HORIZONS A Graduate Research Journal. Volume 1, Issue 1
E-ISSN: 3155-7023

DOI: https://doi.org/10.66206/eduheart.HORIZONS.010

Teachers' Perspectives on The Utilization, Effectiveness, And Challenges of Gamified Learning Activities for Number Recognition In Kindergarten: Basis for a Proposed School Learning Action Cell

Sheryl Ann S. Coderias
ORCID ID: 0009-0004-7324-8178
Master of Arts in Education Major in Educational Management
Aldersgate College Inc.
Solano Nueva Vizcaya, Philippines
sherylann.coderias@deped.gov.ph

ABSTRACT

This study examined teachers' Perspectives on the utilization, effectiveness, and challenges of gamified learning activities for number recognition in kindergarten across the three districts of Nueva Vizcaya. Using a quantitative descriptive design, the researchers collected data from 31 teachers through a validated questionnaire and analyzed them using frequency, percentage, weighted mean, standard deviation, and Pearson r. Findings showed that teachers used gamified activities very highly (overall M = 3.84), with visual aids and manipulatives used most often, while digital tools were used least due to variability in access. In terms of effectiveness, gamified instruction was perceived as highly effective across all domains of Bloom's Taxonomy, with the highest effectiveness observed in the applying domain (M = 3.89), followed by analyzing, remembering, and understanding, while evaluating obtained the lowest mean, though still highly effective. These results indicate that gamified strategies are particularly strong in promoting experiential and application-based learning among kindergarten learners. The profile of respondents, characterized by manageable class sizes and predominantly mid-career teachers, contributed to consistent implementation and positive perceptions of effectiveness. However, the study identified challenges such as limited resources, time constraints, and the need for stronger instructional design for higher-order thinking tasks. Statistical analysis further confirmed a significant relationship between utilization level and perceived effectiveness of gamified activities. Based on these findings, the study proposed a School Learning Action Cell plan to strengthen teacher competencies and address implementation gaps. Overall, the study affirms the value of gamified instruction as a developmentally appropriate and effective approach in early numeracy education.*

Keywords: *Gamified learning approaches, number recognition skills, early childhood classrooms, instructional effectiveness, teaching-related challenges*

INTRODUCTION

Developing early numeracy skills remains a fundamental goal of kindergarten education, as it lays the foundation for learners' future mathematical understanding. Among these foundational competencies, number recognition from 0 to 10 is considered a critical skill that enables learners to identify symbols, associate quantities, and engage in basic counting tasks. However, teaching number recognition to young children requires approaches that are not only instructionally sound but also developmentally appropriate and responsive to their natural ways of learning.

Despite these strong theoretical and policy foundations, recent studies and classroom practices reveal persistent challenges in implementing play-based teaching effectively. Research in selected elementary schools in the Philippines indicates that while teachers recognize the importance of play, its use is often shaped by limited resources, insufficient training, and varying levels of teacher competence (Santos et al., 2024). In addition, some studies note that although play-based activities increase learner engagement, they do not always guarantee mastery of targeted competencies when not carefully aligned with learning objectives (Padillo et al., 2024). These findings suggest a gap between the intended outcomes of play-based instruction and its actual implementation in the classroom.

These classroom realities highlight the need to examine more closely the challenges and contributing factors affecting the implementation of play-based teaching strategies in number recognition. Understanding these factors is essential in identifying specific areas where teachers require support and professional development. In particular, the School Learning Action Cell (SLAC) serves as an appropriate platform for collaborative learning and capacity building among teachers.

Anchored on these considerations, this study aimed to examine Teachers' Perspectives on the Utilization, Effectiveness, and Challenges of Gamified Learning Activities for Number Recognition in Kindergarten within the researcher's school/ division context. The findings of the study served as a basis for the development of a Teacher Development SLAC Plan designed to enhance teachers' competencies in implementing effective, purposeful, and outcome-based play-oriented instruction. Ultimately, the study seeks to contribute to improved teaching practices and better numeracy outcomes among kindergarten learners.

I. METHODOLOGY

This study employed a quantitative descriptive research design, aimed at examining the level of utilization, effectiveness, and challenges of gamified teaching-learning activities in teaching number recognition (0–10) among kindergarten learners in three districts of the Division of Nueva Vizcaya. The descriptive method is appropriate because it allows the researcher to systematically describe current instructional practices, gather numerical data from teachers' perceptions, and identify patterns and trends without manipulating variables (Creswell & Creswell, 2018).

