



Improving Numeracy Skills of 5-6 Year-Old Children Using TASPIN

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ABSTRACT

Early numeracy skills are essential for supporting young children's cognitive development and preparing them for formal mathematics learning. This study aimed to develop and evaluate TASPIN (Tas Pintar), a portable non-digital learning medium designed to improve the numeracy skills of children aged 5–6 years. The study employed a Research and Development (R&D) approach adapted from the Borg and Gall model, consisting of four stages: needs analysis, media design and expert validation, implementation, and evaluation. The participants were 42 kindergarten children from TK Budi Luhur, divided into the Sky Class (n = 21) and the Cloud Class (n = 21). Data were collected through structured observation checklists, performance assessments, and field notes. The findings showed a substantial improvement in children's numeracy skills after the implementation of TASPIN. The average mastery level increased from 35.7% to 84.5% in the Sky Class and from 40.4% to 89.2% in the Cloud Class. Classroom observations also indicated that children became more actively engaged, collaborated with peers, and maintained attention during learning activities. These findings suggest that TASPIN is a feasible and practical non-digital learning medium for supporting early numeracy development in kindergarten classrooms.

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Introduction

Numeracy skills are a fundamental component of cognitive development in early childhood and play a crucial role in preparing children for formal learning at the primary education level. Early numeracy learning helps children understand basic number concepts, quantities, and logical thinking through meaningful and concrete experiences. Studies in early childhood education emphasize that numeracy instruction should be delivered through interactive and play-based learning activities to support children's cognitive engagement [1]. Previous research has demonstrated that interactive learning media contribute significantly to the improvement of early numeracy skills.

Al Banna et al. [1] found that the use of innovative learning media in early childhood classrooms increased children's ability to recognize numbers and perform simple counting tasks. Similarly, Fauziyah and Rakhmawati [2] reported that game-based learning media enhanced children's numeracy skills by increasing learning motivation and attention during numeracy activities. These findings indicate that learning media that actively involve children can improve numeracy outcomes more effectively than conventional methods. However, most existing studies tend to focus on digital or screen-based learning media. For example, Fauziyah and Rakhmawati [2] developed game-based learning media that relied on visual digital elements, while other studies have emphasized animated or multimedia-based learning tools.

Although these digital media were found to be effective, their implementation in early childhood education is not always practical, particularly in settings with limited facilities and a strong need for hands-on learning experiences [3]. As a result, research examining simple, portable, and non-digital interactive learning media remains limited. Preliminary observations conducted at TK Budi Luhur revealed that children aged 5–6 years demonstrated basic numeracy abilities; however, their engagement decreased when learning activities relied heavily on worksheets and flashcards. This condition supports the findings of Adawiyah et al. [4], who reported that conventional learning media were less effective in maintaining children's attention and active participation during numeracy learning activities. Therefore, an alternative learning medium that integrates play-based activities and concrete manipulation is required [5]. To address this research gap, the present study develops TASPIN (Tas Pintar) as an interactive learning medium specifically designed for early childhood numeracy learning. Unlike previous studies that primarily utilized digital learning media, TASPIN is a non-digital, portable learning medium that allows children to manipulate learning materials directly. This study aims to develop TASPIN (Tas Pintar) as a learning medium to improve the numeracy skills of children aged 5–6 years.

Although previous studies have demonstrated the effectiveness of interactive learning media in improving early numeracy skills, most have focused on digital applications or single-purpose instructional tools. This study differs by developing TASPIN (Tas Pintar), a portable non-digital learning medium that integrates multiple numeracy activities with tactile manipulation and collaborative play into a single instructional package. By providing empirical evidence from its implementation in a kindergarten classroom, this study contributes to the development of practical, play-based learning media that can be applied in early childhood education, particularly in settings with limited access to digital resources.

Literature Review

A. Early Numeracy Learning in Early Childhood Education

Early numeracy skills constitute a fundamental component of cognitive development in early childhood and serve as a critical foundation for successful mathematical learning in subsequent formal education [6]. Through meaningful and concrete experiences, early numeracy learning helps children understand basic number concepts, quantities, and logical thinking patterns. Instructional design in early childhood education strongly emphasizes that numeracy instruction must be delivered through interactive, play-based learning activities to optimally support children's cognitive engagement.

