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Stimulating Early Childhood Numeracy through a Modified Sunda Manda Game: A Classroom Action Research

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ABSTRACT

Background: Numeracy is a foundation for later learning, yet early numeracy is often taught through verbal drills and worksheets that leave young children unenthusiastic.

Methods: Classroom action research (Kemmis and McTaggart) was conducted in two cycles with 15 children aged 5–6 years at RA Al-Hidayah, Kroya, Cilacap, using a five-indicator numeracy checklist and interviews.

Results: Class numeracy achievement rose from 28.9% in the pre-cycle to 56.4% in Cycle I and 82.6% in Cycle II, and children became more active and confident in counting independently.

Novelty: The study modifies the traditional Sunda Manda game with numbers, colours, and pictures integrated into Merdeka Curriculum themes, combining embodied movement and numeracy tasks in a culturally familiar format.

Conclusion: Modified Sunda Manda is a low-cost, culturally relevant alternative for stimulating early numeracy.

KEYWORDS

numeracy; early childhood; traditional games; Sunda Manda; classroom action research.

Introduction

Early numeracy is a strong predictor of later academic achievement (Duncan et al. 2007), and early mathematics learning is most effective when it follows children's developmental learning trajectories through concrete, playful experiences (Clements and Sarama 2014). Numeracy is not limited to adding, subtracting, multiplying, or dividing; it is the ability to apply number concepts and reasoning to solve problems in various everyday contexts (Han et al. 2017). In Indonesia, early childhood education aims to stimulate children's physical and spiritual growth so that they are ready for further education (Republik Indonesia 2003; Kemendikbud 2014), and the Merdeka Curriculum explicitly emphasises fostering an early love of literacy and numeracy (Kemendikbudristek 2022).

Young children learn best through play: activities carried out with pleasure and without coercion, yet structured to produce developmental outcomes (Yogman et al. 2018). Traditional games are particularly valuable because they combine play with the transmission of local culture (Mulyani 2016). One such game is Sunda Manda, a hopscotch game known by different names across Indonesia, in which children throw a flat token (gacuk) onto a grid and hop through the squares. Sunda Manda trains balance, communication, social skills, and logical thinking (Wardoyo and Ngaisah 2023). When the grid is

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enriched with numbers, colours, and shapes, it provides concrete experiences for recognising patterns, shapes, and counting (Arvy 2024). Previous studies have reported that theme-based and numeracy-oriented modifications of Sunda Manda improved children's early mathematics abilities (Saputro, Sugiyo, and Utanto 2023; Yuniati, Kristiana, and Rusdiani 2024).

Preliminary observation in Group B of RA Al-Hidayah, Kroya, showed that children's numeracy was still low. Numeracy was taught monotonously through teacher recitation and the children's worksheets, so children were unenthusiastic, and teachers seldom introduced new games to stimulate numeracy. To address this problem, the researcher modified Sunda Manda by adding numbers, colours, and attractive pictures to each square while preserving the game's original character. This study aimed to examine how the modified Sunda Manda game could improve the numeracy skills of children aged 5–6 years.

Methods

Research Design

This study used classroom action research based on the Kemmis and McTaggart model, in which each cycle comprises planning, acting, observing, and reflecting (Kemmis, McTaggart, and Nixon 2014). The study was conducted in two cycles, each consisting of two meetings, following the institution's thematic topics: Land Transportation in Cycle I and Digital Literacy (within the topic Exploring Technology) in Cycle II (Figure 1).

