

The Effect of Number Pocket Media on Students' Learning Interest and Conceptual Understanding of Multiplication in Third-Grade Elementary School

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ABSTRACT

Mathematics is a fundamental subject in elementary school that plays an important role in developing students' logical, systematic, and critical thinking skills. However, many lower-grade students still experience difficulties in understanding multiplication concepts because learning activities tend to focus on memorizing multiplication tables. This condition leads to low learning interest and weak conceptual understanding. This study aims to analyze the effect of number pocket media on improving learning interest and conceptual understanding of multiplication among third-grade students. The research employed a quantitative method with a pre-experimental one-group pretest-posttest design. The subjects consisted of 27 third-grade students of SD Taruna Mandiri. Research instruments included an achievement test to measure conceptual understanding and a Likert-scale questionnaire to assess students' learning interest. Data were analyzed using descriptive statistics and the Wilcoxon Signed Rank Test. The results showed that the average score increased from 48.89 in the pretest to 67.41 in the posttest, with mastery learning percentages rising from 37.04% to 70.37%. The Wilcoxon test yielded a significance value of $0.000 < 0.05$, indicating a significant difference. In addition, the learning interest questionnaire scores increased from 2.61 to 3.67 after the implementation of the learning media. Therefore, number pocket media are proven to be effective in improving students' learning interest and conceptual understanding of multiplication. Teachers are encouraged to use this simple concrete media as an innovative instructional strategy to make mathematics learning more interactive and enjoyable.

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INTRODUCTION

Elementary education is a crucial initial phase in building the foundation of students' intelligence and character. According to Tilaar (2012), elementary education serves as the starting point for developing fundamental competencies that will influence the quality of learning at higher educational levels. At this stage, learning is not only directed toward the development of cognitive abilities but also toward fostering students' learning interest, motivation, and social skills. Mathematics is one of the core subjects that plays a vital role, as it is closely related to the development of logical, systematic, and critical thinking skills (Suherman, *et al.*, 2017). Mastery of mathematical concepts at

the elementary school level significantly affects students' ability to understand more complex material in secondary education (Kilpatrick, [2002](#)).

However, realities in the field indicate that mathematics is still frequently perceived as a difficult and intimidating subject. The results of the Programme for International Student Assessment (PISA) 2018 placed Indonesia at a relatively low level in mathematical literacy, partly due to students' high levels of anxiety when facing mathematical problems (OECD, [2019](#)). Similar conditions were observed at SD Taruna Mandiri Bekasi, the site of this study, where teachers reported that most third-grade elementary school students experienced difficulties in understanding multiplication and tended to be passive during classroom activities. This situation creates psychological barriers, including anxiety, pressure, and low learning motivation.

Multiplication is one of the fundamental topics in elementary school mathematics. This skill is not only essential for basic arithmetic but also forms the foundation for understanding higher-level mathematical concepts such as division, fractions, and algebra (Anggraeni et al., [2025](#)). Unfortunately, learning practices in many elementary schools are still dominated by conventional approaches that emphasize memorization of multiplication tables (García-Orza et al., [2021](#); Safitri et al., [2025](#)). Such practices encourage students to memorize procedures mechanically without understanding multiplication as repeated addition. Consequently, many third-grade elementary school students demonstrate low learning achievement and fail to meet the Minimum Mastery Criteria (MMC).

In addition to low conceptual understanding, students' interest in learning mathematics at the elementary school level also tends to be weak. Slameto ([2015](#)) explains that learning interest is a strong internal drive that significantly influences learning success, as students are more engaged in activities they find enjoyable. External factors, such as instructional methods and learning media used by teachers, also play an important role in shaping students' learning interest (Hadis & Nurhayati, [2014](#)). Research conducted by Mauliana et al. ([2025](#)) confirms that variations in learning media usage can increase students' interest in mathematics learning.

Numerous studies support the effectiveness of concrete learning media in elementary mathematics instruction. Concrete media significantly improves students' ability to understand abstract mathematical concepts by providing multisensory, hands-on experiences that bridge tangible objects and symbolic reasoning (Az-Zahra et. al., [2025](#)). Hendriani ([2021](#)) found that learning through the manipulation of real objects significantly increases students' motivation and engagement. Piaget's cognitive development theory further emphasizes that children aged 7–11 years are in the concrete

operational stage, making them more capable of understanding mathematical concepts when presented through direct and hands-on experiences.