The respondents of this study were all kindergarten teachers currently teaching in the three participating districts, making this a total population study or census design. A total of 31 kindergarten teachers participated: 12 from Villaverde District, 6 from Quezon District, and 13 from Santa Fe District. Conducting a census provided comprehensive data, eliminated sampling bias, and allowed findings to accurately reflect the instructional practices and challenges of all accessible

kindergarten teachers across the three districts (Etikan, Musa, & Alkassim, 2016). The total population approach ensures that no eligible respondent was excluded, strengthening the internal validity of the findings.

Data were collected using a structured questionnaire developed by the researcher and adapted from previous studies on play-based and gamified learning approaches (Gianan, 2025; Porras & Caliba, 2025). It was a four-point Likert scale. Ethical Considerations

This study followed the ethical guidelines for research in education:

•Teacher-Developed Structured Questionnaire. Data were collected using a structured questionnaire developed by the researcher and adapted from previous studies on play-based and gamified learning approaches (Gianan, 2025; Porras & Caliba, 2025). It uses a four-point Likert scale to reduce neutral responses. It will be properly disposed of after use by ensuring secure handling and confidentiality, such as shredding printed copies and permanently deleting digital files from storage to prevent unauthorized access.

•Voluntary Participation. All respondents participated voluntarily and were informed that they could withdraw from the study at any time without consequence.

•Confidentiality. All data were anonymized to protect the identities of the participants. No individual school or teacher was identified in the reporting of results.

•Data Security. All collected data were securely stored and accessible only to the researcher throughout the study period.

•Non-maleficence. Participation in this study caused no harm or undue stress to respondents. The questionnaire was designed to be straightforward and non-intrusive (Creswell & Creswell, 2018).

Theoretical Framework

This study was anchored on established developmental and learning theories that explain how young children acquire knowledge, particularly through play and interaction. These theories provide a strong foundation for understanding the role of gamified and play-based teaching in developing number recognition among kindergarten learners.

First, Piaget's (1952) Cognitive Development Theory explains that kindergarten learners are in the preoperational stage, where they begin to develop symbolic thinking but still rely heavily on concrete experiences. In this stage, children learn best through hands-on activities and visual representations. Gamified teaching strategies, such as number games and manipulative-based activities, support this developmental need by allowing learners to actively construct their understanding of numbers.

Second, Vygotsky's (1978) Sociocultural Theory emphasizes the importance of social interaction and guided learning in cognitive development. According to this theory, learning occurs through collaboration with more knowledgeable others, such as teachers and peers. The concept of the Zone of Proximal Development (ZPD) highlights that children can achieve higher levels of understanding with scaffolding. In play-based teaching, teachers guide learners through structured games and activities, making learning more meaningful and effective. Third, Gesell's Maturation Theory explains that children's learning and development follow a natural sequence based on readiness. This theory suggested that instruction should align with the learner's developmental stage. In kindergarten education, play-based and gamified activities were appropriate because they match children's natural tendencies to explore, move, and engage in playful experiences.

While these foundational theories originated in the mid-20th century, recent studies continue to validate their relevance in modern early childhood education. For instance, recent research showed that play-based learning enhances learners' engagement, motivation, and cognitive development, particularly in numeracy skills (Sasan et al., 2024). Additionally, studies in the Philippine context show that play-based approaches significantly improve number recognition and numeracy appreciation among kindergarten learners when activities are developmentally appropriate and well-structured (Gianan, 2025; Porras & Caliba, 2025).

Moreover, contemporary research highlighted that teachers play a crucial role in effectively implementing play-based strategies. Their competence, creativity, and understanding of instructional goals directly influence learning outcomes (Santos et al., 2024). These findings demonstrated that while play is naturally beneficial, its effectiveness depends on how it is utilized in the teaching-learning process.

Taken together, these theories and recent studies supported the idea that gamified teaching and play-based learning are not only developmentally appropriate but also effective strategies in teaching number recognition. However, they also pointed to the importance of examining how these approaches were implemented in actual classroom settings, particularly in terms of utilization, effectiveness, and challenges.

