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Enhancing Counting Skills in 6–7-Year-Old Children Through the Utilization of Numeracy Smart Board Media

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ABSTRACT

Early childhood numeracy skills are crucial for cognitive development and future academic success. However, many young learners struggle with basic arithmetic due to difficulties in understanding abstract concepts, lack of engagement, and limited exposure to interactive learning tools. This study aims to determine the effectiveness of numeracy smart board media in improving counting skills among 6–7-year-old students at Kekajodho Catholic Elementary School because traditional teaching methods often fail to address students' learning challenges effectively. A descriptive qualitative approach was used, with data collected through observations, interviews, and documentation of changes in speed, accuracy, concentration, and focus before and after using the smart board. The results showed a significant improvement in problem-solving speed, accuracy, and sustained focus due to repeated practice and real-time feedback. This study highlights the potential of numeracy smart boards as an effective tool for early numeracy education, encouraging broader implementation in primary schools to support foundational math skills.

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1. INTRODUCTION

Education is a process of interpreting human existence so that humans increasingly realize the true nature of life (Ita, 2018; Komariah & Nihayah, 2023). Education involves the transmission of knowledge, skills, values, and attitudes from one generation to the next, usually through institutions such as schools, colleges, and universities, but can also occur in informal contexts such as at home or community (Yembuu, 2021). As a basic need of every human being, education is the most important aspect to ensure the survival of human life to be more dignified. The purpose of education is to facilitate the all-round development of individuals, prepare them to play an active role in society, and promote personal and social progress and well-being (Farswan, 2023). Effective education helps individuals to reach their full potential and contribute positively to the world around them (Seligman *et al*., 2022). As well as the objectives of national education stated in the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, which is to develop abilities and form the character and civilization of a dignified nation to educate the nation's life, aims to develop its potential to become actual and formed in the attitude of its personality.

Primary School is the basic education level in the formal education system in Indonesia that aims to provide basic education to children to equip them with the necessary knowledge, skills, and attitudes as a foundation for continuing to a higher level of education. Basic education is the initial foundation to strengthen further education. The age of students in the early grades, namely grade 1 elementary school generally ranges from 6-7 years and is still classified as an early childhood category. In this period, children experience a fundamental developmental process in the sense that developmental experiences in early childhood can have a lasting and long-term influence that underlies the child's subsequent developmental process (Nafsia & Ngura, 2022). At this stage, children can understand the concept of conservation and think systematically about the relationship between objects and numbers but still have difficulty with abstract concepts. They understand concepts more easily through real objects or visualization rather than abstract concepts and tend to learn better through direct experience and manipulation of real objects.

In the world of primary school level education, especially in the early grades, students must have basic reading, writing, and counting (listing) skills. Literacy is a prerequisite for learning further skills and knowledge. Numeracy is one of the most important skills that every student must have so that it can be applied in everyday life (Widowati *et al*., 2022). Numeracy is a basic ability that every child has that relates to addition, subtraction, multiplication, and division. Numeracy is a basic skill that is very important for children to develop as their provision in the present and future because numeracy is needed in everyday life (Rakhmawati & Mustadi, 2022; Purpura *et al*., 2011). Counting activities for 6-7-year-olds are usually designed to introduce and reinforce basic math concepts in a fun and interactive way, creating a positive learning experience and building a strong foundation for future math understanding. Basic math concepts introduced include number recognition, addition, and subtraction. Children need to be able to understand these basic concepts well as they form the foundation for further math learning. Without a strong understanding of the basics of numeracy, students will struggle to master more complex concepts such as multiplication, division, fractions, and geometry in higher grades. Through a fun and interactive approach, children can learn to count effectively and enjoyably. The way to make children happy to do counting activities is by introducing the concepts of many and few and big and small using concrete objects as learning resources (Due & Ita, 2019). Counting activities utilize one aspect of early childhood development, namely cognitive aspects. Cognitive development abilities

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include grouping objects that have similar colors, shapes, and sizes, matching circles, triangles, and rectangles, and recognizing and counting numbers 1 to 20 (Wulandari *et al*., 2022). Numeracy helps them build skills in problem-solving, which is one of the important aspects of cognitive development. For example, when they are faced with a simple math problem such as "What is the result of 3+2?", they have to analyze the problem, apply counting strategies, and find a solution. This process strengthens their ability to think logically and creatively.

