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PLAY-BASED MATHEMATICS INSTRUCTION AND EARLY LEARNING ENGAGEMENT AMONG KINDERGARTEN LEARNERS IN A RURAL PHILIPPINE INTEGRATED SCHOOL CONTEXT

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ABSTRACT

This qualitative study explored play-based mathematics instruction and early learning engagement among Kindergarten learners at Marannao Integrated School, Marannao, San Mariano, Isabela. The study aimed to examine how play-based instructional practices influence learner participation, motivation, and engagement in early mathematics education within a rural Philippine school setting. Using a descriptive qualitative research design, data were gathered through semi-structured interviews, classroom observations, and document analysis involving Kindergarten teachers and selected learners. Thematic analysis revealed four major themes: (1) interactive and play-centered mathematics instruction, (2) active learner participation and engagement through play, (3) contextualized and developmentally appropriate learning experiences, and (4) classroom and instructional challenges in implementing play-based mathematics education. Findings showed that play-based instructional approaches such as games, manipulatives, storytelling, songs, and collaborative activities significantly enhanced learners' participation, confidence, and interest in mathematics. Learners became more engaged when lessons involved movement, colorful materials, and enjoyable classroom interaction. However, inadequate instructional resources, limited classroom space, and learner attention span challenges affected instructional implementation. The study concludes that play-based mathematics instruction contributes positively to early learning engagement and meaningful mathematics experiences among Kindergarten learners. Strengthening instructional support, teacher training, and classroom resources is recommended to sustain developmentally appropriate and learner-centered mathematics education in rural schools.

Keywords: *play-based learning, mathematics instruction, learner engagement, Kindergarten education, rural education, early childhood education, qualitative study, Philippines*

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I. INTRODUCTION

Early childhood education plays a significant role in developing learners' foundational cognitive, social, emotional, and behavioral skills. Among the core learning areas in Kindergarten education, mathematics is essential in strengthening learners' problem-solving abilities, logical thinking, numeracy skills, and cognitive development. However, teaching mathematics to young learners requires developmentally appropriate instructional approaches that sustain learner participation, curiosity, and engagement.

Play-based instruction has become one of the most widely recognized pedagogical approaches in early childhood education because it promotes active participation, exploration, creativity, and experiential learning among young learners. In mathematics education, play-based instructional practices allow learners to explore mathematical concepts through games, manipulatives, songs, storytelling, role-playing, and interactive activities. Such approaches make learning enjoyable and meaningful while supporting learners' developmental needs and attention spans.

Learner engagement is particularly important in Kindergarten mathematics instruction because young learners learn best through active interaction, movement, exploration, and hands-on experiences. Engaged learners demonstrate participation, attentiveness, enjoyment, and willingness to interact during classroom activities. Play-based learning environments create opportunities for learners to actively construct knowledge and develop mathematical understanding through social and experiential experiences.

In rural Philippine schools, Kindergarten teachers often encounter challenges related to inadequate instructional materials, limited classroom resources, insufficient manipulatives, and diverse learner needs. Despite these limitations, teachers continuously adapt instructional approaches and maximize locally available resources to provide meaningful learning experiences for young learners. Previous studies revealed that play-based and experiential instructional practices significantly improve learner engagement, classroom participation, and foundational mathematics learning in early childhood education. However, limited qualitative investigations have explored the experiences of Kindergarten teachers implementing play-based mathematics instruction within rural Philippine school settings.

This study therefore aimed to explore play-based mathematics instruction and early learning engagement among Kindergarten learners at Marannao Integrated School, Marannao, San Mariano, Isabela.

Specifically, the study sought to answer the following questions:

I. What play-based instructional practices are utilized in Kindergarten mathematics education?
II. How do Kindergarten learners demonstrate engagement during play-based mathematics activities?
III. What challenges do teachers encounter in implementing play-based mathematics instruction?
IV. What implications may be derived for improving early mathematics education in rural schools?

Review of Related Literature

Play-Based Learning in Early Childhood Education

Play-based learning refers to instructional approaches that utilize games, exploration, interaction, and experiential activities to facilitate learning among young children. According to Jean Piaget, children learn effectively through active exploration and interaction with their environment (Piaget, 1952). Play allows learners to develop cognitive, social, emotional, and problem-solving skills through meaningful experiences.

Research indicates that play-based instruction improves

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learner participation, motivation, creativity, and classroom interaction in early childhood education (Pyle & Danniels, 2017). Play-centered classrooms encourage learners to actively participate in learning activities while promoting enjoyment and curiosity.

Mathematics Instruction in Kindergarten Education

Kindergarten mathematics instruction focuses on foundational numeracy skills such as counting, number recognition, patterns, shapes, measurement, and problem-solving. Effective mathematics instruction in early childhood education emphasizes experiential, hands-on, and developmentally appropriate learning experiences.