In the context of multiplication learning, one concrete instructional medium that can be utilized is number pocket media. This medium is simple yet strategic, as it enables students to understand multiplication as repeated addition by placing objects into pockets according to the numbers being multiplied. Nurhaswinda et al. (2026) found that students using concrete media demonstrated significantly better conceptual understanding than those using conventional teaching methods. This finding aligns with Guthrie et al. (2012), who emphasized that learning interest emerging from positive learning experiences tends to be more enduring than interest driven by external demands.

Preliminary observations at SD Taruna Mandiri further highlight the urgency of implementing innovative learning media in elementary school mathematics classrooms. Most third-grade students had not achieved the MMC in multiplication topics. Teachers primarily relied on lectures and textbook-based exercises with limited media variation, resulting in student boredom and decreased motivation. These conditions indicate the need for concrete instructional media such as number pocket media to make learning more interactive, enjoyable, and meaningful.

From a theoretical perspective, this study contributes to the literature on the effectiveness of manipulative media in elementary mathematics education, particularly in terms of learning interest and conceptual understanding. Practically, the findings may serve as a reference for elementary school teachers to be more creative in selecting instructional media that align with students' characteristics. Unlike previous studies that primarily focused on learning outcomes, this study simultaneously examines the effect of number pocket media on two aspects: learning interest and conceptual understanding of multiplication. This dual focus represents the novelty (state of the art) of the present study.

The urgency of this research is also related to national educational challenges. The education system is expected to produce graduates who are not only cognitively competent but also possess strong learning motivation to compete in the global era (Hosnan, 2014). Therefore, instructional innovation through number pocket media offers a simple yet effective solution to address fundamental problems in elementary school mathematics learning.

Based on the discussion above, this study aims to analyze the effect of using number pocket media on improving learning interest and conceptual understanding of multiplication among third-grade elementary school students. This research is expected to provide a meaningful contribution to improving mathematics learning practices by enhancing both students' learning outcomes and their interest in a subject that has long been perceived as challenging.

METHOD

This study employed a quantitative approach using a pre-experimental design, specifically the one-group pretest–posttest design. The purpose of this design was to examine the effect of using number pocket media on learning interest and conceptual understanding of multiplication among third-grade elementary school students. The research participants consisted of 27 third-grade students from SD Taruna Mandiri. The sample was selected based on both practical and academic considerations, including the availability of a homogeneous class in terms of grade level and curriculum, as well as the researcher's accessibility in implementing the instructional treatment. Although the use of a single class may limit the generalizability of the findings due to the lack of variation in student characteristics and school context, this approach remains appropriate for a preliminary study focusing on the effectiveness of instructional media in lower elementary grades.

The research procedure was conducted in three main stages. First, students were administered a pretest to measure their initial understanding of multiplication concepts, along with a learning interest questionnaire to capture their motivational condition prior to the intervention. Second, the instructional treatment was implemented through mathematics learning activities using number pocket media. This media was designed to help students understand multiplication as repeated addition through hands-on and manipulative activities. Third, students were given a posttest and the learning interest questionnaire again to identify significant changes in both learning outcomes and learning interest after the intervention.

The research instruments consisted of an achievement test in the form of multiple-choice questions and a learning interest questionnaire using a five-point Likert scale. The validity of the test items was examined using Pearson product–moment correlation, while the reliability of the instruments was calculated using Cronbach's Alpha. The learning interest questionnaire included indicators of enjoyment, interest, attention, and student engagement in mathematics learning. In addition, observation sheets were used to record students' activities and engagement during the learning process. The observation sheets were developed based on indicators of active learning behavior, student interaction, and responses to the use of instructional media. To ensure reliability, observations were conducted by two observers using the same observation guidelines, allowing the data to be compared and consistency to be examined.

The collected data were analyzed using both descriptive and inferential statistics. Descriptive analysis was employed to calculate means, percentages, and score distributions. Data normality was tested using the Shapiro–Wilk test to determine whether the data followed a normal distribution. Since some data were not normally distributed,

hypothesis testing was conducted using the Wilcoxon Signed Rank Test. The analysis focused on comparing pretest and posttest scores as well as changes in questionnaire scores before and after the intervention.

Through this procedure, the study sought to obtain a clear description of the effectiveness of number pocket media in improving learning interest and conceptual understanding of multiplication among third-grade elementary school students. Although this design did not involve a control group, the findings provide initial empirical evidence that may serve as a reference for elementary school teachers in developing instructional strategies based on concrete media that align with students' cognitive developmental characteristics.