Smart Board Media is one of the learning media that can be developed with the creativity of educators who can train student activeness so that learning is more interesting and can help students learn to count. Smart boards are a form of implementation of the use of learning media in addition, subtraction, and multiplication, division operations (Setiowati, 2023). Numeracy is the ability to understand and use various kinds of numbers and symbols related to basic mathematics and analyze information displayed in various forms (graphs, tables, charts, and so on) to solve practical problems in the context of everyday life (Nafsia *et al*., 2024). Numeracy activities for 6-7-year-olds focus on introducing and reinforcing basic math concepts in a fun and age-appropriate way. The numeracy smart board media is an innovative teaching method that utilizes smart boards to make math lessons more interesting and relevant to children, as well as enabling multiple approaches to understanding and practicing numeracy concepts. The numeracy smart board in question is a medium designed from used items in the surrounding environment in the form of used cardboard, colored cardboard paper, ale-ale cups, and ice camelo sticks. In addition to its practical and easily available utilization, through the use of numeracy smart board media, children can understand the abstract concept of solving basic addition and subtraction operations through real objects.

Some researchers have explained the effectiveness of using numeracy smart board media in improving the counting skills of children aged 6-7 years or early grades in elementary schools. Some researchers conducted research regarding numeracy skills to children aged 6-7 years in Nagerawe Village, Boawae, Indonesia, showing that the use of counting innovative board media can significantly improve numeracy skills of addition 1-20 in early grade students (Brinkman *et* al., 2013). Furthermore, other researchers applied contextual approach with counting board media to 1st grade students of Pedurungan Lor, Semarang, Indonesia, showing that the use of counting board media in mathematics learning with addition material 1-20 stated to increase after using smart board media from pre-cycle to cycle 1 by 10.69% and obtained a pre-cycle average score of 54.48% to cycle 1 average of 65.17% or in the sufficient category. Researchers are trying to expand the use of numeracy innovative board media to not only help improve counting skills in addition but also the concept of subtraction. Children at the age of 6-7 years have difficulties in distinguishing between the concepts of addition and subtraction. The numeracy smart board media is effective, in which children are taught that the concept of subtraction from 9-3 is by taking 9 sticks and placing them in box 1. Then, we can ask the children to take 3 sticks from box 1 place them in box 2 and count the remaining sticks in box 1 as a result. This way can make children physically see what the concept of subtraction means taking several objects from a set and counting the remaining objects.

The objective of this study is to evaluate the impact of numeracy smart board media on enhancing early-grade students' numeracy skills. Specifically, the study aims to assess improvements in problem-solving accuracy, speed, and student engagement after using interactive learning media. This research contributes to the existing body of knowledge on numeracy education by providing a comprehensive approach to teaching both addition and

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subtraction using interactive learning media. Unlike previous research that focused solely on addition, this study demonstrates how smart board media can effectively support both arithmetic concepts, making it a more holistic educational tool.

The findings of this research have significant implications for educators and policymakers, emphasizing the importance of integrating interactive learning media into primary education. Schools and teachers are encouraged to adopt numeracy smart board media as a cost-effective and engaging instructional tool to strengthen early numeracy education. By incorporating interactive teaching strategies, this study aims to improve foundational math skills, ensuring that students develop strong numeracy abilities that will benefit them throughout their academic journey.

In the broader context of education, the relationship between teachers, learning media, and students plays a crucial role in creating an effective learning environment. Teachers are responsible for implementing instructional strategies that enhance student engagement and learning outcomes. The success of teaching and learning activities depends on the teacher's ability to create a supportive classroom environment, foster student trust, and provide reinforcement and feedback. Effective teaching requires the use of varied instructional methods and appropriate learning media to ensure that students can process and retain information efficiently. Learning media serves as a bridge between abstract concepts and practical understanding, making lessons more interactive and meaningful for students.