RESEARCH PARADIGM OF THE STUDY

Figure 1

Paradigm of the Study

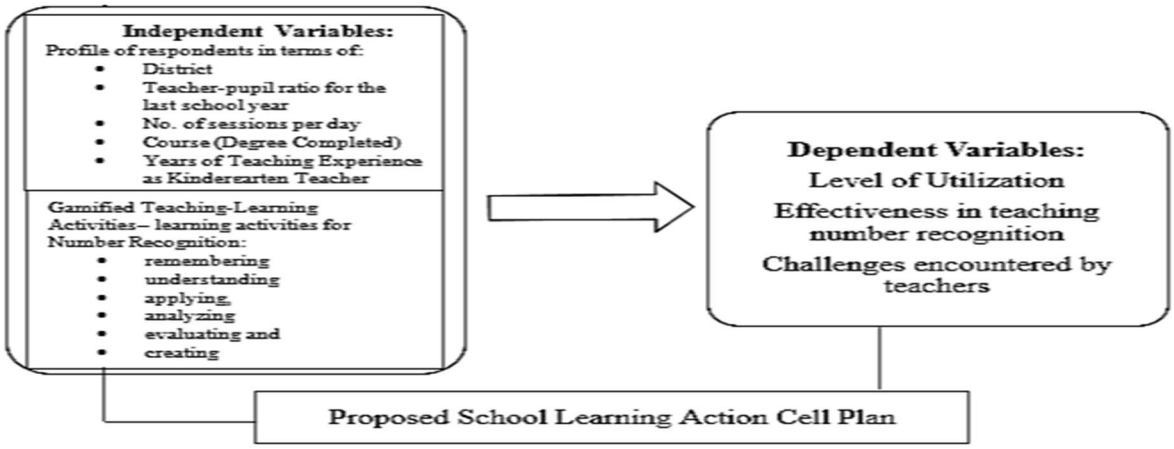

Figure 1: Research Paradigm

Figure 1 presents the study variables. The framework was anchored on the assumption that implementing gamified teaching-learning activities significantly influences their effectiveness in teaching number recognition, as well as the challenges encountered by teachers.

Research Setting

The study was also conducted in public elementary schools across three districts in the Division of Nueva Vizcaya, Philippines: Villaverde District (Northern), Quezon District (Northern), and Santa Fe District (Southern). All participating schools operate under the DepEd MATATAG Kindergarten Curriculum, which emphasizes developmentally appropriate play-based and gamified learning strategies (Republic Act No. 10157, 2012). The three districts were selected because they collectively represent the accessible population of kindergarten teachers implementing these strategies within the division. Villaverde District comprises twelve (12) public elementary schools located in different barangays of Villaverde, Nueva Vizcaya, yielding a total of 12 kindergarten teacher-respondents from this district. Quezon District contributed six (6) kindergarten teacher-respondents from its public elementary schools, and Santa Fe District (Southern) contributed thirteen (13) kindergarten teacher-respondents from its public elementary schools. The researcher used Google Maps to locate the schools in each district.

Data Gathering Tools

The researcher collected data using a structured questionnaire developed and adapted from previous studies on play-based and gamified learning approaches (Gianan, 2025; Porras & Caliba, 2025). It was a four-point Likert scale.

Validity and Reliability: Three experts in early childhood education reviewed the questionnaire for content validity: the Education Program Supervisor in Kindergarten, District In-Charge (doctoral graduate), District Kindergarten and Math Coordinator, and the District QA team of Villaverde. A pilot test was conducted with thirty (30) kindergarten teachers outside the participating districts, but only twenty (20) completed the questionnaire; the results yielded a Cronbach's alpha of 0.87, indicating high internal consistency (Field, 2018).

Statistical Treatment of Data

Part I. Demographic Profile of the Respondents. The demographic profile of the respondents, including district, teacher-pupil ratio, number of sessions handled per day, years of teaching experience, and educational background, was analyzed using descriptive statistics, specifically frequency counts, percentages, and, where applicable, measures of central tendency.

Part II. Gamified Teaching-Learning Activities Utilized. The level of utilization of gamified teaching-learning activities in teaching number recognition (0–10) was analyzed using the weighted mean ($\bar{X}$) and standard deviation (SD), based on a 4-point Likert scale with the following values: 4 – Always | 3 – Sometimes | 2 – Rarely | 1 – Never.

Part III. Level of Effectiveness of Gamified Teaching-Learning Activities Based on Bloom's Taxonomy. The perceived level of effectiveness of gamified teaching-learning activities in improving number recognition (0–10) was analyzed using the weighted mean ($\bar{X}$) and standard deviation (SD), based on a 4-point Likert scale: 4 – Highly Effective | 3 – Moderately Effective | 2 – Slightly Effective | 1 – Not Effective. This scale evaluates effectiveness in relation to Bloom's Taxonomy, which classifies cognitive learning into six hierarchical levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. The analysis was designed to determine whether gamified activities effectively promote not only foundational skills such as remembering and understanding, but also higher-order thinking skills including applying, analyzing, evaluating, and creating, all of which are developmentally relevant cognitive targets in kindergarten numeracy instruction. The 4-point Likert scale ensures clear interpretation and avoids neutral responses (Anderson & Krathwohl, 2001; Krathwohl, 2002; Taherdoost, 2019).

Part IV. Challenges Encountered by Teachers. The level of challenges encountered by teachers in using gamified teaching-learning activities was analyzed using the weighted mean ($\bar{X}$) and standard deviation (SD), based on a 4-point Likert scale: 4 – Very Difficult | 3 – Moderately Difficult | 2 – Slightly Difficult | 1 – Not Difficult.