RESULTS AND DISCUSSION

This study was conducted to examine the effectiveness of number pocket media in improving learning interest and conceptual understanding of multiplication among third-grade elementary school students. The research data were obtained through achievement tests administered twice (pretest and posttest) and a learning interest questionnaire distributed before and after the intervention. Data analysis was carried out using both descriptive and inferential statistics to identify differences in students' achievement and to test the research hypotheses.

At the initial stage, the pretest results showed that the students' average score was 48.89, with a relatively low score distribution and most students performing below the Minimum Mastery Criteria (MMC). This result indicates that the majority of students had not yet developed a strong understanding of multiplication concepts. The main difficulties identified included students' confusion in interpreting multiplication as repeated addition, errors in solving word problems, and weaknesses in recognizing numerical patterns. These findings are consistent with the initial classroom observations, which revealed that multiplication instruction tended to rely heavily on memorization of multiplication tables without adequate conceptual reinforcement. In practice, teachers primarily wrote multiplication tables on the board and asked students to recite them collectively, followed by routine textbook exercises that emphasized mechanical practice. Students were required to memorize multiplication results without being given opportunities to understand the meaning of the operation through concrete objects or real-life experiences. This monotonous learning process caused students to become easily bored, feel pressured when unable to memorize correctly, and remain passive during learning activities. Such experiences contribute to the perception that mathematics is a difficult and intimidating subject, as learning emphasizes memorization rather than meaningful understanding.

After the implementation of learning activities using number pocket media, the posttest results showed a significant improvement. The students' average score increased to 67.41, representing an increase of nearly 19 points compared to the pretest mean. The Wilcoxon Signed Rank Test produced a significance value of $0.000 < 0.05$, indicating a statistically significant difference between pretest and posttest scores. This finding demonstrates that the use of number pocket media effectively improved students' understanding of multiplication concepts. The improvement can be explained by the role of number pocket media in helping students visualize the multiplication process concretely. Through activities involving placing objects into pockets according to the numbers being multiplied, students were able to directly observe the meaning of multiplication as repeated addition. This manipulative process facilitated students' understanding of previously abstract concepts, in line with Piaget's theory, which emphasizes that elementary school children are in the concrete operational stage and therefore learn more effectively through interaction with tangible objects rather than abstract explanations alone.

Table 1 presents the comparison of students' pretest and posttest scores. The table shows an improvement not only in average scores but also in the number of students achieving mastery. Before the intervention, only about one-third of the students met the mastery standard, whereas after learning with number pocket media, more than two-thirds of the students successfully exceeded the MMC. Although not all students reached the mastery level, this improvement indicates a positive impact of using concrete instructional media on students' learning outcomes.

Table 1. Comparison of Pretest and Posttest Scores

Test Type	Mean Score	Mastery (%)
Pretest	48,89	37,04
Posttest	67,41	70,37

In addition to learning achievement, the analysis of the learning interest questionnaire also revealed significant changes. Prior to the implementation of number pocket media, many students demonstrated low scores on learning interest indicators such as enjoyment, attention, and engagement. However, after the intervention, all indicators showed improvement.

Table 2. Comparison of Learning Interest Questionnaire Scores Before and After Treatment

Learning Indicators	Average Before	Average After	Change Category
Feelings of Enjoyment	2,71	3,68	Increased
Interest	2,63	3,74	Increased
Attention	2,52	3,56	Increased
Involvement	2,59	3,71	Increased
Total Average	2,61	3,67	Increased

As shown in Table 2, the average learning interest score increased from 2.61 to 3.67, representing an increase of more than one point. This change indicates a consistent improvement across all learning interest indicators. Thus, the use of number pocket media not only enhanced students' learning outcomes but also motivated them to become more actively involved in mathematics learning.

Furthermore, the Shapiro–Wilk normality test showed that the pretest data were normally distributed, while the posttest data were not. Therefore, hypothesis testing was conducted using the Wilcoxon Signed Rank Test. The results presented in Table 3 show that the significance values for both variables were less than 0.05. This indicates significant differences between the conditions before and after the intervention in terms of both conceptual understanding of multiplication and learning interest. In other words, the research hypothesis stating that number pocket media have an effect on improving these two aspects is accepted.