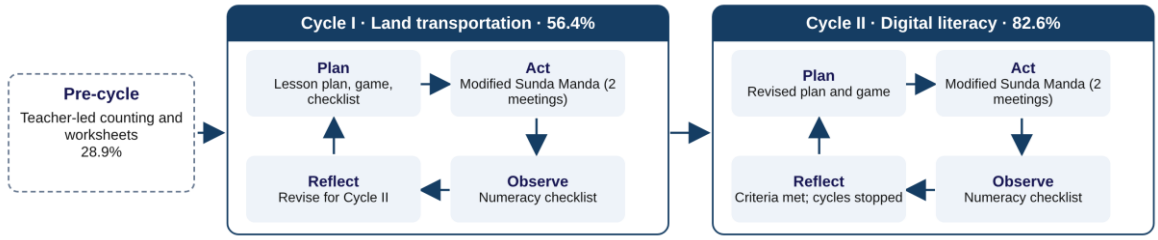


Figure 1. Classroom action research cycles based on the Kemmis and McTaggart model

Participants and Setting

The study took place at RA Al-Hidayah, Bajing, Kroya District, Cilacap Regency, from January to February 2025. Participants were 15 children aged 5–6 years in Group B.

Intervention

The modified Sunda Manda game retained the traditional rules: the grid was laid on the floor or schoolyard, and children threw a gacuk onto a target square before hopping through the grid. The modifications consisted of numbers, colours, and pictures on each square, and foam puzzle mats bearing pictures or numerals that could be arranged as the grid. During the game, children practised recognising numerals, counting, and simple addition and subtraction using the numbers and pictures on the squares. Table 1 compares the traditional and modified versions.

Table 1. Comparison of the traditional and modified Sunda Manda games

Aspect	Traditional Sunda Manda	Modified Sunda Manda
Grid	Plain squares drawn on the ground	Squares with numbers, colours, and pictures; foam puzzle mats can be used
Rules	Throw the gacuk and hop through the squares	Same rules, retaining the original character of the game
Learning content	Balance and social play	Numeral recognition, counting, and simple addition and subtraction

Aspect	Traditional Sunda Manda	Modified Sunda Manda
Theme	Not linked to learning themes	Integrated with classroom topics (transportation, technology)

Data Collection and Analysis

Data were collected through observation using a numeracy checklist covering five indicators (Table 2) and through interviews with the principal and class teacher. Observation scores were converted into class achievement percentages, P = (Σ obtained score / Σ maximum score) × 100%, for the pre-cycle and each cycle. Qualitative data from observation notes and interviews were analysed through reflection at the end of each cycle to identify obstacles and plan improvements. The action was considered successful when all indicators had been achieved and the class average reached the "starting to be consistent" category.

Table 2. Numeracy indicators observed

No	Indicator	Description
1	Recognising number symbols	Names and identifies numerals 1–10 on the squares
2	Counting 1–10	Counts in sequence while hopping or reading the squares
3	Counting objects	Counts pictured or concrete objects correctly
4	Simple addition	Combines two small quantities and states the total
5	Simple subtraction	Removes a small quantity and states what remains

Results

Class numeracy achievement increased consistently across the cycles (Table 3 and Figure 2). In the pre-cycle, achievement was low at 28.9%. Many children were passive, lacked confidence, and depended on the teacher when counting or naming numerals.

In Cycle I, the modified Sunda Manda game was implemented within the Land Transportation topic. Achievement rose to 56.4%, an increase of 27.5 percentage points. Children were enthusiastic about the game and began to recognise numerals and count objects, but the success criteria had not yet been met, so the plan was revised for the next cycle based on reflection.

In Cycle II, implemented within the Digital Literacy subtopic, achievement reached 82.6%, a further increase of 26.2 percentage points. Children not only recognised numerals and counted objects correctly but also began to understand simple addition and mathematical symbols. Children who had previously been passive and lacked confidence took the initiative, tried counting independently, and participated actively. Because all indicators were achieved and the class average reached the "starting to be consistent" category, the action was deemed successful and the research was concluded after Cycle II.