Part V. Significant Relationship Between Utilization and Effectiveness. The Pearson product-moment correlation coefficient (Pearson r) was used to determine whether a significant relationship exists between the level of utilization of gamified teaching-learning activities and their perceived level of effectiveness. The analysis was conducted at $\alpha = 0.05$ (two-tailed). The null hypothesis tested was: There is no significant relationship between the level of utilization of gamified teaching-learning activities and their perceived level of effectiveness in teaching number recognition (0–10) among kindergarten learners. The decision rule was as follows: if the computed p-value is less than $\alpha = 0.05$ and the obtained Pearson r exceeds the critical value at the corresponding degrees of freedom, the null hypothesis is rejected.

RESULTS AND DISCUSSIONS

Table 1. Distribution of Respondents by District

The table showed that the 31 respondents were drawn from three geographically distinct districts within the Division of Nueva Vizcaya. Santa Fe District (Southern) had the most respondents, with 13 teachers (41.9%), while Quezon District (Northern) had the fewest, with only six respondents (19.4%). The difference in representation reflected the varying number of public elementary schools offering kindergarten programs in each area. The multi-district composition aligned with the recommendations of Etikan, Musa, and Alkassim (2016), who emphasized that a total population census design eliminates sampling bias and allows findings to more accurately reflect the target population's practices and challenges.

Table 2. Distribution of Respondents by Teacher-Pupil Ratio

Student-led tech startups face serious financial challenges. The table showed that most respondents (38.7%) reported a teacher-pupil ratio (TPR) in the 1:11–1:20 range, the highest. Only one respondent (3.2%) reported a ratio above 1:41, which was the lowest. The mean TPR was 1:20.2, with a range of 1:5 to 1:41, showing that most classes are small to moderate in size. These findings aligned with the Organization for Economic Co-operation and Development (OECD, 2022), which found that smaller class sizes facilitate more individualized instruction and closer monitoring of learner progress during interactive activities.

Table 3. Distribution of Respondents by Number of Sessions Per Day

The table showed that most respondents (71.0%, n = 22) handled one session per day, while the smallest group (29.0%, n = 9) managed two sessions. This pattern was consistent with the half-day kindergarten program structure under DepEd. Hwang and Chien (2022) observed that teachers operating under time-limited or high-load schedules tend to gravitate toward familiar, easily executable instructional strategies. The finding that seven in ten respondents handle only one session per day suggested that most respondents are not constrained by multiplicative session demands, creating conditions conducive to integrating diverse gamified strategies. This finding partially aligned with Hwang and Chien's (2022) observation by confirming that workload distribution does influence instructional choices, but it extended their argument by demonstrating that favorable workload conditions, specifically the single-session structure, were associated with higher and more diversified gamified activity implementation.

Table 4. Distribution of Respondents by Educational Qualification

It was also indicated that the majority of respondents hold a Bachelor's Degree (74.2%, n = 23), with 19.4% (n = 6) having earned a Master's Degree and 6.5% (n = 2) classified under other qualifications. The predominance of baccalaureate-level teachers was consistent with the standard minimum qualification requirement for kindergarten positions in the Philippine public school system, typically a Bachelor of Elementary Education (BEED) or a Bachelor of Early Childhood Education (BECED).

The respondents' qualification profile was consistent with the findings of Darling-Hammond et al. (2023), who found that formal training in early childhood pedagogy was a significant determinant of teachers' capacity to design developmentally appropriate and cognitively stimulating activities. The present study confirmed this relationship contextually: the high prevalence of formally trained baccalaureate-level teachers appears to undergird the consistently high utilization levels documented in Research Problem number 2. However, the limited representation of graduate-degree holders also supported Santos et al. (2024) that ongoing professional development remains essential to sustain and deepen the quality of play-based instruction, particularly in public school settings where in-service training was the primary mechanism for advancing teacher competence beyond the pre-service level.

Table 5. Distribution of Respondents by Years of Teaching Experience in Kindergarten

The table showed that the 11–15 years bracket had the most respondents, with 12 teachers (40.0%). Early-career teachers (1–3 years) and veteran teachers (16 years and above) had the fewest respondents, with four each (13.3%). The mean teaching experience was 10.7 years (SD = 4.71). Note that one respondent did not indicate years of experience (valid n = 30). These findings were consistent with the established relationship between teaching experience and instructional quality articulated by Kini and Podolsky (2022), who demonstrated that experienced teachers exhibit stronger classroom management skills, greater comfort with learner-centered strategies, and a more nuanced understanding of child development principles, all of which are prerequisite capacities for effective gamified instruction.