Studies revealed that manipulatives, games, songs, storytelling, and interactive classroom activities strengthen mathematical understanding and learner participation among young learners (Sarama & Clements, 2009). Mathematics learning becomes more meaningful when learners are actively engaged in concrete and interactive learning experiences.

Learner Engagement in Early Learning

Learner engagement refers to learners' active participation, emotional involvement, and cognitive investment in learning activities (Fredricks et al., 2004). In Kindergarten classrooms, engagement is reflected through attentiveness, participation, enthusiasm, interaction, and willingness to participate in classroom activities.

Research suggests that young learners demonstrate stronger engagement when instructional activities are enjoyable, interactive, colorful, and movement-oriented (Bodrova & Leong, 2015). Play-based learning environments create supportive and learner-centered classrooms that sustain children's attention and participation.

Challenges in Rural Early Childhood Education

Rural schools frequently encounter challenges related to limited instructional materials, inadequate classroom facilities, insufficient learning resources, and diverse learner needs (OECD, 2019). Kindergarten teachers often improvise instructional materials and adapt activities according to available community resources and classroom conditions.

Despite these limitations, teachers demonstrate creativity and resilience in implementing meaningful and engaging instructional practices for young learners. However, institutional support and resource augmentation remain essential in sustaining quality early childhood education.

II. METHODOLOGY

Research Design

This study utilized a descriptive qualitative research design to explore play-based mathematics instruction and learner engagement experiences among Kindergarten learners in a rural Philippine integrated school context. The qualitative approach enabled the researcher to examine participants' lived experiences, instructional practices, classroom interaction, and learner engagement within natural educational settings.

Research Locale

The study was conducted at Marannao Integrated School located in Marannao, San Mariano, Isabela, Philippines. The school serves learners from rural farming communities and reflects the realities of early childhood education in geographically challenged and resource-limited school environments.

Participants of the Study

The participants included six Kindergarten teachers and ten selected Kindergarten learners. Participants were selected through purposive sampling based on their involvement and experiences in Kindergarten mathematics instruction and classroom learning activities.

Data Gathering Procedures

Data were gathered through:

- Semi-structured interviews
- Classroom observations
- Document analysis of lesson plans, activity sheets, manipulatives, and instructional materials

Interviews explored teachers' instructional practices, learner engagement experiences, classroom strategies, and challenges encountered during mathematics instruction.

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Classroom observations focused on learner participation, teacher-learner interaction, classroom routines, and play-based instructional activities.

Data Analysis

Data were analyzed using thematic analysis following the framework developed by Virginia Braun and Victoria Clarke (2006). Coding, categorization, and theme generation were conducted systematically to identify meaningful patterns and interpretations from the collected qualitative data.

Trustworthiness of the Study

Credibility was established through triangulation and member checking. Dependability was ensured through audit trails and organized documentation of research procedures. Confirmability and transferability were strengthened through detailed descriptions of the research context, participants, and findings.

Ethical Considerations

Ethical principles such as informed consent, confidentiality, anonymity, voluntary participation, and respect for participants were strictly observed throughout the conduct of the study. Permission from school authorities and parental consent for learner participants were secured prior to data gathering activities.

III. RESULTS AND DISCUSSION

Theme 1: Interactive and Play-Centered Mathematics Instruction

The findings revealed that Kindergarten teachers at Marannao Integrated School primarily utilized interactive and play-centered instructional approaches to make mathematics learning enjoyable, meaningful, and developmentally appropriate for young learners. Teachers emphasized that learners became more engaged and participative when mathematics lessons involved games, songs, manipulatives, storytelling, and movement-based activities.

One participant shared:

"Mas natututo ang mga bata kapag parang laro lang ang math activities."

Another teacher explained:

"Kapag may blocks, counting games, at songs, mas interesado silang sumali sa klase."

Teachers frequently integrated counting games, number matching activities, puzzles, songs, flashcards, role-playing, storytelling, and hands-on manipulatives during mathematics instruction. Classroom observations showed that learners actively participated in activities involving colorful materials, movement, and collaborative classroom interaction.

One participant stated:

"Hindi sila madaling mabore kapag interactive at may actual silang ginagawa."

Another teacher added:

"Mas mabilis nilang naiintindihan ang numbers kapag gumagamit kami ng concrete materials."

Learners likewise expressed enjoyment during play-based mathematics activities.

One learner shared:

"Masaya po ang math kapag may laro at kanta."

Another learner stated:

"Gusto ko po kapag gumagamit kami ng blocks at pictures."

Classroom observations further revealed that learners demonstrated excitement, attentiveness, and active participation during experiential mathematics activities. Teachers explained that play-based instruction helped sustain learners' focus and encouraged confidence during classroom participation.

