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Implementation of Numeracy Action Board Media With Realistic Mathematic Education *Approach* to the Learning Outcomes of Grade 1 Elementary School Students

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Abstract
The rapid development of society requires the field of education to continuously innovate in line with the evolving characteristics of contemporary students. Education must be implemented in accordance with the context of the times and the specific needs of learners. The low mathematics learning outcomes in addition and subtraction of numbers among Grade 1 A students at Kebonsari 2 State Elementary School in Malang present a challenge for teachers to design creative, contextual, and meaningful learning strategies. One such effort is the use of numeracy action board media integrated with the Realistic Mathematics Education approach, which is a mathematics learning method that connects abstract concepts with real life situations familiar to students' daily experiences, such as stories about shopping at small stalls or sharing cakes with friends. This study employed classroom action research based on the Hopkins model, which consists of two implementation cycles. The research subjects were 28 Grade 1 A students at Kebonsari 2 State Elementary School in Malang. The findings revealed an improvement in the percentage of students achieving mastery learning, from 46.62 percent in the pre cycle to 79 percent in the first cycle, and a further significant increase to 93 percent in the second cycle. These results indicate that the use of numeracy action board media based on the Realistic Mathematics Education approach is effective in enhancing students' mathematics learning outcomes. For future research, it is recommended to include statistical significance testing to strengthen the validity of the quantitative findings.

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Introduction

Education plays a pivotal role in preparing individuals to adapt to the accelerating pace of technological change. In the era of globalization and technological advancement in the twenty first century, the expectations for elementary school graduates extend beyond cognitive mastery, demanding active engagement in the learning process. Learning should be designed to align with twenty first century educational characteristics, offering authentic and meaningful experiences to students (Rosnaeni, 2021). Instructional models applied in elementary schools are therefore expected to foster active participation, shifting the focus from teacher centered to student centered learning. This paradigm shift requires innovative approaches that address the needs of modern learners. Effective learning must integrate strategies that develop not only knowledge but also skills for application in real world contexts. Such approaches encourage creativity, collaboration, and critical thinking in young learners.

In mathematics education, students are often required to grasp abstract concepts such as addition and subtraction operations. Mathematical abstraction is defined as the ability to form new concepts based on prior experiences and foundational knowledge (Nurhasanah et al., 2017). This capability is essential for solving mathematical problems with flexibility and creativity. Consequently, mathematics education in elementary schools should not be limited to enhancing numeracy skills but should also emphasize conceptual understanding and problem solving abilities. One way to achieve this is through the use of learning media that concretize abstract concepts. Learning media encompasses any tool that conveys instructional messages from teachers to students, stimulating their thinking, emotions, and interest in learning (Wasiyah et al., 2023). Appropriate media can transform passive learning into active engagement. Furthermore, it can support differentiated instruction by catering to varied learning styles.

The use of learning media becomes more effective when paired with suitable pedagogical approaches. The Realistic Mathematics Education approach is highly relevant for elementary level mathematics instruction as it uses students' real life experiences as the starting point for conceptual understanding (Laila & Wardhani, 2019). This approach enables students to relate abstract mathematical ideas to familiar situations, enhancing their problem solving skills. Empirical evidence supports this integration, as shown by studies employing Smart Ticket media (Rahma et al., 2022), Flower Number Garden media (Sya'diah et al., 2025), and origami based manipulative media (Amalia et al., 2019). These studies consistently demonstrate that concrete media, when combined with a realistic approach, lead to improved learning outcomes. However, the potential of such combinations remains underexplored in certain mathematical topics. This indicates an opportunity for innovation in instructional design.

Despite the growing body of research, no studies have specifically examined the development and effectiveness of numeracy action board media for teaching addition and subtraction story problems in elementary schools. The novelty of this study lies in combining numeracy action board media with the Realistic Mathematics Education approach to enhance learning outcomes in basic arithmetic. The media is designed as an interactive tool integrating numerical operations, number representation, and contextualized story problems. Story cards are based on familiar daily activities such as buying traditional cakes at the market, sharing food with peers, or simple trading transactions, making learning more meaningful. The inclusion of pictorial sticks as visual aids allows for hands on manipulation of numbers, reinforcing

comprehension. This design aims to bridge the gap between abstract mathematics and concrete experiences. The approach also encourages collaborative learning among students.