By leveraging innovative teaching tools such as numeracy smart board media, educators can enhance student motivation, engagement, and comprehension of mathematical concepts. This research highlights the potential of interactive learning media in improving early numeracy skills and underscores the importance of adopting engaging instructional approaches in primary education.

2. METHODS

This study employed a qualitative research approach to explore the development of students' counting skills using numeracy smart board media. Qualitative research aims to understand the experiences, perceptions, and behaviors of research subjects holistically within a natural context (Fossey *et al.*, 2002). This study analyzed students' responses, engagement, and progress in numeracy through direct observation and interviews. The research was conducted in early-grade classes at Kekajodho Catholic Elementary School, located in Ende District, Ende Regency, Indonesia. A total of 10 students participated in this study over four months, from 14 August to 4 December 2024. The research object was basic counting skills, with the researcher acting as a tutor while utilizing numeracy smart board media as an intervention tool.

2.1. Data Collection Techniques

Data collection was conducted through observations and interviews to analyze the students' counting skills before and after using numeracy smart board media. Observations were made during numeracy assistance activities in math lessons, focusing on students' development in performing basic arithmetic operations such as addition and subtraction. The collected data followed the Miles (1990) framework, which includes data reduction, data presentation, and conclusion drawing.

(i) Data Reduction: Raw data from interviews and observations were simplified, categorized, and organized based on key themes, such as numeracy performance, learning engagement, and cognitive development.

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(ii) Data Presentation: The reduced data were presented descriptively in narrative form and tabulated for clearer interpretation.
(iii) Conclusion Drawing: The final stage involved analysing trends in students' progress, drawing insights regarding the effectiveness of numeracy smart board media, and providing recommendations for future implementation.

2.2. Initial Observation of Students' Counting Skills

Before introducing the numeracy smart board, an initial observation was conducted to assess students' basic counting skills. The findings highlighted several challenges, including difficulty in performing simple arithmetic operations, slow problem-solving speed, and short attention spans during counting activities. As shown in **Table 1**, only two students could perform basic addition and subtraction, while the remaining eight students struggled to complete simple problems. Additionally, five students had difficulties in maintaining focus, frequently getting distracted during numeracy activities. These findings suggested the need for a new teaching strategy to make math learning more engaging and interactive.

Table 1. Initial observation results of students' counting skills.

No	Aspect Observed	Indicator	Observation Before Intervention
1	Basic Math Operation Skills	Ability to perform simple addition and subtraction (e.g., 3+2, 5-1)	2 students could solve problems, while 8 students could not complete them.
2	Calculation Speed	Time taken to complete simple math problems	8 students took up to 30 minutes to solve a single problem.
3	Concentration and Focus	Ability to stay focused on counting tasks	5 students were frequently distracted and required reminders.

2.3. Implementation of Numeracy Smart Board Media

To address students' difficulties in numeracy, numeracy smart board media was introduced as a learning intervention. This method aimed to enhance students' understanding of arithmetic concepts through interactive visualization. The smart board allowed students to represent numbers using physical objects (sticks), pattern recognition, and problem-solving exercises.

During implementation, students were guided to use the numeracy smart board for addition and subtraction exercises. For example, in addition, to problems (e.g., 7+8), students placed seven sticks in box 1 and eight sticks in box 2, visually combining them to reach a total of 15 sticks. For subtraction problems (e.g., 8-2), students placed eight sticks in box 1, removed two sticks, and counted the remaining six sticks as the answer.

The numeracy smart board media transformed abstract numerical concepts into tangible experiences, making math more accessible and engaging for early-grade students. This intervention aligned with Piaget's cognitive development theory, which suggests that children in the concrete operational stage (ages 7-11) benefit from hands-on learning experiences.

2.4. Observation of Students' Counting Skills after The Intervention

Following the use of numeracy smart board media, an evaluation was conducted to measure improvements in students' numeracy performance. **Table 2** shows a significant increase in basic math operation skills, calculation speed, and focus among participants. Students showed remarkable progress in numeracy after using the smart board. The visualization method helped them grasp addition and subtraction concepts more effectively, and their problem-solving speed improved drastically. Additionally, the interactive nature of

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the smart board enhanced students' engagement, keeping them focused throughout the learning sessions.

Table 2. Development of students' numeracy skills after using numeracy smart board media.