The findings suggest that play-centered instructional practices significantly strengthen learner engagement and mathematical understanding among Kindergarten learners. Interactive activities created enjoyable and learner-friendly classroom environments that promoted participation and exploration.

These findings support the cognitive developmental theory of Jean Piaget, which emphasizes active learning and concrete experiences in early childhood education (Piaget, 1952). Similarly, Sarama and Clements (2009) found that hands-on and play-based mathematics activities significantly improve numeracy development and classroom engagement among young learners.

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Theme 2: Active Learner Participation and Engagement Through Play

Another major finding revealed that play-based mathematics instruction strengthened learners' behavioral, emotional, and cognitive engagement during classroom activities. Teachers observed that learners became more motivated and confident when they actively participated in games, collaborative tasks, and movement-oriented mathematics activities.

One participant explained:

"Kapag games ang ginagamit, halos lahat gusto nang sumali."

Another teacher shared:

"Mas nagiging active sila kapag nakakapaglaro habang natututo."

Teachers noted that learners demonstrated increased participation, attentiveness, and cooperation during collaborative mathematics activities. Classroom observations revealed that learners eagerly volunteered to answer questions, participate in counting activities, and interact with classmates during games and group tasks.

Learners also expressed excitement regarding play-based classroom experiences.

One learner shared:

"Mas gusto ko po ang math kasi nakakatuwa po ang activities."

Another learner stated:

"Nag-eenjoy po kami kapag may group games."

Behavioral engagement was observed through learners' active participation, attentiveness, and willingness to complete classroom activities. Emotional engagement emerged through learners' enjoyment, enthusiasm, confidence, and positive interaction during classroom instruction. Cognitive engagement was reflected in learners' ability to recognize numbers, solve simple counting tasks, identify shapes, and apply mathematical concepts during interactive activities.

One participant noted:

"Mas lumalabas ang confidence nila kapag hindi sila pressured at parang naglalaro lang."

Another teacher added:

"Nagiging mas participative kahit iyong mahiyain kapag collaborative ang activities."

The findings indicate that play-based instructional approaches contribute significantly to learner engagement by creating supportive, enjoyable, and interactive learning environments for young children. Learners became more willing to participate and interact during classroom instruction when activities were developmentally appropriate and experiential.

These findings align with the study of Fredricks et al. (2004), which emphasized that learner engagement involves behavioral, emotional, and cognitive participation in classroom learning. Similarly, Bodrova and Leong (2015) highlighted that play-based classrooms strengthen children's motivation, interaction, and active learning engagement.

Theme 3: Contextualized and Developmentally Appropriate Learning Experiences

The findings further revealed that teachers implemented contextualized and developmentally appropriate mathematics activities to make learning more meaningful and relatable to Kindergarten learners. Teachers integrated familiar objects, local examples, and community-based experiences into classroom instruction.

One participant stated:

"Ginagamit namin iyong mga bagay na nakikita nila sa bahay at paligid para mas maintindihan nila ang math."

Another teacher explained:

"Mas naiintindihan nila kapag related sa everyday life ang examples."

Teachers utilized fruits, sticks, stones, bottle caps, local toys, and environmental materials as manipulatives during mathematics activities. Participants explained that using locally available materials allowed learners to connect classroom learning with real-life experiences.

Classroom observations revealed that learners became more participative when teachers incorporated familiar community experiences and concrete examples into lessons. Learners demonstrated stronger understanding during activities involving local objects and environmental materials.

One learner shared:

"Mas naiintindihan ko po kapag gumagamit kami ng totoong bagay."

Another learner stated:

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"Masaya po kapag nakakapagbilang kami gamit ang laruan at objects."

Teachers emphasized that developmentally appropriate and contextualized instruction supported learners' comprehension and classroom confidence. Participants also explained that play-based learning reduced learners' fear of mathematics and promoted positive classroom experiences.

One participant stated:

"Hindi sila natatakot sa math kapag masaya at simple ang activities."

The findings suggest that contextualized and concrete instructional practices strengthen learner comprehension, confidence, and participation in Kindergarten mathematics education. Developmentally appropriate activities enabled learners to explore mathematical concepts through meaningful and familiar experiences.

These findings support the sociocultural learning theory of Lev Vygotsky, which emphasizes guided interaction and meaningful social experiences in cognitive development (Vygotsky, 1978). The findings also align with developmentally appropriate practice frameworks in early childhood education emphasizing experiential and contextualized learning experiences.

Theme 4: Classroom and Instructional Challenges in Implementing Play-Based Mathematics Education

Despite the positive effects of play-based instruction, teachers encountered several classroom and instructional challenges affecting the implementation of play-centered mathematics education in the rural school setting.

One participant stated:

"Mahirap minsan kasi kulang ang materials at maliit ang classroom."