Table 6. Level of Utilization of Gamified Teaching-Learning Activities

Another important point is that all eight activity types were rated Very Highly Utilized, a stronger result than some Philippine studies report. For example, Padillo et al. (2024) noted that while teachers value play-based approaches, actual use can vary due to resource limitations and differences in teacher competence, often resulting in moderate utilization. In this study, however, the consistently high means may reflect teachers' experience and class conditions that make activity-based

lessons manageable. Sasan et al. (2024) also supported the idea that play-based approaches can improve learners' engagement and numeracy, which may encourage teachers to continue using these strategies. In addition, Gianan (2025) and Porras and Caliba (2025) reported that play-based and gamified activities improve learners' numeracy outcomes, which may further strengthen teachers' motivation to maintain high utilization.

Table 7. Level of Effectiveness of Gamified Activities —Remembering

The table showed that all six Remembering indicators were rated Highly Effective, with a domain mean of 3.76 (SD = 0.44). The highest-rated indicator was reciting numbers in correct order from 0 to 10 ($\bar{X}$ = 3.90), showing that teachers found this foundational task well supported by gamified activities. The lowest-rated indicator was distinguishing numbers in different formats ($\bar{X}$ = 3.65), though it still fell within the Highly Effective range. The findings were consistent with Alotaibi (2024), which found that repetitive play-based activities strengthen memory retention among young learners through multiple sensory experiences. The current data supported this in the Philippine kindergarten setting, where teachers often use songs, chants, and counting games to reinforce remembering skills. The results also aligned with Lampropoulos and Sidiropoulos (2024), who reported that gamified environments support recall through immediate feedback and reinforcement—features commonly present in counting games and number-matching activities.

Table 8. Level of Effectiveness of Gamified Activities —Understanding

The table summarized that all Understanding indicators were rated Highly Effective, with a domain mean of 3.71 (SD = 0.46). The highest-rated indicator was matching numbers to the correct number of objects ($\bar{X}$ = 3.90), showing strong support from gamified activities for this concrete task. The lowest-rated indicator was identifying errors in number-object matching ($\bar{X}$ = 3.58), which requires a higher level of thinking, though it still remained Highly Effective. These findings were supported by Berner et al. (2024), who reported that interactive games can improve children's ability to identify and explain numerical ideas. The current study builds on this by breaking the Understanding domain into specific indicators and showing a clear pattern: teachers view quantity matching and comparison as the most strongly supported, while positional and error-detection tasks receive slightly lower ratings. Similarly, Gómez Niño et al. (2025) explained that gamification supports comprehension by keeping learners actively engaged and helping them form meaning from experience. In this study, the most "game-friendly" tasks—those that can be shown through physical manipulation—received the highest ratings, while tasks requiring stronger language abstraction (like positional words) received somewhat lower ratings.

Table 9. Level of Effectiveness of Gamified Activities —Applying

The table shows that the Applying domain had the highest mean among all six Bloom's levels ($\bar{X}$ = 3.89, SD = 0.31). Three indicators tied for the highest score at $\bar{X}$ = 3.94: counting objects and matching them to numbers, joining number-based games, and using counting in real-life situations. The lowest-rated indicator was writing numbers in worksheets ($\bar{X}$ = 3.81), though it remained within the Highly Effective range. The Applying domain was strongly supported by the literature Sasan et al., (2024), wherein it was documented that learners who engage in counting games and hands-on activities demonstrate a better ability to apply number recognition skills in practical contexts, a finding directly replicated by the present study's top-ranked Applying indicators. Romero-Rodríguez et al. (2024) further noted that gamified environments support experiential learning by engaging learners in tasks that simulate real-world numerical applications, an observation that aligns with the indicators that received the highest scores in the present study.

Table 10. Level of Effectiveness of Gamified Activities—Analyzing

The table indicated that the Analyzing domain had a mean of 3.77 (SD = 0.42), rated as Highly Effective. The highest-rated indicators were comparing numbers to find the greater or smaller value and sorting objects by number value, both at $\bar{X}$ = 3.84. The lowest-rated were arranging numbers in order, spotting mistakes in games, and explaining reasoning, all tied at $\bar{X}$ = 3.71, though all remained Highly Effective. These results were consistent with Chatzaki et al. (2024), who found that game-based learning helps children compare numbers and notice patterns—skills aligned with the Analyzing level. The present study supports that claim in the Philippine kindergarten setting and strengthens it by showing a clear quantitative hierarchy where Analyzing was above the foundational domains. However, Zainuddin et al. (2023) noted that gamification at higher-order levels may require more deliberate instructional design to be reliably effective.