At the age of 5–6 years, children are psychologically and generally in the preoperational stage. In this phase, a child's numerical understanding develops and is constructed primarily through concrete, hands-on, and contextual learning experiences. Contemporary studies consistently demonstrate that abstract, rigid, and rote-based approaches to teaching numeracy are less effective for young learners when they are not accompanied by meaningful play activities and the freedom of environmental exploration [7].

Recent research in early childhood education highlights that early numeracy development is not only influenced by how frequently a child is passively exposed to numbers, but is also strongly determined by the instructional strategies applied and the quality of the learning environment. Play-based and experiential learning approaches have been proven to significantly enhance children's deep understanding of number concepts, one-to-one symbol–quantity correspondence, and sequencing skills in a more meaningful and lasting manner within a child's memory [8].

B. Interactive Learning Media in Early Childhood Education

Interactive learning media play a crucial role in stimulating and supporting the effectiveness of cognitive processes and learning in early childhood education institutions [9]. The active developmental characteristics of early childhood require media capable of facilitating multisensory learning experiences—encompassing visual, auditory, and kinesthetic stimulation—that align with children's learning modalities. Empirical evidence

from various recent studies indicates that the use of interactive and manipulative learning media can significantly increase children's active engagement, intrinsic motivation, and sustained attention, particularly when they are learning abstract, basic mathematical concepts [10].

A number of previous studies have demonstrated the tangible contribution of innovative learning media in boosting children's numeracy achievements. For instance, the use of innovative media in early childhood classrooms has been proven to increase children's ability to recognize numbers and complete simple counting tasks [11]. In addition, game-based learning media have been reported to effectively improve children's numeracy skills by reinforcing learning motivation and attention retention during numeracy activities. The presence of media that involve children's active participation is proven to enhance numeracy learning outcomes much more effectively compared to conventional passive methods.

Although conventional instructional tools such as printed worksheets and flashcards remain widely used, several contemporary studies have begun to report the limitations of these tools. Monotonous conventional media are deemed less effective in maintaining children's interest, attention, and active participation over time. Consequently, there is a growing urgency and demand for innovative adaptive learning media that can integrate elements of play, two-way interaction, and free exploration to build a deeper conceptual understanding while fostering enjoyment in learning [12].

C. Play-Based Learning Media and Developmental Theories

The theoretical foundations underlying play-based learning have long been established in developmental psychology and educational science. Jean Piaget's Constructivist Theory asserts that children actively construct their knowledge through direct actions and interactions with concrete objects in their surrounding environment [13]. On the other hand, Lev Vygotsky's Socio-Cultural Theory provides a complementary perspective by highlighting the mediating role of tools (scaffolding) and social interaction in optimizing children's learning within the Zone of Proximal Development (ZPD) [14]. Rooted in these two major theories, learning media designed to encourage collaboration, dialogue space, and guided interaction have proven capable of facilitating children to internalize numerical concepts more effectively.

Recent studies further reinforce the thesis that contextual and play-oriented learning media—particularly those involving direct physical manipulation and active interaction with peers—have a much higher efficacy in developing early numeracy skills compared to conventional passive instructional approaches [15]. These empirical findings underscore the importance of designing learning media that are not merely visually appealing and focused on aesthetic visual aspects, but must also possess pedagogical alignment with the cognitive and socio-emotional developmental characteristics of children.

D. The Development of TASPIN Media within the State of the Art

Most current studies examining interactive learning media tend to focus on the development of digital applications, animation-based multimedia devices, or single-purpose instructional props. Although these digital or screen-based media have proven effective, their implementation in the context of early childhood education is not always practical and faces real constraints in the field [16]. This is especially true in educational institutions with limited infrastructure and facilities, as well as in classroom situations that actually have a strong need for direct, physical, hands-on learning experiences. As a result, research exploring simple, portable, and non-digital interactive learning media remains very limited so far.

In line with this roadmap and global research trends, the development of TASPIN (Tas Pinter) media is positioned as an innovative breakthrough in the category of interactive learning media that integrates foundational early numeracy concepts with structured, play-based manipulative activities. Unlike the widely developed digital learning tools, TASPIN offers a strong differentiation through a combination of tangible materials, structured game design, and space for direct social interaction [17].

Through the TASPIN platform, children are given the opportunity to be actively involved in learning via tactile exploration and peer group collaboration. This non-digital hybrid approach aligns closely with the latest findings of experts who affirm the effectiveness of non-digital interactive media in supporting early numeracy foundations within classroom-based learning contexts. The presence of this TASPIN development study stands not only on a robust theoretical and empirical framework to address practical needs in the ECE classroom, but also extends the academic discourse on manipulative learning innovations to maximize numeracy intelligence from an early age.

