International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Play-Based Learning Approach and Numeracy Appreciation of Kindergarten Learners

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Abstract

This study determined the effect of the play-based learning approach on the numeracy appreciation of kindergarten learners in Sabang Elementary School, West District II, Naga City Division, school year 2023-2024. In particular,it answered the numeracy appreciation of the learners before and after implementation of the lesson guide. A lesson guide was developed using a play-based learning approach on the developmental skills of learners and curricular validated.The significant difference between the level of numeracy appreciation of learners and the effect of thedeveloped lesson guide in the level of numeracy appreciation of the learners was also determined.

This study employed descriptive-comparative-correlational and research and development methods involving forty-seven kindergarten learners of Sabang Elementary School. Data gathering tools utilized in this study were survey questionnaire and evaluation checklist. While the statistical tools applied were weighted mean t-test for dependent samples, and Cohen's d effect.The lesson guide using play-based learning approach was entitled Mathematical Games and Recreations Guide (MGRG) and the design was composed of learning objectives, activities, and learning assessments. Moreover, the learners had moderate appreciation in numeracy before the intervention was appliedwas improved to highly appreciated after the lesson guide was conducted. Additionally, the curricular validity of the designed lesson guide was interpreted very highly valid with a significant difference between the numeracy appreciation levels of learners before and after the conduct of the developed lesson guide and there was a large effect on the level of numeracy appreciation of the learners as the developed lesson guide was applied.

Keywords: Play-based Learning Approach, Numeracy Appreciation, Lesson Guide, Kindergarten

Introduction

Kindergarten is a benchmark in a child's educational growth, the transition from home to organized learning. It is a time of remarkable growth for children in this early stage, building required cognitive, social, and emotional abilities that they will maintain for the duration of their lives. This stage matters, as it sets the stage for future academic success and individual development. Teachers understand that effective instruction is a deep connection with little children, and this is where the kindergarten experience comes in. As children are playing within their environment, they begin developing self-

awareness and interpersonal growth, by this means having a basis of their entire education throughout their lives.

Given that young children have special learning requirements, using the play-based learning approach is helpful in nourishing the holistic development of kindergarten learners. Moreso, play is a recreational activity and an essential component of children's learning, fueling their curiosity and interest in the world around them (Heidecker, 2021). According to Macintyre (2017), play helps children examine concepts, communicate their ideas, and build essential problem-solving skills that other methods may not be able to replicate. This method permits teachers to provide a vibrant classroom environment in which children can succeed, as they are actively involved in hands-on activities and collaborative learning (Drifte 2017). Having children participate in play-based learning not only stimulates their desire to learn but also creates an environment of excitement and happiness that is essential for effective early childhood education.

Furthermore, developing kindergarten learners' understanding of numeracy is a key goal of the play-based learning strategy and of observable importance. Developing numeracy skills at this early stage is important as it provides the foundation for subsequent mathematics concepts and applications. Kindergarten learners can learn numerical ideas in an enjoyable, natural setting through play, which makes mathematics less scary and more accessible (Derman, 2020). This love of numbers underpins core life skills such as critical thinking and problem-solving as well as academic success. Likewise, equipping the young learners with the tools to succeed at future academic tasks by making play a part of numeracy learning and enabling them to develop a positive relationship with mathematics.

Through interesting activities that encourage discovery and hands-on experiences, the kindergarten play-based learning approach is essential for fostering the development of fundamental literacy and numeracy abilities. Supportfortypical rote learning declines when education shifts toward more participatory approaches, promoting the development of social and cognitive skills. This strategy nurtures the critical thinking and creativity necessary for lifelong learning in addition to supporting equal access to high-quality education, which is in line with Sustainable Development Goal 4 of the United Nations. Engaging learners in play helps them develop the abilities needed to succeed both inside and outside of the classroom.

As cited by Gehris et al. (2015), play-based instruction fosters engagement, creates motivation, and builds social skills by employing interactive activities to transition from teacher-directed to learner-directed environments. Keung and Cheung (2019) further highlight the twofold nature of play by distinguishing between child-directed free play and guided play, which involves the use of adult facilitation to enhance learning. These findings collectively reveal the value of integrating play into the classroom in order to promote social and cognitive development and deliver a balanced education.