This study is grounded in observations and interviews with teachers and students, as well as an analysis of research gaps in mathematics education. Its primary aim is to describe the implementation of numeracy action board media integrated with the Realistic Mathematics Education approach in teaching addition and subtraction story problems to Grade 1 A students at Kebonsari 2 State Elementary School in Malang. A secondary aim is to evaluate the improvement in student learning outcomes following the application of this media. The results are expected to make a significant contribution to the development of interactive and effective learning media. Furthermore, they may serve as a reference for teachers in designing mathematics lessons that are engaging, contextual, and aligned with student needs. This research aspires to promote instructional practices that foster both enjoyment and deep understanding of mathematics. In doing so, it aligns with the broader goal of equipping students with essential twenty first century competencies.

Method

This study employed classroom action research to address the problem of low mathematics learning outcomes among Grade 1 A students at Kebonsari 2 State Elementary School in Malang on the topic of addition and subtraction through the use of numeracy action board media integrated with the Realistic Mathematics Education approach. The research was conducted collaboratively between the researcher and an observer to maintain objectivity in observation and evaluation. The design followed the Hopkins spiral model, which comprises four stages planning, implementation of actions, observation, and reflection carried out over two cycles, each consisting of two meetings, with the results of reflection in each cycle informing improvements for the subsequent cycle. The research subjects consisted of 28 Grade 1 A students, comprising 14 male and 14 female students, during the 2024/2025 academic year. Data were collected using observation sheets, learning outcome evaluation sheets, and photo and video documentation of classroom activities. The observation sheet was used to record students' activeness, participation, and behavior during learning, while the evaluation sheet measured cognitive abilities in solving addition and subtraction story problems. The validity of the evaluation sheet content was established through expert judgment by two lecturers in elementary mathematics education and one Grade 1 elementary school teacher, ensuring alignment between the test items, basic competencies, and learning indicators, whereas reliability was examined through instrument trials in comparable classes prior to the study. Data collection techniques included observation, evaluation, and documentation, with qualitative data analyzed through data reduction, data display, and conclusion drawing, supported by source triangulation to ensure validity. Quantitative data were analyzed descriptively by calculating the percentage of learning mastery using the formula P = (Number of students achieving mastery / Total number of students) × 100 percent, then comparing the results to the minimum mastery criterion of 70. Student learning outcomes were categorized into four levels—very low (<59 percent), low (60–69 percent), medium (70–79 percent), and high (>80 percent)—with the action deemed successful if at least 80 percent of students achieved scores above the minimum mastery criterion. The combined qualitative and quantitative analyses were

then used to assess the effectiveness of the intervention and identify areas for refinement in each cycle.

Results and Discussion

Results

The research began with pre cycle activities in the form of an initial test designed to obtain an accurate overview of the level of mastery of learning outcomes among Grade 1 A students in the topic of addition and subtraction of numbers, particularly in solving contextual story problems prior to the implementation of new learning media and approaches. The pre test results indicated that the percentage of students achieving mastery in mathematics learning was still relatively low, with only 46.42 percent of students meeting the minimum mastery criterion. This finding demonstrates that the majority of students were unable to fully comprehend the context of the given story problems, which adversely affected both their learning outcomes and their problem solving abilities.

Based on the results of the initial analysis, it was concluded that there was a clear need for innovation in the delivery of mathematics instruction to improve both the effectiveness of learning and the achievement of student learning outcomes. One potential solution identified was the application of concrete learning media, specifically the numeracy action board, designed to integrate the Realistic Mathematics Education approach. This integration was expected to facilitate students' ability to connect abstract mathematical concepts with real life situations, thereby improving comprehension and retention.

The classroom action research was conducted in two cycles, with each cycle consisting of two meetings, and each meeting lasting 2 × 35 minutes. The first cycle took place on Tuesday and Wednesday, 18–19 February 2025, involving 28 Grade 1 A students, and covered addition and subtraction operations with numbers up to 20. In this cycle, the teaching and learning process incorporated the Realistic Mathematics Education approach through the application of numeracy action board media. Learning activities began with an introductory session that included a class prayer, attendance check, and short question and answer session related to the material. This was followed by the presentation of a contextual problem requiring students to identify relevant information and formulate solutions collaboratively in groups.