Material and Methods

This study employed a Research and Development (R&D) approach adapted from the Borg and Gall development model, which was streamlined into four systematic stages to suit the practical constraints of the early childhood classroom ecosystem: needs analysis, media design and expert validation, implementation (field testing), and evaluation. The main focus was to refine and evaluate an existing non-digital instructional prototype named TASPIN (Tas Pinter) to optimize numeracy delivery for senior kindergarten students.

A. Participants and Sample Size

The research was conducted at TK Budi Luhur. The research subjects comprised 42 children aged 5–6 years old who were selected using a purposive sampling technique. The participants were distributed equally into two authentic classroom cohorts: the Sky Class (n = 21 children) and the Cloud Class (n = 21 children).

B. Development Stages of TASPIN

1. Needs Analysis: Preliminary field observations and semi-structured dialogues with class teachers at TK Budi Luhur were carried out to identify barriers to numeracy acquisition. The analysis showed that conventional paper worksheets and rigid flashcards restricted physical interaction, causing children to easily lose attention.
2. Media Design and Expert Validation: To resolve the gap, TASPIN was modified into a high-utility, hands-on instructional media package. Before class implementation, the design layout, safety, and pedagogical content were evaluated by a panel of two experts: an early childhood education curriculum expert and an instructional media specialist. Iterative improvements were made based on their technical notes regarding Velcro attachment strength and color-coded sorting elements.
3. Implementation: The field testing phase was implemented during regular class hours over a two-week period. Children operated the TASPIN components in individual and small collaborative group settings.
4. Evaluation: Pre-test baseline data and post-test experimental scores were structurally compiled, alongside qualitative behavioral notes, to measure the direct educational value of the media.

C. Operational Definitions and Observation Instrument

To provide measurable tracking, early childhood numeracy skills were operationally broken down into four foundational indicators mapped directly to the components of the TASPIN media:

1. Mentioning numbers 1 to 20 correctly and in sequence (Rote counting and verbal order mastery).
2. Counting using number symbols (One-to-one correspondence by linking tangible item sets to numerical cards).
3. Matching concrete objects or quantities with numeric symbols.
4. Sequencing number symbols correctly into proper spatial arrangements.

Children's task performance was evaluated through structured observation checklists with a 4-point operational development rubric:

- Score 1 (BB - Belum Berkembang / Not Yet Developed): The child cannot complete the mathematical task even when provided with continuous, direct teacher assistance.
- Score 2 (MB - Mulai Berkembang / Starting to Develop): The child performs the task correctly only after receiving substantial verbal prompts or guided models from the teacher.

- Score 3 (BSH - Berkembang Sesuai Harapan / Developing as Expected): The child completes the task independently, accurately, and consistently without instructional prompts.
- Score 4 (BSB - Berkembang Sangat Baik / Well Developed): The child masters the task independently and displays the socio-cognitive ability to naturally guide or correct their peers.

Results and Discussions

The findings presented below describe changes in early childhood numeracy proficiency following the systematic implementation of the revised TASPIN medium. Quantitative results compare baseline mastery (pre-test) with mastery after the intervention (post-test), while qualitative findings describe children's engagement, interaction, and affective responses during classroom implementation. Because the study did not include a control group or inferential statistical testing, the reported changes should be interpreted as descriptive pre-post improvements associated with TASPIN implementation rather than definitive evidence of a causal treatment effect.

A. Structural and Physical Profile of the Developed TASPIN Medium

TASPIN (*Tas Pintar*, or Smart Bag) was developed as a lightweight, portable, non-digital learning medium resembling a compact briefcase. Constructed from durable felt and canvas, the bag unfolds into several interactive panels through which children can manipulate objects while completing numeracy activities. The design was intended to facilitate hands-on exploration, active participation, and play-based learning, which are consistent with developmentally appropriate approaches to early mathematical learning [18].