Moreover, there is a pressing need for kindergarten teachers to develop effective pedagogical strategies that address the complex relationship between play-based learning and numeracy appreciation at the kindergarten level. Investigating how play-based learning can be integrated to enhance numeracy appreciation among learners at Sabang Elementary School, Division of Naga City, is crucial in the

educational landscape. As early childhood education increasingly recognizes the importance of engaging learners in meaningful and interactive ways, understanding the role of play-based learning in nurturing numeracy skills becomes essential. This study aims to explore the benefits of play-based learning tailored to improve learners' numeracy appreciation through experiential classroom activities. Additionally, this research identified best practices employed by teachers using a play-based learning approach and created a lesson guide designed to cultivate a positive learning environment in mathematics education.

Play-Based Learning Approach

The first few years of a child's life seem to be spent almost exclusively in play. Nothing gives us more unease than to see a child who does not play. As a result of playing, the child grows. Growth is the primary use of play, and this is as true of intellectual growth as it is of physical. Through play, the child learns to explore, develop, and master physical and social skills. Kindergarten and preparatory education learners tend to engage in more passive play and more repetitive play. Since play is such an integral part of a child's life, it seems only natural that it be used as a method for dealing with learners at an early stage of education.

In the same tone, Similarly, Keung and Cheung (2019) point out that play-based learning is a method that enables children to learn via play and integrate activities that do not usually count as play but are essential for developing free play and guided play. They make a distinction between free play, which is child-initiated and intrinsically driven, and guided play, which is accompanied by some adult engagement to increase learning opportunities. Confirming this view, Somerville and Williams (2015) point out the improvised and meaningful character of children's play and relate it to their emerging motor, cognitive, and social competencies that are required for successful interaction with others. In addition, Heyd-Metzuyanim (2019) also highlights that a structured play-based approach can promote emotional and cognitive development and allow teachers to enable children to express their emotions and learn maladaptive behaviors through meaningful play experiences while improving their overall developmental outcome.

As Gehris et al. (2015) assert, the success of the play-based methodology in early childhood education proves the potential of conscious teaching techniques in constructing valuable learning experiences. Through this participative model, educators can adaptably modify their role, considering their learners' development needs and motivation. Concurred in this is Thomas et al. (2018), who stress that a well-planned environment that fosters learners' innate curiosity and enables learner-initiated and adult-guided inquiry within a range of learning areas is vital. Moreso, Macintyre (2017) explains how play-based learning enhances young learners' knowledge by naturally integrating ideas between a range of disciplines, enabling mastery of advanced skills in a meaningful way. In the same tone, Drifte (2017) emphasizes that activities like exploration and repetition are instrumental in supporting the learners in building and elaborating their cognitive models, demonstrating that even activities that appear repetitive can be followed by great learning insights when successfully supported by educators.

Consequently, the significant effect of guided play on math acquisition among young learners found that preschool children were more motivated to learn geometric principles through play than through

instruction and performed more effectively on shape-sorting tasks (Eason & Ramani, 2021). Likewise, Heidecker (2021) found that the integration of play-based materials into kindergarten literacy classes greatly improved learners' phonemic awareness and phonics competencies and proved effective throughoutthe implementation phase. While, Derman (2020) took this investigation further into play-based mathematics activities and found significant gains in personal-social, fine motor, and language growth in 48-to-60-month-old children, highlighting the many facets of play's advantage. Likewise, Han et al. (2020) determined that a play-oriented approach to vocabulary instruction resulted in higher growth for receptive and expressive vocabulary than traditional instruction, showing again the importance of integrative learning methods using the power of play in the education of early childhood. In line with these, Milteer (2018) highlighted the pivotal role that play has in ensuring social, emotional, cognitive, and physical health, especially for disadvantaged learners who can be denied access to play.