No	Aspect Observed	Indicator	Observation Before Intervention	Observation After Intervention	Improvement Observed
1	Basic Math Operation Skills	Ability to perform simple addition and subtraction (e.g., 3+2, 5-1)	8 students were unable to complete problems.	8 students could perform addition and subtraction using the smart board.	Significant improvement in independent problem-solving skills.
2	Calculation Speed	Time taken to solve simple math problems	8 students took **30 minutes** per problem.	The average completion time was reduced to **30 seconds**.	Increased calculation speed and focus.
3	Concentration and Focus	Ability to stay focused on counting tasks	5 students frequently lost focus.	Most students remained engaged for **10 minutes** without distraction.	Increased concentration due to interactive learning.

2.5. Ethical Considerations

This study adhered to ethical research standards by ensuring informed consent from parents and school authorities before involving students. Participants' identities remained confidential, and data collection strictly focused on academic performance without any personal identifiers.

3. RESULTS AND DISCUSSION

3.1. Students' Counting Skills before Using Numeracy Smart Board Media

The initial observations of students' numeracy skills at Kekajodho Catholic Elementary School revealed significant difficulties in performing basic arithmetic operations. As shown in **Table 1**, only two students were able to solve simple addition and subtraction problems, while the remaining eight students struggled to complete even the most basic calculations. Additionally, students demonstrated low calculation speed, with some requiring up to 30 minutes to solve a single math problem.

Another notable issue was a lack of concentration and focus. Approximately five students frequently lost attention during numeracy activities, requiring constant reminders from the teacher to stay engaged. These findings indicate that students had difficulty grasping numerical concepts, suggesting the need for a more interactive and engaging approach to teaching basic arithmetic.

The lack of interest in mathematics may be attributed to several factors, including unvaried teaching methods, limited use of learning media, and minimal hands-on activities. Traditional instruction methods, which often rely on rote memorization, do not adequately cater to the cognitive development needs of early-grade students. Piaget's cognitive development theory states that children in the preoperational and concrete operational stages benefit most from visual and hands-on learning experiences. Therefore, introducing a more engaging approach (such as numeracy smart board media) was expected to enhance their mathematical abilities.

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3.2. Impact of Numeracy Smart Board Media on Students' Counting Skills

Following the introduction of numeracy smart board media, students exhibited notable improvements in numeracy performance. **Table 2** highlights key advancements in basic math operation skills, problem-solving speed, and focus. Several aspects were obtained:

(i) Improved Basic Arithmetic Skills. Before the intervention, only two out of ten students could perform basic addition and subtraction. However, after using the numeracy smart board, eight students were able to complete arithmetic problems independently. The visual representation of numbers and hands-on activities facilitated students' understanding of numerical concepts. The smart board's interactive features allowed students to manipulate numbers physically, reinforcing their learning process. By placing objects (e.g., sticks) into designated boxes, they could visually grasp addition and subtraction, making abstract concepts more concrete and accessible. This approach aligns with studies suggesting that visual and kinesthetic learning methods enhance students' comprehension of mathematical concepts.

(ii) Increased Calculation Speed. One of the most significant improvements was in calculation speed. Initially, eight students required up to 30 minutes to complete a single arithmetic problem. After using the smart board, the average completion time was reduced to 30 seconds. This dramatic improvement suggests that students not only understood the material better but also developed greater confidence in solving problems. The increase in speed is a direct result of the interactive learning experience, where students engaged in repeated pattern recognition exercises. Repetition in a visual and engaging format strengthened their ability to recognize number relationships quickly, allowing them to solve problems more efficiently.

(iii) Enhanced Focus and Engagement. Another key benefit observed was improved student concentration. Before the intervention, five students frequently lost focus, getting distracted by their surroundings. However, after using the numeracy smart board, most students remained engaged for the full 10-minute numeracy session without requiring reminders to stay on task. This shift can be attributed to the interactive and visually stimulating nature of the smart board, which captured students' interest and transformed learning into an engaging activity. Unlike traditional methods, which often involve passive learning, the smart board encouraged active participation, motivating students to stay attentive throughout the lesson.