TASPIN consists of the following five activity modules:

1. Felt Finger-Counting Panel. This panel contains two large felt hands with flexible, Velcro-tipped fingers that children can raise or fold to represent quantities and solve basic counting and arithmetic problems.
2. Number-Egg Matching Module. This module consists of multicolored felt eggs divided into two halves. Children match the half containing beads or dots with the half displaying the corresponding numeral from 11 to 20.
3. Math-Attire Outfit Board. This board contains felt shirts displaying basic arithmetic operations, such as $15 - 4$ and $10 + 4$. Children match each shirt with a skirt or pair of trousers displaying the correct answer.
4. Geometric Sequence Board. This board enables children to reproduce, extend, and create linear patterns using removable fabric shapes, including circles, hearts, squares, and stars.

5. Visual Fruit-Slot Tracker. This module contains transparent grid compartments in which children sort and arrange laminated fruit cards to construct specified quantities and sets.



Fig. 1. Design of the game activities incorporated into TASPIN.



Fig 2. Interactive learning panels of the developed TASPIN medium.

The five modules were designed to connect verbal number sequences, physical quantities, written numerals, arithmetic operations, and repeating patterns within a single learning environment. This integration is consistent with learning-trajectory research showing that effective early mathematics instruction should connect progressively more complex mathematical representations and activities [19]. TASPIN's movable felt objects also provide concrete representations of otherwise abstract numerical relationships. A meta-analysis of mathematics instruction found that concrete manipulatives can support learning, particularly when their mathematical meaning is made explicit [20]. Nevertheless, concrete materials should function as representational supports rather than as ends in themselves. Instruction should gradually direct children's attention from the physical appearance of the objects to the numerical relations they represent, consistent with the principle of concreteness fading [21].

B. Quantitative Results and Discussion

Quantitative mastery was defined as the number and proportion of children attaining at least the *Developing as Expected* level (BSH/score 3) or the *Well Developed* level (BSB/score 4). The analysis included four numeracy indicators: verbal number sequencing, counting with number symbols, matching quantities with numerals, and sequencing numeral symbols.

Table 1. Comparison of Numeracy Mastery in the Sky Class ($n = 21$)

No.	Numeracy indicator	Pre-test mastery, n	Pre-test (%)	Post-test mastery, n	Post-test (%)	Change (percentage points)
1	Reciting numbers 1–20 correctly and sequentially	9	42.9	19	90.5	+47.6
2	Counting using number symbols	7	33.3	17	81.0	+47.6

3	Matching quantities with numerals	8	38.1	18	85.7	+47.6
4	Sequencing numeral symbols correctly	6	28.6	17	81.0	+52.4
Mean across indicators		7.5	35.7	17.8	84.5	+48.8

As shown in Table 1, mean indicator-level mastery in the Sky Class increased from 35.7% at pre-test to 84.5% at post-test, representing an average increase of 48.8 percentage points. The highest post-test mastery was found for reciting numbers 1–20 correctly and sequentially, achieved by 19 children (90.5%). The largest change occurred in sequencing numeral symbols, which increased by 52.4 percentage points.

The strong improvement in verbal sequencing is consistent with research demonstrating that structured number play can strengthen counting, numeral identification, numerical magnitude knowledge, and number-sequence representations [22]. Evidence from linear number-board activities further indicates that arranging numbers in an ordered spatial sequence can support children’s understanding of numerical order and magnitude [23]. In TASPIN, these processes may have been reinforced through repeated coordination among spoken number words, movable quantities, and printed numerals.

Although all indicators improved substantially, post-test mastery was comparatively lower for counting with number symbols and sequencing numeral symbols. These activities require children to connect quantities and number words with conventional written notation, which is more complex than reciting a memorized verbal sequence. Longitudinal evidence similarly identifies early numeracy as a multidimensional construct in which counting, numerical-relational knowledge, and basic arithmetic skills may develop at different rates [24]. Consequently, children who can recite numbers correctly may still require additional support to understand the quantities and ordinal relations represented by those symbols.

Table 2. Comparison of Numeracy Mastery in the Cloud Class ($n = 21$)

No.	Numeracy indicator	Pre-test mastery, n	Pre-test (%)	Post-test mastery, n	Post-test (%)	Change (percentage points)
1	Reciting numbers 1–20 correctly and sequentially	10	47.6	20	95.2	+47.6
2	Counting using number symbols	8	38.1	18	85.7	+47.6
3	Matching quantities with numerals	9	42.9	19	90.5	+47.6
4	Sequencing numeral symbols correctly	7	33.3	18	85.7	+52.4
Mean across indicators		8.5	40.5	18.8	89.3	+48.8

Table 2 shows a comparable pattern in the Cloud Class. Mean mastery increased from 40.5% at pre-test to 89.3% at post-test, also representing an average increase of 48.8 percentage

points. Reciting numbers 1–20 produced the highest post-test mastery, with 20 children (95.2%) attaining at least the BSH level. Numeral sequencing again showed the largest change, increasing by 52.4 percentage points.

