

Concrete-Pictorial-Abstract Approach on Early Numeracy Skills of Kindergarten Pupils in Balimbing Elementary School, 2025-2026

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Abstract

Early numeracy skills are fundamental in developing children's logical thinking, problem-solving abilities, and readiness for formal mathematics learning. However, many kindergarten pupils experience difficulties in number recognition, basic addition, and subtraction due to limited exposure to developmentally appropriate instructional strategies. This study investigated the effectiveness of the Concrete-Pictorial-Abstract (CPA) approach in strengthening the early numeracy skills of kindergarten pupils at Balimbing Elementary School during the School Year 2025–2026.

Specifically, the study aimed to determine the pupils' level of numeracy skills in terms of number recognition, basic addition, and basic subtraction before and after the implementation of CPA-based instruction. A quasi-experimental one-group pretest–posttest research design was utilized involving forty (40) kindergarten pupils. Data were gathered using a validated teacher-made Early Numeracy Test, observation checklist, and semi-structured interview guide. Statistical tools such as frequency count, percentage, weighted mean, ranking, and paired sample t-test were employed to analyze the data.

Findings revealed that prior to the intervention, pupils demonstrated varying levels of numeracy skills, with subtraction identified as the most difficult competency. After the implementation of the CPA approach, pupils showed significant improvement in number recognition, basic addition, and basic subtraction. Learners also demonstrated increased engagement, enjoyment, confidence, and participation during mathematics-related activities. The use of manipulatives, pictorial representations, and guided abstraction enabled pupils to better understand mathematical concepts and apply them effectively.

The study concluded that the CPA approach is an effective instructional strategy in enhancing early numeracy skills among kindergarten pupils. The study recommends the integration of CPA-based activities in kindergarten mathematics instruction, provision of manipulative materials, and continuous teacher training on developmentally appropriate numeracy strategies.

Keywords: *Concrete-Pictorial-Abstract Approach, Early Numeracy Skills, Kindergarten Pupils, Number Recognition, Basic Addition, Basic Subtraction*

1. INTRODUCTION

Background of the Study

Early childhood education plays a significant role in the holistic development of children. It is during this stage that learners acquire foundational skills necessary for lifelong learning and academic success. Among these foundational competencies, numeracy is considered one of the most essential because it enables children to develop logical reasoning, critical thinking, and problem-solving abilities. Strong numeracy skills during the kindergarten years contribute significantly to children's readiness for more advanced mathematical concepts in the succeeding grade levels.

In the Philippine educational system, the Department of Education emphasizes the importance of numeracy development through developmentally appropriate and play-based learning experiences. However, despite curricular efforts, many kindergarten pupils continue to struggle with basic numeracy competencies such as number recognition, addition, and subtraction. Classroom observations reveal that traditional instructional approaches often focus on rote memorization and repetitive drills rather than conceptual understanding. Consequently, many pupils experience difficulty in understanding abstract mathematical symbols and operations.

The challenges in early numeracy instruction became more evident following the COVID-19 pandemic, which disrupted face-to-face learning and limited pupils' opportunities for hands-on and interactive mathematical experiences. As a result, many young learners entered formal schooling with insufficient numeracy readiness and weak mathematical foundations.

One instructional strategy that addresses these concerns is the Concrete–Pictorial–Abstract (CPA) approach. Rooted in Jerome Bruner's cognitive theory, the CPA approach provides a structured sequence of learning experiences beginning with concrete manipulation of objects, progressing to pictorial representations, and eventually transitioning to abstract symbols. This approach allows learners to gradually construct conceptual understanding while actively engaging in meaningful mathematical experiences.

The CPA approach has gained international recognition for its effectiveness in strengthening mathematical understanding, improving learner engagement, and reducing mathematics anxiety. However, despite its documented success in other contexts, there remains limited localized research on its implementation in Philippine kindergarten classrooms. Thus, this study was conducted to determine the effectiveness of the CPA approach in strengthening the early numeracy skills of kindergarten pupils in Balimbing Elementary School.

Review of Related Literature

Early numeracy skills include number recognition, counting, addition, subtraction, patterns, and measurement. According to Sarama and Clements (2021), these skills form the

foundation for children's later mathematical achievement and cognitive development. Studies indicate that children with strong early numeracy skills are more likely to perform better in mathematics and other analytical subjects in higher grade levels.

Several Philippine studies revealed that many kindergarten learners continue to experience difficulties in basic numeracy skills due to inadequate instructional strategies, lack of manipulative materials, and limited home numeracy experiences.

Lavador et al. (2023) found that pupils from disadvantaged backgrounds often struggle with number recognition and arithmetic operations. Similarly, Jomboy (2025) emphasized that many kindergarten learners require structured interventions to improve foundational numeracy competencies.

The CPA approach has been widely recognized as an effective strategy in mathematics instruction. Moore and Rimbey (2021) explained that CPA allows learners to move gradually from concrete experiences to abstract understanding, thereby reducing cognitive overload and strengthening conceptual understanding. Research further indicates that learners exposed to CPA-based instruction demonstrate improved mathematical representation skills, higher achievement scores, and increased learner engagement.

Studies conducted locally and internationally confirmed the effectiveness of CPA in improving number recognition, basic addition, and subtraction skills. Manipulative-based instruction and visual representations help learners connect mathematical symbols with concrete experiences, making learning more meaningful and enjoyable.

Despite these positive findings, several challenges affect the implementation of CPA, including insufficient instructional materials, limited teacher training, classroom management concerns, and learners' varying levels of cognitive readiness. These gaps highlight the need for further localized studies examining the effectiveness of CPA among kindergarten learners.