Another teacher explained:

"May mga bata ring madaling mawalan ng attention kaya kailangan laging may bagong activity."

Teachers identified inadequate instructional materials, limited manipulatives, insufficient classroom space, short learner attention spans, and lack of educational resources as major instructional challenges. Participants explained that preparing play-based activities required additional time, creativity, and effort.

One participant shared:

"Kailangan talaga gumawa minsan ng sariling materials para may magamit sa activities."

Another teacher noted:

"Nakakapagod minsan maghanda pero kailangan para maging engaging ang lesson."

Classroom observations showed that teachers frequently improvised instructional materials using recycled and locally available resources. Teachers modified activities according to classroom conditions and learners' varying attention spans.

Learners also recognized classroom limitations.

One learner shared:

"Mas gusto po namin kung mas maraming toys at games."

Another learner stated:

"Minsan po masikip kapag naglalaro kami sa classroom."

Despite these challenges, teachers demonstrated resilience, creativity, and commitment in maintaining meaningful and enjoyable learning experiences. Participants emphasized that learner enjoyment and participation motivated them to continue implementing play-based instructional practices despite resource constraints.

The findings indicate that while play-based mathematics instruction positively influences learner engagement, institutional support, classroom resources, and instructional materials remain essential in sustaining quality early childhood education in rural schools.

These findings support the study of OECD (2019), which emphasized that rural schools frequently encounter instructional and infrastructural limitations affecting educational quality. Similarly, Dela Peña (2020) highlighted that rural teachers often adapt instructional strategies creatively despite limited classroom resources and facilities.

Discussion

The study revealed that play-based mathematics instruction significantly contributes to learner engagement, participation, and meaningful learning experiences among Kindergarten learners in rural Philippine school contexts. Teachers at Marannao Integrated School demonstrated learner-centered and developmentally appropriate instructional practices that strengthened learners' motivation, confidence, and classroom interaction.

Interactive and experiential mathematics activities such as

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games, storytelling, songs, manipulatives, and collaborative tasks enhanced learners' behavioral, emotional, and cognitive engagement. Learners became more attentive, participative, and enthusiastic when classroom instruction involved movement, exploration, and enjoyable activities. These findings reinforce early childhood learning theories emphasizing active exploration and experiential learning as important components of cognitive development.

Play-based learning environments also strengthened positive classroom interaction and reduced learners' anxiety toward mathematics instruction. Teachers' use of contextualized and culturally familiar materials contributed to more meaningful learning experiences by connecting mathematical concepts to learners' everyday lives and community experiences.

However, classroom challenges related to inadequate instructional resources, limited classroom space, short learner attention spans, and insufficient manipulatives continue to affect the implementation of quality play-based mathematics instruction in rural schools. Despite these limitations, teachers demonstrated adaptability, creativity, and commitment in sustaining learner-centered classroom environments.

The findings highlight the importance of strengthening institutional support, instructional materials, and teacher development programs to improve early childhood mathematics education in rural educational contexts.

IV. CONCLUSION

The study concludes that play-based mathematics instruction significantly enhances learner engagement and meaningful learning experiences among Kindergarten learners in rural Philippine school settings. Teachers at Marannao Integrated School utilized interactive, experiential, and learner-centered instructional approaches that promoted participation, confidence, enjoyment, and mathematical understanding among young learners.

Play-centered classroom activities strengthened learners' behavioral, emotional, and cognitive engagement through active participation, collaboration, exploration, and enjoyable learning experiences. Contextualized and developmentally appropriate instructional practices further contributed to learners' comprehension and positive attitudes toward mathematics learning.

However, challenges related to inadequate instructional materials, limited classroom space, insufficient educational resources, and learner attention span difficulties continue to affect instructional implementation in rural early childhood education.

Despite these constraints, teachers demonstrated creativity, flexibility, and dedication in sustaining engaging and meaningful classroom instruction. The study emphasizes the importance of developmentally appropriate, play-based, and learner-centered pedagogical practices in strengthening early mathematics education and learner engagement.

Implications of the Study

The findings imply that Kindergarten mathematics instruction should continuously emphasize play-based, experiential, and developmentally appropriate teaching approaches to strengthen learner engagement and foundational numeracy development.

Educational leaders and policymakers may strengthen institutional support by providing adequate manipulatives, instructional materials, classroom resources, and learning spaces necessary for effective play-based instruction. Schools may also encourage the development of contextualized instructional materials utilizing locally available and culturally relevant resources.

Professional development programs focusing on early childhood pedagogy, play-based learning strategies, classroom engagement techniques, and developmentally appropriate mathematics instruction may further enhance teachers' instructional effectiveness.

Future researchers may conduct similar qualitative or mixed-methods studies exploring learner outcomes, play-based instructional innovations, and early childhood mathematics development across diverse educational contexts.

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