Table 11. Level of Effectiveness of Gamified Activities —Evaluating

The table showed that the Evaluating domain had the lowest mean among all six Bloom's domains ($\bar{X}$ = 3.52, SD = 0.58), though still rated as Highly Effective overall. The highest-rated indicators were justifying why a number is correct or incorrect and evaluating peers' answers, both at $\bar{X}$ = 3.55. The only indicator rated below the Highly Effective range was identifying the most effective strategies for solving number tasks ($\bar{X}$ = 3.48), rated Moderately Effective. The results in the Evaluating domain were consistent with Zainuddin et al. (2023), who warned that gamification at the Evaluating level needs intentional lesson planning, especially activities that include reflection and feedback.

Table 12. Level of Effectiveness of Gamified Activities—Creating

The table showed that the Creating domain had a mean of 3.58 (SD = 0.59), rated as Highly Effective. The highest-rated indicator was creating drawings or visual representations of numbers ($\bar{X}$ = 3.77), which gamified activities strongly supported. The lowest-rated indicator was developing short stories using numbers ($\bar{X}$ = 3.42, SD = 0.72), the only Moderately Effective indicator in this domain, with the highest variability among all indicators in the study. Nguyen (2024) supported these results, explaining that play-based learning helps learners show creativity by designing games and making visual representations of numbers. The lower storytelling result also aligned with Baltabayeva et al. (2026), who noted that achieving outcomes in early childhood gamification can be harder because of task complexity.

Table 13. Summary of Perceived Effectiveness of Gamified Activities by Bloom's Taxonomy Domain

The table summarizes the effectiveness scores across all six Bloom's domains, with an overall mean of 3.71 (SD = 0.49), rated as Highly Effective. The Applying domain had the highest mean ($\bar{X}$ = 3.89), while the Evaluating domain had the lowest ($\bar{X}$ = 3.52). Out of 36 indicators, only two fell below Highly Effective: identifying the most effective strategies for solving number tasks ($\bar{X}$ = 3.48) and developing number-based short stories ($\bar{X}$ = 3.42). This supported findings reported by Alotaibi (2024) and Chatzaki et al. (2024) on the effectiveness of gamification at the foundational and analytical levels, and by Sasan et al. (2024) and Romero-Rodríguez et al. (2024) at the application level. In addition, this study added value by showing a Highly Effective rating in all six domains within the Philippine kindergarten setting.

Table 14. Challenges Encountered in Implementing Gamified Teaching-Learning Activities

The table presented that the overall weighted mean for challenges was 2.02 (SD = 0.85), within the Slightly Difficult range. No challenge reached the Moderately Difficult level. The greatest challenge was the lack of instructional materials, manipulatives, or resources ($\bar{X}$ = 2.16, SD = 0.93), with the highest variability across schools. The least challenging was insufficient support from school administration or colleagues ($\bar{X}$ = 1.71), showing that school leaders are generally supportive. Padillo et al. (2024) and Hwang and Chien (2022) reported that resource-related and training-related challenges significantly constrain the implementation of play-based and gamified instruction, suggesting a level of difficulty more consistent with the Moderately Difficult range. Santos et al. (2024) similarly documented resource limitations as a recurring and substantive barrier in Philippine early childhood classrooms.

Table 15. Pearson r Correlation Between Level of Utilization and Level of Effectiveness

The table presents Pearson product-moment correlation results for the relationship between utilization level and perceived effectiveness of gamified teaching-learning activities among the 31 respondents. The computed Pearson r is 0.4987 ($p = 0.0043$). With 29 degrees of freedom and a critical r of ±0.3550 at $\alpha = 0.05$ (two-tailed), the obtained coefficient clearly exceeds the critical threshold. The null hypothesis that no significant relationship exists between utilization level and perceived effectiveness is therefore rejected. The correlation was classified as moderate in strength according to Cohen's (1988) convention, wherein r values between 0.30 and 0.50 represent a moderate effect size. Both variables registered high mean scores: Level of Utilization (M = 3.84) and Level of Effectiveness (M = 3.71), consistent with the Very Highly Utilized and Highly Effective ratings documented in Research Problem Number 2 and Research Problem Number 3, respectively. This significant positive relationship between utilization frequency and perceived effectiveness aligns with findings by Alotaibi (2024) and Sasan et al. (2024), who reported positive associations between gamified activity use frequency and improved instructional outcomes. In the Philippine context, Gianan (2025) and Porras and Caliba (2025) similarly established that consistent implementation of structured play-based and gamified activities was associated with measurable improvements in learners' numeracy appreciation and performance, findings that aligned with the perception-based relationship demonstrated in the present study. The present results extended the work of Hwang and Chien (2022), who linked teachers' adoption frequency to positive perceptions of instructional value, by demonstrating that this relationship was not merely anecdotal or qualitatively described but statistically verifiable at the $p = 0.0043$ significance level.