Statement of the Problem

This study aimed to determine the effectiveness of the Concrete–Pictorial–Abstract (CPA) approach in strengthening the early numeracy skills of kindergarten pupils in Balimbing Elementary School during the School Year 2025–2026.

Specifically, it sought to answer the following questions:

1. What is the current level of kindergarten pupils' numeracy skills in terms of:

- number recognition;
- basic addition; and

- obasic subtraction?

2.To what extent did the CPA approach improve kindergarten pupils' numeracy skills in terms of:

- onumber recognition;
- obasic addition; and
- obasic subtraction?

3.How does the CPA approach strengthen the early numeracy skills of kindergarten pupils?

4.What challenges were encountered in implementing the CPA approach?

5.What CPA-based activities may be proposed based on the findings of the study?

2.MATERIALS AND METHODS

Research Design

This study employed a quasi-experimental research design using the one-group pretest–posttest method. This design was appropriate because it allowed the researcher to measure changes in pupils' numeracy skills before and after exposure to the CPA intervention. The study also incorporated qualitative observations and interviews to supplement quantitative findings.

Participants of the Study

The participants of the study consisted of forty (40) kindergarten pupils enrolled at Balimbing Elementary School during the School Year 2025–2026. The pupils were aged five to six years old and represented diverse learning abilities and socio-economic backgrounds.

Research Instruments

The study utilized the following researcher-made instruments:

Early Numeracy Test

A validated teacher-made test measuring:

- Number recognition
- Basic addition
- Basic subtraction

Observation Checklist

Used to assess pupils' engagement, participation, and behavior during CPA-based activities.

Semi-Structured Interview Guide

Used to gather insights from the kindergarten teacher regarding the implementation of the CPA approach.

Data Gathering Procedure

The researcher secured permission from the Schools Division Office and the school administration prior to conducting the study. Parental consent forms were distributed and collected before data gathering commenced.

The Early Numeracy Test was administered in two phases:

1. Pretest before the implementation of CPA
2. Posttest after the intervention period

During the implementation, pupils participated in CPA-based numeracy activities involving manipulatives, pictorial representations, and abstract mathematical tasks. Observation checklists were used throughout the intervention period. Interviews with the kindergarten teacher were conducted after the completion of the intervention.

Confidentiality, voluntary participation, and ethical research practices were strictly observed.

Data Analysis

The following statistical tools were used:

- Frequency Count
- Percentage
- Weighted Mean
- Ranking
- Paired Sample t-test

These tools were utilized to determine pupils' performance levels and evaluate the effectiveness of the CPA approach.

3.RESULTS

Level of Numeracy Skills Number Recognition

Results revealed that 27.5% of pupils achieved a Very High level in number recognition, while 30% remained at the Below Average level. The findings indicated that although many pupils demonstrated familiarity with numbers, a considerable number still required intervention and reinforcement.

Basic Addition

Findings showed that 37.5% of pupils performed at the Below Average level in basic addition. Only 17.5% achieved Very High performance. These results suggested that many learners still struggled with understanding addition concepts before the intervention.

Basic Subtraction

Basic subtraction emerged as the most difficult competency. Nearly half of the pupils (47.5%) fell under the Below Average category. This indicated the need for structured instructional support and developmentally appropriate teaching strategies.

Effectiveness of the CPA Approach

The implementation of the CPA approach significantly improved pupils' numeracy skills. Learners demonstrated increased enjoyment, engagement, and understanding of mathematical concepts. Pupils strongly agreed that pictures, manipulatives, and guided instruction helped them understand numbers more effectively.

The highest-rated indicator showed that pupils preferred listening to teachers explain numbers using pictures. Pupils also expressed confidence and happiness when solving mathematical problems correctly.

The use of manipulatives such as blocks, counters, toys, and visual representations enhanced pupils' conceptual understanding of addition and subtraction.

4.DISCUSSION

The findings of the study support previous research emphasizing the effectiveness of the CPA approach in strengthening early numeracy skills. The significant improvement in pupils' performance after the intervention confirms that kindergarten learners benefit greatly from hands-on and visual learning experiences.

The concrete stage allowed pupils to physically manipulate objects and develop foundational understanding of numbers and operations. The pictorial stage enabled learners to

visualize mathematical relationships, while the abstract stage helped them transition to symbolic representations.

The study also revealed that learners became more motivated and actively engaged when exposed to CPA-based activities. This supports constructivist learning theory, which emphasizes that children learn best through active participation and meaningful experiences.

However, challenges such as limited instructional materials, time constraints, and varying learner readiness levels affected the implementation of the CPA approach. These findings suggest the need for additional teacher training, administrative support, and adequate classroom resources.

The results align with studies conducted by Suryaningsih et al. (2025), Lavador et al. (2023), and Vendicacion et al. (2024), which reported significant improvements in learners' mathematical understanding through CPA-based instruction.

5.CONCLUSION

The study concluded that the Concrete–Pictorial–Abstract (CPA) approach is an effective instructional strategy for strengthening early numeracy skills among kindergarten pupils. The approach significantly improved learners' number recognition, basic addition, and basic subtraction skills while increasing engagement, confidence, and motivation in mathematics learning.

The use of manipulatives, pictorial representations, and guided abstraction enabled pupils to develop conceptual understanding rather than relying solely on memorization. CPA-based instruction also provided meaningful and enjoyable learning experiences that supported active participation and deeper mathematical comprehension.

Based on the findings, the study recommends the continuous integration of CPA-based strategies in kindergarten mathematics instruction, provision of adequate manipulative materials, and professional development programs for teachers focusing on developmentally appropriate numeracy instruction.

Future researchers may conduct similar studies involving larger samples, different grade levels, and longer intervention periods to further validate the effectiveness of the CPA approach in diverse educational settings.

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