On the other hand, Ridgway and Quinones (2019) demonstrate how kindergarten students can consider their pedagogical identities in light of the significance of intentionality in play-based learning. Students themselves reconceptualized their concept of play as pedagogy through the construction of a model of play that captured their vision of being future teachers, realizing that "open play" alone will not be effective for meaningful learning. Likewise, Sylva (2018) investigated which play activities most engaged children's imagination and problem-solving and concluded that the quality of the "play partner," such as sensitive adults, is key to enhancing play experiences. In addition, Van Oers and Duijkers (2018) discovered that classrooms with play-oriented environments promoted more vocabulary learning than those emphasizing direct instruction.

Conversely, the study by Gehris et al. (2015) emphasizes the critical role of deliberate teaching practices in play-based learning, demonstrating how these approaches can create engaging learning experiences responsive to children's developmental requirements. Through careful positioning on the teaching continuum, teachers can effectively tap into learners' natural desire to play, enabling exploration, discovery, and problem-solving in creative ways. A carefully crafted play-based strategy can powerfully initiate curiosity and inquiry by creating welcoming environments that integrate learner-directed discovery with adult-supported facilitation in a range of subjects, including reading and art (Thomas et al., 2018). Thus, Macintyre (2017) asserts that play enhances learning while deepening learners' awareness of social and cultural dynamics, enabling them to develop complex ideas and skills in real-world contexts, a notion supported by Drifte (2017), who highlights that exploration and repetition in play are crucial for constructing cognitive frameworks and fostering ongoing growth.

This study applied Csikszentmihalyi's Theory of Flow as it underscores the need to incorporate play-based practices, indicating how kindergarten learners experience maximum pleasure and participation in activities that equate challenge to skill. This setting allows for hands-on activities in counting, sorting, and measuring, allowing learners to achieve a state of flow and develop a positive disposition towards mathematics while promoting spontaneous numeracy concepts and intellectual development. Additionally, this study applied Krathwohl's Affective Domain Theory (KADT)to create a lesson guide through play-based learning, aiming to increase numeracy appreciation through activities that promote emotional engagement and positive attitudes towards mathematics. Through the concept of KADT, learners feel engaged and involved with numeracy ideas, and fun scenarios enable them to enjoy

learning, making mathematics a subject to which they can relate and hence foster greater knowledge and teamwork.

Numeracy Appreciation

Numeracy appreciation is the ability to understand how mathematical concepts are utilized in everyday life and how to solve problems with logical and mathematical reasoning in an educational setting (Lag, et al., 2014). It is important in the context of this research to understand and acknowledge the importance of kindergarten-level numeracy skills. Similar to what this study described as numeracy in kindergarten, it is the fundamental ability to understand and utilize numerical concepts and skills to be able to make informed decisions.It covers a very small range of mathematical skills and is restricted to counting and basic arithmetic.

It was later uncovered by Grootenboer et al. (2018) that the crucial part early childhood teachers take in developing appreciation for numeracy among students with a focus on play-based learning and practical experiments. Similarly, their conclusion is shared by Mues et al. (2022) that the home situation and parent beliefs determine learners' numeracy competencies and tend to emphasize a trend where boys would be perceived as more mathematically competent. In addition, Salminen et al. (2021) discussed how both parental involvement and home numeracy environment directly influence learners' early literacy and numeracy skills. Furthermore, these studies indicate the requirement of specific teacher training and greater awareness among parents to foster a supportive learning culture for young children.

The critical interplay between home environments and learners' mathematical literacy and numeracy appreciation were explored and revealed that the significant relationship between mathematical literacy and numeracy appreciation among learners advocates for a focus on enhancing mathematical literacy to boost numeracy appreciation and further examined how sociocultural factors influence home literacy and numeracy environments, emphasizing their impact on educational experiences and outcomes (Motala, 2015); Cheung et al., 2021). It was further established that socio-economic status (SES) impacts early numeracy and literacy ability, with domestic settings acting to mediate the relationship (Bonifacci, et al., 2021) and reinforce a positive link between home numeracy activities and students' mathematics skills (Mutaf-Yildiz, et al., 2020). Whereas Napoli et al. (2021) emphasized the role of family characteristics in influencing literacy and numeracy practice, as parents tend to focus on literacy, which indicates the necessity of efforts to boost participation in numeracy activities too.