During the core learning activities, the researcher acted as a facilitator, guiding students in the process of critical and collaborative thinking and encouraging them to relate mathematical concepts to real life situations. The numeracy action board served as a visual and interactive tool to support the concrete understanding of concepts. Students manipulated pictorial and numerical elements on the board to solve problems, thereby reinforcing their comprehension through hands on engagement. Before concluding the session, a formative assessment was administered to measure the level of mastery achieved by the students in relation to the learning objectives.

The formative assessment results from the first cycle showed an improvement in the percentage of students achieving mastery compared with the pre cycle stage. This indicated that the integration of numeracy action board media with the Realistic Mathematics Education approach had begun to yield positive effects on student learning outcomes. The findings from this cycle served as the basis for reflection, informing adjustments to teaching strategies and

the refinement of media usage in the second cycle to further enhance student engagement and performance.

Table 1. Student Learning Outcomes Cycle I

Category	Learning outcomes of the 1st meeting	Learning outcomes of the 2nd meeting
Number of students	28	28
MOH	70	70
Highest Score	85	95
Lowest Score	30	45
Average score	69,28	73,35
Number of students completed	18	22
Number of students who have not completed	10	6
Completion percentage	64%	79%
Information	Low	Keep

The results of the formative assessment in the first cycle showed that 64 percent of Grade 1 A students achieved the minimum mastery criterion in the first meeting, while 79 percent achieved mastery in the second meeting. These results indicate a marked improvement in students' understanding of addition and subtraction up to the number 20 when compared with the pre cycle stage, which had a considerably lower percentage of mastery. This improvement demonstrates that the integration of the Realistic Mathematics Education approach with the numeracy action board learning media was effective in enhancing students' comprehension of the material.

Observational data further support these findings, showing that students were more actively engaged in the learning process. Their enthusiasm was particularly evident during activities involving the numeracy action board, as well as in group discussions where they collaborated to solve contextual problems. For instance, one student, referred to here by the pseudonym "Student KES," displayed consistent enthusiasm throughout all stages of the learning process, contributing to a more lively and enjoyable classroom atmosphere.

Nevertheless, documentation analysis revealed that a small proportion of students who had not yet achieved mastery in this cycle exhibited relatively passive behavior. These students tended to listen without actively interacting with the teacher or peers, showed limited focus, and were easily distracted by other activities. This passivity appeared to be linked to difficulties in comprehending the contextual nature of the problems presented.

Overall, the first cycle results suggest that the applied learning strategy not only improved cognitive outcomes but also fostered a generally high level of interest and motivation among students. Based on these findings, the learning activities were refined and developed further for implementation in the second cycle, with the aim of maximizing learning outcomes and ensuring that all students could meet or exceed the mastery criterion.

In the implementation of the second cycle, several improvements were introduced based on the reflections from the first cycle. These improvements included the use of more varied and

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interactive learning media, the revision of addition and subtraction story problems to make them more contextual and engaging, and the provision of clearer and simpler instructions to students. These adjustments aimed to address the obstacles encountered in the first cycle and to enhance the overall effectiveness of the learning process. The second cycle was carried out over two meetings on Monday and Tuesday, 24–25 February 2025, with the focus remaining on addition and subtraction up to the number 20, but supported by refined teaching strategies.

Figure 1. Cycle I Learning Activities

Learning activities continued to employ the Realistic Mathematics Education approach integrated with the numeracy action board media, which had been further developed to be visually more attractive. Additionally, the quantity of numeracy action boards was increased so that their use shifted from a whole class format to small group settings, enabling more hands on engagement for each student. During the introductory stage, the teacher facilitated opening activities consisting of a collective prayer, attendance checking, and light question and answer exchanges to stimulate prior knowledge.

In the main learning phase, students were presented with newly designed contextual problems that were more closely related to their daily experiences. These problems were intended to prompt students to identify key information, determine appropriate solution strategies, and collaborate effectively within small groups. Throughout this process, the teacher acted as a facilitator, providing targeted guidance to promote critical and logical thinking, ensuring that students could connect mathematical concepts to practical, real world contexts.