RECOMMENDATIONS

In light of the foregoing findings and conclusions, the following recommendations were proposed:

1: Given that the demographic profile revealed a predominantly experienced and bachelor-educated workforce, school administrators and curriculum supervisors are encouraged to institutionalize the experiential capital of veteran teachers by creating structured peer-coaching arrangements, learning partner programs, and instructional rounds facilitated through the SLAC platform. For the 13.3% of early-career teachers in the sample, the school should integrate differentiated onboarding support focused on gamified teaching strategies into its annual instructional improvement plan. Furthermore, eligible teachers are encouraged to pursue graduate-level studies in Early Childhood Education or related fields, as the relatively small proportion of master's degree holders (19.4%) suggests continued room for academic advancement that can deepen theoretical grounding and instructional innovation.

2: To sustain and further enrich the already very high level of utilization, particularly the consistent use of visual aids and manipulatives, school administrators and the Division office were encouraged to invest in creating a school-based or district-level repository of ready-to-use gamified materials for kindergarten numeracy. This repository should include locally crafted, cost-effective resources such as number flashcards, counting boards, sorting trays, and tactile number cards accessible to all teachers regardless of school location or budget. To address the comparatively lower and more variable utilization of digital tools ($\bar{X}$ = 3.61, SD = 0.56), coordinated efforts between the school and the Division ICT unit were encouraged to improve technology access in schools with limited infrastructure and to provide practical training on free or low-cost digital platforms that can supplement non-digital gamified instruction.

3: To strengthen the effectiveness of gamified activities across all cognitive levels of Bloom's Taxonomy, teachers are particularly encouraged to invest additional attention in designing activities that target the Evaluating and Creating domains, which registered the lowest domain means of 3.52 and 3.58, respectively. Specifically, teachers may consider integrating structured self-assessment routines such as simple scoring rubrics, peer evaluation tasks, and guided reflection questions to stimulate evaluative thinking, even among young learners. For the Creating domain, activities that let learners produce their own visual representations of numbers, design simple number puzzles, or narrate number-based stories using drawings and objects would more directly address the two lowest-rated indicators in the study. Curriculum developers and instructional coaches should incorporate higher-order thinking indicators into lesson-plan evaluation criteria, encouraging teachers to plan beyond the Remembering and Applying levels in their gamified instruction.

4: To address the challenges identified in this study, particularly the lack of instructional materials ($\bar{X}$ = 2.16) and limited technology access ($\bar{X}$ = 2.10), school administrators are encouraged to allocate a dedicated budget line within the school improvement plan for the procurement and creation of gamified instructional materials for the kindergarten program. In the interim, SLAC sessions should include collaborative material-making workshops where teachers co-produce low-cost gamified resources using locally available supplies, reducing dependence on externally sourced materials. To address learners'

short attention spans and classroom management concerns ($\bar{X}$ = 2.13), SLAC facilitators were encouraged to incorporate discussions on differentiated gamified instruction and inclusive classroom management strategies suited to early childhood settings. The Division of Nueva Vizcaya is also encouraged to include gamified teaching as a priority topic in its annual division-wide in-service training calendar.

5: Given the moderate but statistically significant positive correlation between utilization and perceived effectiveness (r = 0.4987, p = 0.0043), educational administrators were encouraged to treat the frequency and quality of gamified activity use as a key performance indicator in early childhood instruction. Supervisory observations and instructional coaching conversations may consider explicitly including gamified teaching as a dimension of teaching quality. Professional development sessions should guide teachers toward more purposeful, cognitively demanding, and curriculum-aligned gamified designs rather than simply encouraging higher utilization. The study's finding that frequency of use was associated with higher perceived effectiveness also implies that newly assigned kindergarten teachers should receive early, structured exposure to gamified strategies so they can begin developing the utilization patterns that experienced teachers have already established.

6: The development and full implementation of the proposed School Learning Action Cell (SLAC) Plan are considered the primary institutional response to the gaps and challenges identified in this study. The SLAC Plan may consider around three priority areas: first, deepening teachers' competence in designing gamified activities for higher-order thinking skills, particularly the Evaluating and Creating domains of Bloom's Taxonomy; second, building a collaborative culture of gamified material development that reduces individual resource dependence and promotes shared ownership of instructional tools; and third, strengthening teachers' ability to systematically align gamified activities with specific competencies in the MATATAG Kindergarten Curriculum. The SLAC sessions are encouraged to follow pre-implementation, implementation, and post-implementation phases to allow for planning, application, and reflective evaluation. School heads are encouraged to serve as active participants rather than functioning solely as supervisors, as their engagement communicates institutional value for gamified instruction and motivates broader teacher participation.