The parent-led home numeracy environment (HNE) for learners aged 3 to 5 was evaluated by Tricket et al. (2022), which revealed that there is no significant correlation between parent-reported HNE activities and learners' composite numeracy skills. In a related study, it was emphasized that while parents predominantly focused on numeracy support over other mathematical areas, their beliefs about their child's abilities influenced how they provided this support, revealing a minimal link between parental assistance and children's skills (Zippert&Rittle-Johnson, 2022). The importance of improving teacher quality in numeracy instruction was reported at a satisfaction level when the training is aimed at including numeracy in teaching practices (Palinussa, Laamena, & Talib, 2023). Teachers in disadvantaged schools struggled to distinguish between numeracy and mathematics, demonstrating a

need for professional development to clarify these concepts and improve instructional strategies, thereby enhancing teacher effectiveness in numeracy education (Coffey &Sharppe, 2021).

Motivated numeracy is about people processing information in a manner that reinforces pre-existing beliefs, with higher numeracy being associated with ideologically congruent interpretation of information, although discrepancies were observed. Recent studies emphasized the fact that early literacy skills have a stronger influence on fourth-grade mathematics achievement than early numeracy skills, and students' confidence plays a key role in performance (Persson, et al., 2021; Chang, 2023). The findings of Lopez-Pedersen (2023) also highlight the need for persistent and consistent educational interventions to ensure that low-performing students are able to develop and sustain their numeracy skills over time. Further, a study identified strong connections between preschoolers' numeracy skills and vocabulary skills, finding that preschool and home activities influence these skills, whereas executive function skills were related to a number of numeracy skills in young children, indicating the multifaceted nature of influences on early math development (Novita, et al., 2023; Chan & Scalise, 2022; Caroll, 2020; Miller, 2018).

According to Aunio et al. (2021), early numeracy skills become the cornerstone of future academic success and expose the transformative power of targeted intervention programs for first graders at risk of mathematical learning difficulties. Their research showed that not only did the intervention group achieve significant improvements in numerical relational skills, but these gains persisted even after accounting for extraneous factors like executive functions and language skills. Moreso, the complexity of the home learning environment (HNE) within the context of participation in direct numeracy activities in relation to mathematical knowledge enhances preschoolers' abilities. As teachers balance varied teaching practices and professional growth, the interplay between parental engagement and socio-economic influences reveal themselves as central factors in building strong numeracy abilities in early learners.

Siegler's Numeracy Development Theory integrates cognitive, social, and emotional concepts to enhance learners' understanding of numeracy. By promoting a positive attitude toward mathematics, teachers can inspire a lifelong enthusiasm for numbers, enabling learners to grasp mathematical concepts beyond simple memorization. Incorporating play-based learning into a thoughtfully designed lesson plan enriches the discovery process, making counting and sorting activities enjoyable and relevant to real-life situations. Piaget's Constructivist Learning Theory highlights the importance of active engagement, allowing learners to build their knowledge through hands-on experiences and collaborative interactions. Consequently, the combination of these theoretical frameworks fosters both confidence and skill in mathematics, transforming abstract numeracy into a fundamental component of daily life.

Methods

This study employed research and development techniques as well as descriptive-comparative-correlational methodologies. The degree of numeracy appreciation of students before and after the implementation of the developed lesson guide for kindergarten learners was assessed using the descriptive approach. It was also included in the lesson guide's design, which focused on learners' developmental skills and used a play-based learning approach. The level of curricular validity of the

developed lesson guide was also assessed using the descriptive technique. Additionally, the comparativemethod was used to determine if there was a significant difference between the learners' numeracy appreciation before and after the developed lesson guide was implemented.The effectiveness of the developed lesson guide, which used a play-based learning approach to enhance the learners' level of numeracy appreciation, was evaluated using the correlational method. Further, the research and development approach was used to develop lesson guides that were appropriate for kindergarten learners and the curriculum.