In the second cycle, the numeracy action board media was again utilized as a concrete visual aid, but with several notable updates. The media was enhanced with more engaging features, including simple game like flows that were integrated into the Student Worksheet, thereby increasing student involvement and enjoyment in the learning process. These improvements encouraged students to interact more actively with the material, fostering both individual and collaborative problem solving skills. The results showed a significant increase in the level of learning completeness, reaching 93% of students who achieved scores above the

minimum mastery criterion. This figure not only surpasses the targeted success threshold of 80% but also represents a substantial improvement compared to both the pre cycle and first cycle results.

The data indicate that the application of numeracy action board media integrated with the Realistic Mathematics Education approach for teaching addition and subtraction up to 20, when carefully designed and implemented, is highly effective in supporting students' conceptual understanding and improving their overall learning outcomes in mathematics. The combination of contextual story problems, interactive group work, and visually appealing concrete media appears to have created a more meaningful and enjoyable learning experience, ultimately contributing to the notable success achieved in this cycle.

Table 2. Student Learning Outcomes Cycle II

Category	Learning Outcomes of the 1st Meeting	Learning Outcomes of the 2nd Meeting
Number of students	28	28
KKM	70	70
Highest Score	90	100
Lowest Score	55	65
Average score	76,78	87,67
Number of students completed	24	26
Number of students who have not completed	4	2
Completion percentage	86%	93%
Information	Tall	Tall

In this second cycle, where each group is given numeracy action board media, each student in the group can freely explore the use of the media to solve the story problems given, so that students tend to be more enthusiastic and enthusiastic in participating in learning, because they are able to actualize themselves to learn independently well.

Figure 2. Cycle II Learning Activities

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Based on the results obtained through the classroom action research that has been carried out, there has been an increase in the completeness of learning outcomes of students in grades 1 A, the results are as follows:

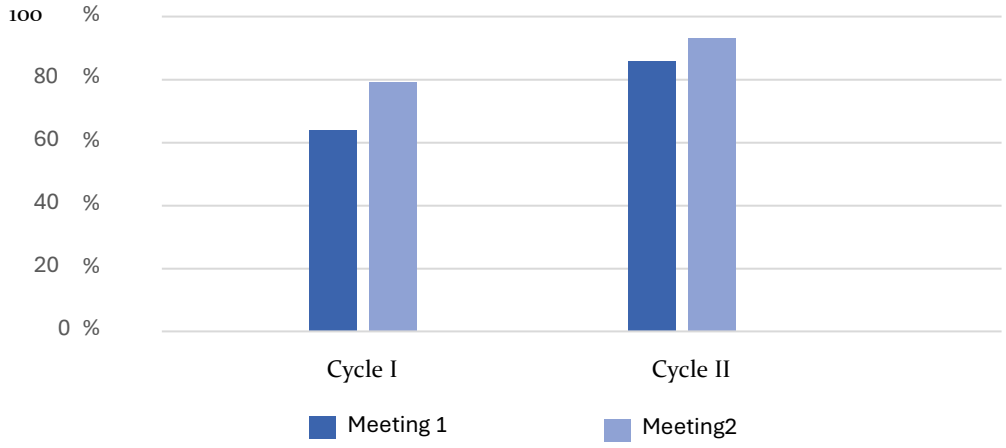

Figure 3. Recapitulation of Percentage of Learning Completeness

Based on these data, it is evident that the percentage of students achieving learning completeness increased consistently across each cycle, with notable progress observed at each meeting. In the first cycle, the percentages of students who achieved learning completeness were 64% in the first meeting and 79% in the second meeting, placing the results within the medium category of success. In contrast, the second cycle demonstrated further improvement, with 86% of students achieving learning completeness in the first meeting and 93% in the second meeting, which falls into the high category of success. This upward trend indicates that the learning interventions implemented, namely the integration of numeracy action board media with the Realistic Mathematics Education approach, have been effective in progressively enhancing student performance in addition and subtraction learning activities.

Discussion

Classroom action research conducted in Grade 1 A of Kebonsari 2 State Elementary School in Malang demonstrated a significant improvement in students' learning outcomes following the implementation of numeracy action board media combined with the Realistic Mathematics Education approach. The use of numeracy action board media equipped with picture sticks as visual aids for performing counting operations, along with the integration of the Realistic Mathematics Education approach that presents contextual story problems closely related to students' daily lives, proved effective in increasing students' focus and engagement during the learning process. Through this tangible learning medium, students were able to easily grasp the concepts of addition and subtraction in a concrete manner, enabling them not only to memorize calculation procedures but also to understand the meaning of these operations through direct experience. The improvement in learning outcomes—from a pre cycle mastery percentage of 46.62 percent, to 79 percent in the first cycle, and reaching 93 percent in the second cycle—indicates that this medium is effective in enhancing students' mathematics learning results.

