third, other variables that also influence student learning outcomes, such as learning styles, family background, and learning environment support, have not been analyzed in depth. Therefore, further research is recommended to explore the use of RME-based concrete media in a broader and more diverse context, as well as with a more comprehensive mixed methods approach.

AUTHOR'S NOTE

The author declares that there is no conflict of interest related to the publication of this article. The author also affirms that all data, analysis, and content in this article are original and free from plagiarism.

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