Results and Discussion

As kindergarten learners start their mathematical adventure, they start to understand fundamental numeracy concepts such forms, colors, and patterns, as well as basic number words, counting, and number recognition. Atan early educational stage, the kindergarten learners'mathematics concept is essential for developing a lifelong appreciation of numeracy.A validated survey that focused on affective, cognitive, and psychomotor skills and included seven indicators, each with a 4-point Likert scale based on observational data from kindergarten teachers, was used to gauge their appreciation of numeracy. The study included a number of statistical analyses, such as rankings and weighted averages, to characterize the learners' general level of numeracy appreciation. The findings are shown in tables that describe the students' understanding of numeracy prior to the use of a planned, play-based learning strategy.

Table 1 outlines how learners engage with numeracy appreciation and indicates varying levels of engagement and understanding across the affective, psychomotor, and cognitive domains. The affective domain ranks highest wherein it can infer that when learners feel connected to numeracy, they are more motivated, resulting in a better learning experience. The psychomotor domain result may demonstratethe learners' engagement in numeracy activities, which indicates that hands-on experiences enhance their skills. Similarly, the cognitive domain result may suggests a need for improved understanding and deeper involvement with mathematical concepts through inquiry-based learning. These findings imply that numeracy appreciation thrives in a supportive environment while identifying areas for improvement, particularly in the cognitive and psychomotor domains. Thus, Siegler's Numeracy Development Theory principles are applied, highlighting the importance of integrating emotional, practical, and conceptual understanding throughout the learning process.

The kindergarten curriculum employs a play-based learning approach to enhance literacy and numeracy appreciation through engaging activities and games. This method fosters learners' natural curiosity and creativity in a stimulating environment, allowing them to explore mathematical concepts interactively. It effectively develops numeracy skills while promoting problem-solving, critical thinking, and social skills. The play-based learning approach was conceptualized with specific objectives, activities, and learning outcomes, then presented to kindergarten teachers and school administrators for further development and curricular validation before implementation. Additionally, a detailed Lesson Guide titled Mathematical Games and Recreations Guide (MGRG) was created to support the play-based learning approach as part of the teachers' lesson plans for kindergarten learners.

Based on average weighted means reflected in Table 2 are the evaluation of the curricular validity of the developed lesson guide. Content validity ranks first, closely followed by construct validity, and face validity at high validity classification together with its overall curricular validity. These results demonstrate effective alignment with the knowledge and skills intended for kindergarten learners. Additionally, Reyes (2015) supports these findings, emphasizing that high content validity indicates that the instructional material effectively conveys clear concepts and instructions, while construct validity reinforces the organization of ideas in facilitating learning. Aligning with Piaget's Constructivist Development Theory, the lesson guide promotes active discovery and hands-on experiences, with high ratings for content and construct criteria supporting interactive activities suitable for students' developmental stages, by this means underscoring the guide's effectiveness in fostering a conducive learning environment.

Meanwhile,Table 3 summarizes learners' levels of numeracy appreciation following the implementation of a Lesson Guide, highlighting high engagement across affective, cognitive, and psychomotor domains. The findings indicate a positive attitude towards mathematics, emphasizing the multidimensional nature of learning and the necessity of addressing psychological and physical components in numeracy development. Notably, hands-on activities significantly enhance engagement and understanding, while learners show a strong grasp of mathematical concepts and a positive emotional response to learning. This aligns with existing studies that suggest effective teaching methods, such as guided play, help preschoolers move past simplistic understandings and develop deeper mathematical insights. The results underline the importance of a holistic educational approach that combines mental, physical, and emotional aspects to foster a robust appreciation of numeracy.

A notable increase in the level of numeracy appreciation among learners after implementing the play-based learning approach with the aid of the developed lesson guide (see Table 4). Thus, the analysis indicates that there is a significant difference in the numeracy appreciation of the learners. A study by van Oers and Duijkers (2018) supports the result that achieving numeracy appreciation differs across learner groups, emphasizing the need for intervention to reinforce learning. Furthermore, Lynch (2015) emphasizes the importance of educators ensuring that learners understandobjectives and outcomes to achieve proficiency in designated competencies. Siegler's Numeracy Development Theory (NDT) supports the result after the developed lesson guide was applied, enabling kindergarten learners to shift from abstract to a more appropriate representations of numerical concepts through meaningful and cooperative engagement in their numeracy appreciation.