Table 3. Class numeracy achievement across cycles

Stage	Achievement (%)	Increase (percentage points)
Pre-cycle	28.9	–
Cycle I	56.4	+27.5
Cycle II	82.6	+26.2

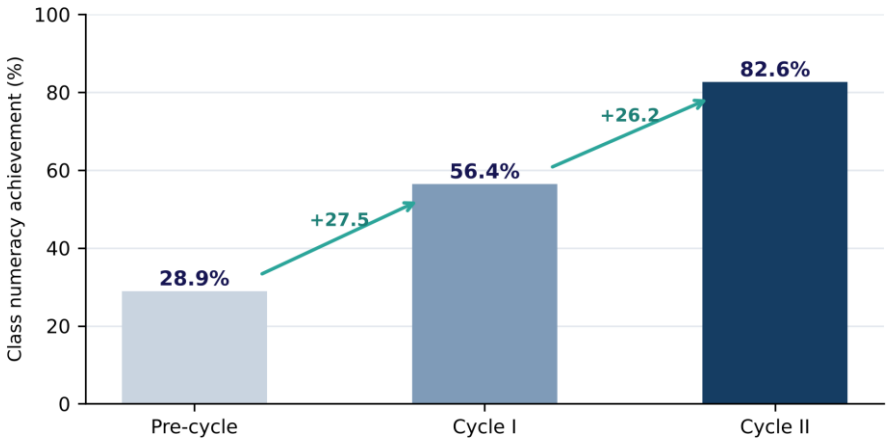


Figure 2. Class numeracy achievement in the pre-cycle, Cycle I, and Cycle II

Discussion

The findings show that the modified Sunda Manda game improved children's numeracy, nearly tripling class achievement from the pre-cycle to Cycle II. Several mechanisms can explain this result. First, the game provides concrete and multisensory experiences. Numbers, colours, and pictures on the squares link abstract symbols to visible quantities and positions, which supports the concrete learning that characterises children aged 5–6 years (Clements and Sarama 2014; Arvy 2024).

Second, the game embodies number concepts in movement. As children hop along a sequence of numbered squares, they physically experience order and magnitude, much like moving along a number line. Embodied training in which children walk along a number line has been shown to improve numerical understanding more than comparable non-embodied training (Link et al. 2013). Combining gross motor activity with counting may therefore strengthen children's mental representation of numbers.

Third, the playful and culturally familiar format increased children's engagement. Monotonous recitation and worksheets had left children unenthusiastic; in contrast, the game offered enjoyment, turn-taking, and peer interaction, which encouraged passive children to participate and attempt counting independently (Yogman et al. 2018; Wardoyo and Ngaisah 2023). These results are consistent with previous studies showing that Sunda Manda and its modifications improve early mathematics and numeracy (Saputro, Sugiyo, and Utanto 2023; Yuniati, Kristiana, and Rusdiani 2024), and they extend this evidence by integrating the game with thematic topics in the Merdeka Curriculum. The game also helps preserve traditional games for younger generations (Mulyani 2016).

For practice, teachers can use modified Sunda Manda as a regular numeracy activity, adapting the numbers, pictures, and tasks to each theme and gradually increasing difficulty from numeral recognition to simple addition and subtraction. Low-cost materials such as chalk, tape, or foam mats make the game feasible for most early childhood settings.

Limitations

This study has limitations inherent in classroom action research. It involved a single class of 15 children without a comparison group, so improvements cannot be attributed solely to the game; maturation and repeated exposure to the observation tasks may also have contributed. Observations were not verified by an independent rater, and the analysis relied on descriptive percentages. Future studies should use quasi-experimental designs with comparison groups, independent observers, and standardised early numeracy assessments.

Conclusion

Classroom action research in two cycles showed that the modified Sunda Manda game improved the numeracy skills of children aged 5–6 years in Group B of RA Al-Hidayah, Kroya, with class achievement rising from 28.9% in the pre-cycle to 56.4% in Cycle I and 82.6% in Cycle II. The game integrates gross motor movement, visual media, and counting activities in an enjoyable and interactive atmosphere, helping children recognise numerals, count objects, and begin to understand simple addition and subtraction. Modified Sunda Manda can therefore serve as a culturally relevant and low-cost alternative for stimulating early childhood numeracy.

Disclosure Statement

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