The consistency of the gains across the two classes suggests that TASPIN could be implemented with similar classroom results in both groups. The pattern is also compatible with findings from early mathematics interventions organized around sequenced learning trajectories, which have produced improvements across counting, number, arithmetic, geometry, and patterning domains [25]. TASPIN's design may have supported this progression by allowing children to move repeatedly between concrete quantities, spoken number words, and symbolic representations.

The Geometric Sequence Board adds an important dimension beyond basic counting. Patterning activities require children to identify a repeating unit, anticipate the next element, and generalize a rule. Research has shown that preschool patterning knowledge is related to broader mathematics performance and can be strengthened through targeted instruction [26]. Longitudinal evidence also indicates that preschool counting and patterning knowledge can predict later mathematics achievement, while symbolic mapping and calculation become increasingly important during the primary-school years [27]. Thus, the improvement in numeral sequencing may reflect not only memorization but also emerging recognition of order and regularity.

The nearly identical mean shifts in the two classes are noteworthy, but they should not be interpreted as proof that the intervention would produce the same effect in other settings. Baseline mastery was slightly higher in the Cloud Class, and the present analysis reports only mastery counts and percentages. Nevertheless, the observed improvements concern foundational competencies that have been associated with later academic achievement in longitudinal studies [28]. Follow-up assessments would therefore be useful to determine whether children retain these competencies and can transfer them to unfamiliar materials and problems.

C. Qualitative Results and Discussion

The qualitative findings complement the quantitative data by illustrating how children interacted with TASPIN during the learning process. Structured field notes identified three recurring themes: sustained cognitive engagement, spontaneous peer collaboration, and reduced hesitation during numeracy activities.

These observations are broadly consistent with a systematic review and meta-analysis indicating that guided play can benefit children's learning when playful activity is combined with an identifiable learning objective and appropriate adult guidance [29]. However, play-based learning encompasses different levels of child choice and teacher direction, and its

educational value depends on how activities are structured and facilitated [30]. TASPIN is therefore best characterized as a guided-play medium: children are free to manipulate and test the pieces, while the teacher establishes the numerical objective, poses questions, and provides scaffolding when necessary [31]. Evidence from guided-play research in early geometry also suggests that playful exploration accompanied by targeted prompts can produce stronger conceptual learning than free play without guidance or highly didactic instruction [32].

1. Sustained Cognitive Engagement and Attention

Before TASPIN was introduced, most children maintained attention for approximately 8–10 minutes during worksheet-based numeracy activities. During TASPIN sessions, children generally remained engaged for approximately 25–30 minutes while manipulating the felt pieces, matching quantities and numerals, and completing the assigned tasks. They demonstrated curiosity and persistence and required fewer teacher reminders to return to the activity.

This observation suggests that TASPIN changed the mode of participation from primarily passive worksheet completion to active manipulation and decision-making. According to the ICAP framework, learning activities are more cognitively engaging when learners actively manipulate information, construct responses, or interact with others rather than merely receive information [33]. TASPIN supported active engagement because children had to select, position, compare, and revise the objects. Some activities became constructive when children explained why a quantity matched a particular numeral or predicted the next element of a pattern.

However, longer participation should not automatically be interpreted as deeper learning. Some of the extended engagement may have resulted from the novelty, color, or tactile characteristics of the medium. Future observations should therefore distinguish behavioral engagement—such as time on task—from cognitive engagement, such as explaining numerical relationships, selecting efficient strategies, or transferring a concept to a different representation.

2. Spontaneous Socio-Collaborative Peer Interaction

TASPIN naturally encouraged children to work in pairs or small groups. Children took turns completing activities, observed their peers' strategies, and voluntarily assisted classmates who experienced difficulty matching number pieces or completing the number-egg puzzle. They also discussed possible answers and corrected mismatched pieces without always waiting for teacher direction.