The play-based learning lesson guide was found effective in enhancing the kindergarten learners' numeracy appreciation as revealed in the Cohen's d value result suggests a large effect size. This large effect may suggest that the developed lesson guide have influenced the learner's exposure with numeracy concepts. Through mathematical literacy is being honed while mathematics anxiety is being reduced by fostering numeracy appreciation among learners in and out of a classroom (Motala, 2015). Similarly, Grootenboer et al. (2018) stress the importance of numeracy appreciation in early childhood education which underlines the crucial role of educators in shaping this understanding. Parallel to Piaget's Cognitive Development theory, it further supports the design of the lesson guide with integration of play-based learning approach in facilitating cooperative and collaborative learning

sessions that enable learners to construct their own understanding of numeracy concepts through hands-on activities.

Table 1: Numeracy Appreciation Status of Learners

Domains	**AWM**	**Interpretation**	**Rank**
Affective	3.50	HA	1
Psychomotor	3.20	MA	2
Cognitive	2.98	MA	3
Overall Average Weighted Mean (AWM)	**3.23**	**Moderately Appreciated**	

Legends:

Range	Interpretations
3.26 to 4.00	Highly Appreciated (HA)
2.56 to 3.25	Moderately Appreciated (MA)
1.76 to 2.50	Less Appreciated (LA)
1.00 to 1.75	Least Appreciated (LsA)

Table 2: Curricular Validity of the Developed Lesson Guide using the Play-Based Learning Approach

Criteria	**AWM**	**Interpretation**	**Rank**
Content	3.76	HV	1
Construct	3.74	HV	2
Face	3.54	HV	3
Overall Average Weighted Mean (AWM)	**3.68**	**Highly Valid**	

Legends:

Range	Interpretation
3.26 to 4.00	Highly Valid (HV)
2.51 to 3.25	Moderately Valid (MV)
1.76 to 2.50	Less Valid (LV)
1.00 to 1.75	Least Valid (LsV)

Table 3: Numeracy Appreciation Level of Learners After the Conduct of the Lesson Guide

Domains	**AWM**	**VI**	**Rank**
Psychomotor	3.80	HA	1
Cognitive	3.74	HA	2
Affective	3.68	HA	3
Overall Average Weighted Mean (AWM)	**3.74**	**Highly Appreciated**	

Legends:

Range	Interpretations
3.26 to 4.00	Highly Appreciated (HA)
2.56 to 3.25	Moderately Appreciated (MA)

1.76 to 2.50	Less Appreciated (LA)
1.00 to 1.75	Least Appreciated (LsA)

Table 4: Level of Numeracy Appreciation of Learners

Numeracy Appreciation	OAWM	t-stat	t-crit	Interpretation
Before	3.23	7.207	2.086	Significant
After	3.74			

Legends:
OAWM : Overall average weighted mean on learners' level of numeracy appreciation
t-stat : t-test computed value
t-crit : t-test critical value at 5% significance level

Table 5: Effectiveness of the Lesson Guide to Kindergarten Numeracy Appreciation

Numeracy Appreciation	OAWM	SD	Cohen's d	Interpretation
Before	3.23	0.29	1.78	Large Effect
After	3.74	0.28		

Legends:
OAWM : Overall average weighted mean on learners' level of numeracy appreciation
SD: Standard deviation
Cohen's d : Cohen's d effect size value

Range	Interpretation
0.81 or higher	Large Effect
0.51 to 0.80	Medium Effect
0.21 to 0.50	Small Effect

Conclusions

The overall status of the numeracy appreciation of the learners was at moderate level. Specifically, learners obtained a high level of numeracy appreciation only at the affective domain, while both in psychomotor and cognitive domains were at moderate level. In addition, the lesson guide using a play-based learning approach was developed according to the result of the numeracy appreciation status of the kindergarten learners. Enhancing the developmental skills of kindergarten learners using the Mathematical Games and Recreations Guide (MGRG) achieved an overall highly valid curricular validity. Likewise, the suggestions and recommendations from evaluators and other co-kindergarten teachers were consolidated and incorporated to achieve the commendable effectiveness of the developed lesson guide.