3.3. Addressing Numeracy Challenges through Interactive Learning Media

The findings of this study confirm that traditional teaching methods alone may not be sufficient to support numeracy development in early-grade students. The use of digital and interactive media, such as numeracy smart boards, can significantly enhance learning outcomes by making abstract mathematical concepts more tangible and engaging. Interactive learning tools contribute to numeracy development in several ways:

(i) Enhancing Conceptual Understanding: Visual representation of numbers improves concept retention and comprehension of arithmetic operations.

(ii) Increasing Student Engagement: Interactive activities make learning more enjoyable, reducing resistance to mathematics.

(iii) Improving Problem-Solving Speed: Repeated exposure to interactive exercises helps students develop automaticity in arithmetic calculations.

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(iv) Strengthening Focus and Attention: Engaging learning tools help reduce distractions, leading to longer attention spans and better task completion.

These findings align with Piaget's cognitive development theory, which suggests that children in early-grade levels learn best through concrete, hands-on experiences. By providing visual and physical representations of numbers, the numeracy smart board effectively bridged the gap between abstract mathematical concepts and students' cognitive abilities.

3.4. Educational Implications and Future Recommendations

The success of numeracy smart board media in enhancing counting skills suggests that integrating interactive learning tools into mathematics education can be highly beneficial for young learners. However, there are several key considerations for further improving numeracy education:

(i) Expanding the Use of Interactive Media: Schools should explore the use of other interactive technologies, such as digital games, augmented reality (AR), and virtual manipulatives, to further enhance mathematics learning experiences.
(ii) Teacher Training and Capacity Building: Teachers should receive specialized training in utilizing technology-based learning media to maximize their effectiveness in the classroom.
(iii) Personalized Learning Approaches: Incorporating adaptive learning systems that adjust to each student's skill level can help ensure optimal learning progress for all students.
(iv) Further Research on Long-Term Effects: While the short-term impact of numeracy smart boards has been positive, future studies should examine the long-term retention of numeracy skills and the scalability of interactive learning tools.

3.5. Improvement in Numeracy Skills through The Use of The Numeracy Smart Board

The first indicator in the observation result is that children can do simple addition. In the initial observation, 8 children still had difficulty doing simple addition and subtraction because they did not understand the abstract concepts of subtraction and addition. Teachers must develop creative and efficient teaching strategies during the teaching and learning process so that students can understand the material as a whole (Nafsia *et al.*, 2024). Interactive smartboards provide visual understanding and manipulative tools to clarify the concepts of addition and subtraction. For example, in solving the problem 8+7. With the camelo sticks provided on the numeracy smart board, the teacher invites children to take 8 camelo sticks and then add 7 camelo sticks and count them all to find out the total. With this method, children will more easily understand the abstract concept of addition such as 8 + 9 because they can see and feel it directly.

The second indicator is the time taken when children solve basic math problems. In the initial observation, it was found that many children took longer to complete simple calculations, for example, 5-6 minutes per addition or subtraction problem. This was due to a lack of understanding or confusion in solving the problems. After using the numeracy smart board children were able to complete simple calculations faster, for example, 30 seconds per problem, because they understood the math concepts more naturally without the need for formal explanations or detailed instructions and could count more fluently. A smart board that gives positive feedback as soon as the child completes the calculation correctly serves as a support. This media motivates children to improve their speed, as they are rewarded or given positive feedback every time, they solve a problem quickly. Teachers must give appreciation in the form of praise or others when students can complete quickly and accurately. This constant reinforcement keeps children motivated to complete tasks faster to

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get rewards from the interactive learning system. Competent teachers will be better able to manage their classes so that student learning outcomes are at an optimal level (Jainiyah, 2023).

In the third indicator of concentration and focus, many children are easily distracted or lose concentration after a few minutes of working on a counting task. They are often distracted by the environment or think about other things so their counting performance decreases. Efforts must be taken to improve concentration and teachers must prepare to learn media as the main tool to support the success of teaching and develop methods used by utilizing the media (Khotimah *et al*., 2020). After using learning aids such as numeracy smart boards, children showed improvement in maintaining focus for longer. They were more engaged with the task and could complete calculations with greater consistency. Children at an early age have shorter attention spans, but visual and interactive aids such as smart boards help to optimally allocate mental resources. The visual stimulation and active interaction provided by the smart board increase children's engagement, so they are better able to focus on the numeracy task compared to traditional learning methods. The numeracy smartboard provides an immediate response whenever the child completes a calculation correctly, so the child is motivated to stay focused on the task to get this positive feedback.