Table 3. Results of the Wilcoxon Signed Rank Test

Test Variable	Z Value	Sig. (2-tailed)
Pretest – Posttest Hasil Belajar	-4,623	0,000
Pretest – Posttest Minat Belajar	-4,512	0,000

These findings support the view of Hadis & Nurhayati (2014), who argued that learning interest is influenced by both internal and external factors, including instructional methods and media. The use of number pocket media successfully created a more enjoyable learning environment, thereby reducing students' anxiety toward mathematics. This result is consistent with the study by Mardiana (2023), which found that concrete media increase students' interest in mathematics, as well as the findings of Guthrie et al. (2012), who emphasized that positive learning experiences play a crucial role in fostering long-term learning interest.

From a learning theory perspective, the improvement in both learning interest and conceptual understanding achieved through the use of number pocket media can be explained by constructivist theory. This theory emphasizes that knowledge is actively constructed by learners through direct experiences rather than passively transmitted by teachers. In learning activities using number pocket media, students actively manipulated objects, grouped items, and connected the quantities in each pocket with multiplication results. This process enabled students to construct meaning through direct interaction with concrete objects instead of merely receiving abstract explanations.

In addition, the findings of this study are relevant to motivation theory. Increased learning interest resulting from the use of concrete media provides intrinsic motivation for students to engage more actively in learning. When students perceive mathematics

learning as enjoyable rather than intimidating, they become more confident in attempting to solve multiplication problems. This was reflected in the increased level of student engagement observed during the learning process. Teachers, acting as facilitators, were able to create a supportive learning environment through the use of number pocket media, encouraging students to participate actively.

Improved conceptual understanding of multiplication was also evident in changes in students' problem-solving approaches. During the pretest, many students misinterpreted multiplication word problems. For example, when given the problem "3 bags containing 5 marbles each," some students simply added $3 + 5 = 8$. After the intervention, however, students were better able to connect concrete representations with the appropriate mathematical operation, correctly interpreting the situation as $3 \times 5 = 15$. This shift in thinking demonstrates that number pocket media helped students transition from concrete representations to symbolic understanding.

The findings of this study are consistent with international research emphasizing the importance of manipulative media in mathematics learning. Kilpatrick (2002) stated that conceptual understanding is essential for enabling students not only to memorize procedures but also to think flexibly in problem solving. With the support of concrete media such as number pocket media, students were able to understand why multiplication rules work rather than merely remembering the results. Thus, this media contributes to the development of deeper conceptual understanding.

Despite the significant improvements observed, several limitations should be noted. First, the study employed a pre-experimental design with a single group, meaning that no control group was used for comparison. This limitation prevents the study from fully isolating the effect of the intervention from other influencing factors. Second, the relatively small sample size and the inclusion of students from only one school limit the generalizability of the findings to broader contexts. Nevertheless, the results provide strong preliminary empirical evidence of the potential of number pocket media to enhance the quality of mathematics learning.

Practically, the implications of this study suggest that teachers should be more creative in selecting and utilizing instructional media that align with students' characteristics. Simple media such as number pocket media can serve as effective alternatives for reducing boredom in mathematics learning while strengthening students' understanding of abstract concepts. Schools may encourage teachers to integrate concrete media into daily instructional activities so that students become accustomed to interactive learning experiences. For future researchers, this study may serve as a foundation for developing research with stronger experimental designs, larger sample sizes, and broader subject coverage.

In conclusion, the results of this study demonstrate that number pocket media are effective in improving learning interest and conceptual understanding of multiplication among third-grade elementary school students. The increases in average scores, mastery percentages, and learning interest questionnaire scores provide clear evidence of the positive impact of this concrete instructional media. The theoretical discussion and empirical findings show consistency among cognitive development theory, learning interest theory, and classroom instructional practice. Therefore, number pocket media are recommended as an innovative instructional strategy to support successful mathematics learning in elementary schools.

CONCLUSION

The findings of this study indicate that the use of number pocket media has a positive effect on improving learning interest and conceptual understanding of multiplication among third-grade students at SD Taruna Mandiri. The students' average scores increased from 48.89 in the pretest to 67.41 in the posttest, with mastery percentages rising from 37.04% to 70.37%. In addition, the learning interest questionnaire scores improved from 2.61 to 3.67. These results demonstrate that simple concrete instructional media can help students understand multiplication concepts while simultaneously fostering learning motivation.

Teachers are encouraged to use concrete media such as number pocket media in mathematics instruction to help students better understand abstract concepts through direct experiences. Schools may also promote similar instructional innovations in other subjects to enhance overall learning quality. Future researchers are expected to extend this study by involving larger samples and employing stronger experimental designs to produce more generalizable findings.

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