Furthermore, the numeracy appreciation of the learners after the utilization of the developed and validated MGRG as a lesson guide had improved highly appreciated in all of the domains covered. It is supported by the t-test analyses wherein the hypothesis that there is a significant difference between the level of numeracy appreciation before and after the utilization of the MGRG is accepted. Then again, the effectiveness of the developed and validated lesson guide using a play-based learning approach was evidently achieved. Also, it can be concluded that the MGRG as a lesson guide for kindergarten learnerswas well-structured, relevant to curriculum, and aligned with learning needs of the learners. The

MGRG also was in compliance with educational standards and its capability to enhance the learning experience can be an aid in developing the numeracy appreciation of learners.

Recommendations

It is essential to analyze and improve teaching methodologies across all domains, particularly by fostering engaging and interactive learning strategies in the cognitive domain and incorporating hands-on activities for psychomotor development. Early numeracy intervention is necessary to address foundational skills and boost understanding while building on the strengths of the affective domain by identifying factors that motivate learners and expanding collaborative projects to encourage a positive attitude toward numeracy. Establishing a feedback mechanism will provide regular insights from learners about their experiences, which can further tailor the curriculum to meet their needs. Additionally, investing in professional development for educators will equip them with effective strategies for teaching numeracy that embrace differentiated instruction and active learning techniques, ultimately enhancing overall learner appreciation and performance in the subject.

It is recommended that the teachers integrate the play-based learning approach to enhance the developmental skills of kindergarten learners. The Mathematical Games and Recreations Guide (MGRG) lesson guide should be regularly updated to feature practical feedback from evaluators and kindergarten teachers to ensure its structured design is effective. Assessments of lesson outcomes are also essential to keep engaging activities relevant to learners' needs. Additionally, enhancing the lesson guide with more interactive features that promote parental involvement may further support learning outside the school. Through the implementation of these recommendations, the MGRG may continue to be a valuable resource for creating a dynamic and effective learning environment. It is recommended that the teachers integrate the play-based learning approach to enhance the developmental skills of kindergarten learners. The Mathematical Games and Recreations Guide (MGRG) lesson guide should be regularly updated to feature practical feedback from evaluators and kindergarten teachers to ensure its structured design is effective. Assessments of lesson outcomes are also essential to keep the hands-on activities collaborative and relevant to the needs of kindergarten learners. Furthermore, it is recommended that the interactive features, play, and role-playing within the MGRG as a lesson guide need to be enhanced in promoting parental involvement that may further support learning in their home. Through the implementation of these recommendations, the MGRG may continue to be a valuable resource for creating a dynamic and effective learning environment.

The lesson guide holds potential as a supplementary resource to enhance the numeracy appreciation of learners. Hence, technical aspects such as font style and size, illustrations, and color applied in the lesson guide should be improved to achieve better quality. Increasing the user-friendliness and organization of presented lessons of the Mathematical Games and Recreations Guide (MGRG) may increase the overall effectiveness aligned with the expectations of both teachers and learners. Still, teachers are encouraged to integrate play-based learning approaches into their lesson being conducted with their kindergarten learners academically, as these activities encourage enjoyment and engagement, fostering a deeper understanding of numeracy skills. In developing a lesson guide with a play-based learning approach should aim to aid the teachers organize their objectives and activities effectively within the curriculum outcomes. Consistent assessment of the use of play-based approaches and the incorporation of

appropriate learning materials will further support the growth of numeracy appreciation, mathematical literacy, and literacy of the learners.

Acknowledgment

I wish to convey my heartfelt appreciation to the kindergarten pupils of Sabang Elementary School for their collaboration as participants in the study. Furthermore, gratitude is extended to the school principal and her colleagues for permitting the conduct of the study. Ultimately, gratitude is extended to my family and friends for their steadfast support and encouragement throughout this challenging yet fulfilling path.

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