During the use of the numeracy smart board media, the teacher directs students to solve a series of math problems displayed in the problem box on the smart board. Students were enthusiastic and actively participated in this activity. They took turns coming to the front of the class to answer the questions displayed on the smart board. Students showed increased motivation to learn and interest in the material being taught. Many students who initially tended to be passive during math lessons became more active. They raised their hands more often to participate, indicating that the use of the numeracy smart board media encouraged their engagement. During the observation, it was found that students who previously struggled with simple addition and subtraction concepts found it easier to understand and solve these problems after using the smart board. This can be seen from the student's ability to explain the steps to solve the problems to their classmates.

During the interview process, some students also stated that they preferred learning with the smart board because it was more fun and easier to understand. They mentioned that the visual aid using Camelo sticks displayed on the smart board helped them understand how to count correctly. The researcher noticed that there was a good improvement in the students' counting skills. Some students who initially scored low on math tests showed improvement after using the numeracy smart board for a few weeks.

In the context of education, the relationship between teachers, learning media, and students is very important to create an effective learning environment and support student development. Teachers are the implementers of the teaching and learning process in schools, and the success of their teaching determines the success of education in general (Buchari Agustini, 2018). Teaching and learning activities will run effectively and efficiently when a teacher as a teacher can solve problems and have good basic teaching skills. Teachers must do several things in teaching and learning activities, such as creating a conducive classroom, creating trust in students, responding well, providing reinforcement, listening, providing learning media, and using varied learning methods (Arfandi & Samsudin, 2021). The use of learning media has various benefits in the educational process. Learning media helps teachers deliver material more effectively and makes the learning process more interesting and interactive for students. The use of learning media brings many benefits in education, from increasing student motivation and engagement to providing various ways to understand the material. In learning, the media functions as a messenger for children (Ngura *et al*., 2020). So

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that what children learn from the media used can be easily processed as a supply of information and sources of knowledge. With the right learning media, teachers can make the learning process more interesting, interactive, and effective, which ultimately improves overall student learning outcomes.

4. CONCLUSION

This study demonstrates that the use of numeracy smart board media significantly improves basic arithmetic skills, problem-solving speed, and concentration among early-grade students. The findings emphasize that traditional teaching methods alone may not be sufficient to address numeracy challenges, and integrating interactive media can enhance student engagement, comprehension, and mathematical fluency. The effectiveness of the numeracy smart board was evident in the significant improvements observed in students' understanding of addition and subtraction. Out of the 10 children who participated in the study, 8 children showed substantial progress in performing arithmetic operations accurately. The smart board's visual support and interactive features enabled children to complete calculations faster through repeated practice and real-time feedback. The reduction in calculation errors also indicated that students developed greater accuracy in their numerical reasoning, as they could immediately verify and correct their mistakes. In addition to enhanced arithmetic skills, students exhibited increased concentration and focus during math activities. Before the intervention, students were often distracted and struggled to maintain attention, but the use of engaging visual elements and interactive exercises helped sustain their interest. The active learning environment created by the smart board motivated students to stay focused on their tasks, ultimately improving their overall learning experience. Given the positive impact of numeracy smart boards on early childhood numeracy development, this study suggests that schools and educational institutions should integrate such interactive learning tools into their curricula. Educators should be trained in effectively utilizing numeracy smart boards to maximize their potential in enhancing students' mathematical abilities. Further research is also recommended to explore the long-term effects of smart board-based learning and its applicability across diverse educational settings. By incorporating interactive technology in early mathematics education, educators can foster stronger numeracy skills, build student confidence, and create a more engaging and effective learning environment. The findings of this study highlight the importance of digital learning innovations in supporting the foundational mathematical development of young learners and paving the way for future advancements in mathematics education.

5. AUTHORS' NOTE

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

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