These findings are consistent with the results of research showing that the use of concrete learning media based on a realistic mathematical approach can enhance students' understanding of concepts and improve their learning outcomes in basic arithmetic operations (Sya'diah et al., 2025). Similar conclusions were reached in research indicating that concrete manipulative media, when combined with the Realistic Mathematics Education approach, can improve students' numeracy skills, deepen their conceptual understanding, and build confidence in problem solving (Irmayani et al., 2024). In addition, other studies have emphasized that mathematics learning grounded in the Realistic Mathematics Education approach effectively captures students' attention because it positions real life problems as the starting point for learning, thereby encouraging active and independent problem solving (Laila & Wardhani, 2019). In the present study, students' active participation was evident in their enthusiasm when using picture sticks as counting tools and in their interest in solving story problems related to everyday experiences, such as purchasing snacks or sharing food with friends. This supports the view that learning media integrating real life student experiences can strengthen the learning process and provide meaningful learning experiences (Fajar & Budiyono, 2024).

Nevertheless, this study has certain limitations. First, the number of research participants was limited to 28 students in a single elementary school, meaning the findings cannot yet be generalized to other schools with different conditions and student characteristics. Second, the implementation was limited to two cycles focusing solely on addition and subtraction, so the effectiveness of numeracy action board media based on the Realistic Mathematics Education approach for other mathematical topics remains to be explored. Furthermore, this study did not fully measure the long term impact on students' conceptual understanding, as observations were conducted only during the intervention phase.

Despite these limitations, the findings of this study hold significant practical implications for the field of education, particularly for elementary school teachers. Numeracy action board media based on the Realistic Mathematics Education approach can serve as an alternative, effective, low cost, and easily implemented learning tool in elementary education, as it utilizes simple materials that can be adapted to each school's local context. Teachers may adapt this media concept for various arithmetic operations or other mathematical topics by incorporating story problems relevant to students' local experiences. Furthermore, the Realistic Mathematics Education approach applied through this medium has been shown to enhance students' motivation, active participation, and conceptual understanding, making it advisable for teachers to employ contextual approaches aligned with students' environments more frequently in mathematics instruction. This research can serve as a reference for developing interactive learning media rooted in real life contexts for other subjects at the elementary school level.

Conclusion

Based on the results of the classroom action research conducted in Grade 1 A of Kebonsari 2 State Elementary School in Malang, it can be concluded that teachers play a strategic role in addressing learning challenges in the classroom through the selection of creative and contextual strategies. The implementation of numeracy action board media integrated with the Realistic Mathematics Education approach proved effective in improving

students' learning outcomes in the addition and subtraction of numbers up to twenty, as evidenced by the increase in mastery learning from 46.42 percent in the pre cycle to 64 percent in the first meeting of the first cycle, 79 percent in the second meeting, rising again to 86 percent in the first meeting of the second cycle, and ultimately reaching 93 percent in the second meeting. Beyond these quantitative gains, students demonstrated higher enthusiasm and active participation, as reflected in comments such as, "Now I can do more calculations because there are sticks and stories like at home," indicating that this medium successfully created meaningful learning experiences closely related to their daily lives. The primary contribution of this research lies in the development of numeracy action board media based on contextual story problems specifically designed for number counting operations in elementary school, an approach not widely implemented in prior studies. Nevertheless, the study has limitations in terms of its small sample size confined to a single class and its focus solely on addition and subtraction, suggesting that future research should examine the use of this medium in teaching other mathematical concepts such as place value, multiplication, or measurement, across various grade levels and schools with diverse student characteristics. Furthermore, it is recommended that subsequent studies employ inferential statistical tests, such as paired t tests, to more convincingly determine the significance of improvements in learning outcomes, thereby supporting the broader adoption of numeracy action board media based on the Realistic Mathematics Education approach as an innovative tool for mathematics instruction in elementary schools.

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Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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