These behaviors indicate that the medium functioned not only as an individual manipulative but also as a shared problem-solving space. Research on collaborative learning shows that productive group work depends on whether learners acknowledge,

discuss, and build upon one another's proposals [34]. Providing an answer alone is generally less beneficial than offering an explanation and enabling the recipient to apply that explanation in a subsequent task [35]. Therefore, teachers should encourage children to verbalize their reasoning—for example, by asking, "How do you know that these two pieces match?"—rather than allowing one child simply to provide the correct piece.

The observations are also consistent with social interdependence theory, which emphasizes shared goals, individual participation, and supportive interaction as central conditions for productive cooperative learning [36]. In future implementation, turn-taking rules and role rotation should be used to ensure that children with stronger numeracy skills do not dominate the material. Each child could alternately act as the *matcher*, *counter*, *checker*, or *explainer*, thereby maintaining individual accountability within the shared task.

3. Reduced Hesitation and Anxiety During Numeracy Activities

Unlike worksheet activities, TASPIN allowed children to manipulate, remove, and rearrange learning materials without leaving a permanent record of an incorrect answer. When an error occurred, children repositioned the felt pieces and attempted the task again. They consequently appeared more willing to participate, more confident in proposing answers, and less hesitant after making mistakes.

This behavior is pedagogically important because mathematics anxiety can emerge in the early elementary years and is associated with the use of less advanced problem-solving strategies [37]. Anxiety can also consume working-memory resources required for numerical processing and problem solving [38]. TASPIN's reversible pieces may have reduced the perceived cost of an error: an incorrect answer became a temporary arrangement to be reconsidered rather than a permanent mark to be evaluated.

The medium also generated immediate visual and tactile feedback. Children could compare a numeral with a represented quantity, check whether two halves formed a correct pair, or revise an outfit combination when the arithmetic result did not match. Feedback is most useful when it provides information about the task, the strategy used, and the next step required for improvement [39]. Teachers should therefore supplement the material's self-correcting characteristics with process-focused feedback, such as "Count the dots again and check whether they match the numeral," instead of merely stating that an answer is right or wrong.

Integrated Interpretation and Study Limitations

Taken together, the quantitative and qualitative findings indicate that TASPIN implementation was accompanied by higher numeracy mastery, longer participation, greater peer interaction, and more willingness to revise incorrect responses. A plausible interpretation is that TASPIN combined several potentially supportive mechanisms: concrete representation,

repeated number–quantity mapping, ordered numerical activity, pattern recognition, active manipulation, immediate feedback, and guided peer interaction.

Nevertheless, the design does not establish that TASPIN alone caused the observed gains. The absence of a comparison group means that maturation, repeated exposure to the assessment, teacher assistance, or concurrent classroom instruction cannot be ruled out. In addition, percentages based on 21 children per class can change considerably when the mastery status of only one child changes. The tables report the proportion reaching a developmental threshold but do not show individual score changes, score distributions, measurement reliability, or statistical significance.

Future studies should therefore incorporate a comparison or control condition, individual-level pre-test and post-test scores, validated numeracy measures, inter-rater reliability for observational scoring, delayed post-tests, and effect-size estimates. It would also be valuable to examine performance separately for each TASPIN module so that improvements can be linked more precisely to finger counting, number–quantity matching, arithmetic, patterning, or sorting activities. These additions would provide stronger evidence regarding TASPIN's effectiveness, retention effects, and transfer to numeracy tasks completed without the physical medium.

Conclusion

This study successfully developed TASPIN (Tas Pintar) as a portable non-digital learning medium to support the numeracy skills of children aged 5–6 years. The findings demonstrated that the implementation of TASPIN improved children's numeracy performance across all assessed indicators in both the Sky Class and the Cloud Class. In addition to the quantitative improvement, classroom observations revealed positive changes in children's learning behaviors, including greater engagement, sustained attention, increased peer collaboration, and higher confidence during numeracy activities. These findings indicate that integrating hands-on and play-based learning experiences through TASPIN can effectively support early numeracy development in kindergarten classrooms.

The findings of this study suggest that TASPIN is a practical and feasible non-digital learning medium that can enrich numeracy learning activities, particularly in educational settings with limited access to digital resources. Its portable design and interactive features provide teachers with an alternative instructional medium that encourages active participation and collaborative learning. Future research is recommended to involve larger and more diverse samples, implement the media over a longer intervention period, and examine its effectiveness across different early childhood education settings to strengthen the generalizability of the findings.

Conflict of Interest

The authors declare no conflict of interest.

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