For future researchers and educational policymakers, the following directions for further study are recommended. First, a parallel study examining the actual learning outcomes of kindergarten learners based on School Form 5 whose teachers were assessed in this study would provide a more complete and learner-centered picture of the impact of gamified instruction on number recognition achievement. Second, a longitudinal study tracking changes in teachers' utilization patterns and perceived effectiveness over time following SLAC interventions would help determine whether structured professional development produces sustainable improvements in gamified practice. Third, a comparative study across multiple divisions in Nueva Vizcaya or across regions in the Philippines would test the generalizability of the present findings and identify contextual factors that support or constrain gamified instruction. Finally, a qualitative follow-up study exploring teachers' lived experiences in designing and implementing gamified activities for higher-order thinking would complement the quantitative findings of this research and offer richer insight into the pedagogical decisions experienced teachers make in their gamified instruction.

AI DECLARATION STATEMENT

AI-supported tools helped with grammar and structure in creating this article. No AI tools were used to collect, analyze, or interpret data; all authors are credited for their academic contributions.

REFERENCES

Alotaibi, M. S. (2024). Game-based learning in early childhood education: A systematic review and meta-analysis. Frontiers in Psychology, 15, 1307881. *https://doi.org/10.3389/fpsyg.2024.1307881*

Baltabayeva, N., Adikanova, S., Ponkina, E. V., & Nurkanova, R. (2026). Enhancing education through gamification and Bloom's taxonomy. Frontiers in Education, 11, 1749909. *https://doi.org/10.3389/feduc.2026.1749909*

Berner, V. D., Niklas, F., Chatzaki, M. A., & Seitz-Stein, K. (2024). Play-integrated fostering of basic mathematical skills. Educational Psychology. *https://doi.org/10.1080/01443410.2024.2329638*

Boryga, A. (2022, August 5). For young kids, the power of play-based learning. Edutopia. *https://www.edutopia.org/article/young-kids-power-play-based-learning/*

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Harvard University Press.

Cabug, V. M. E., & Hatague, K. V. (2023). Play-based learning: Intervention in improving letter sound recognition of kindergarten learners. Cognizance Journal of Multidisciplinary Studies, 3(8), 1074–1086. *https://doi.org/10.47760/cognizance.2023.v03i08.030*

Chatzaki, M. A., Skillen, J., Ricken, G., & Seitz-Stein, K. (2024). Game-based preschool assessment of mathematical competencies. Frontiers in Education, 9, 1337716. *https://doi.org/10.3389/feduc.2024.1337716*

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Department of Education (DepEd). (2016). The learning action cell as a K to 12 basic education program school-based continuing professional development strategy for the improvement of teaching and learning (DepEd Order No. 35, s. 2016). DepEd. Retrieved from *https://www.teacherph.com/deped-learning-action-cell*

Department of Education. (n.d.). Features of kindergarten education. Department of Education Philippines. *https://www.deped.gov.ph*

Department of Education. (n.d.). MATATAG curriculum. Department of Education Philippines. *https://www.deped.gov.ph/matatag-curriculum/*

Department of Education. (2023). Republic of the Philippines Department of Education Bureau of Curriculum Development. https ://www.deped.gov.ph/wp-content/uploads/GENERAL-SHAPING-PAPER-2023.pdf

Gayon, A. (2025a). Challenges and utilization of play-based approach of kindergarten teachers. International Journal of Science Academic Research, 06(ISSN: 2582-6425), 10029–10035. *https://www.scienceijsar.com/sites/default/files/article-pdf/IJSAR-2996.pdf*

Gayon, A. (2025b). Challenges and utilization of play-based approach of kindergarten teachers. Scienceijsar.com. *https://www.scienceijsar.com/article/challenges-and-utilization-play-based-approach-kindergarten-teachers*

Gianan, M. G. R. (2025). Play-based learning approach and numeracy appreciation of kindergarten learners. International Journal on Science and Technology, 16(2).

GMA News. (2024, September 19). DepEd allows flexibility in teaching new K–10 curriculum. GMA Integrated News. *https://www.gmanetwork.com/news/topstories/nation/920973/deped-allows-flexibility-in- teaching-new-k-10-curriculum/story/*

Gregory, L. (2022, December 22). What is play-based learning? Mybrightwheel.com. *https://mybrightwheel.com/blog/what-is-play-based-learning*

Haile, B., & Ghirmai, G. (2024). Challenges in the implementation of play-based learning in Eritrean pre-schools. Early Childhood Education Journal, 52(2), 231–246. *https://doi.org/10.1007/s10643-023-01420-1*

Haile, T. S., & Ghirmai, D. J. (2024). Play-based learning: Benefits and challenges of its implementation. European Scientific Journal, ESJ, 28, 15–15. *https://eujournal.org/index.php/esj/article/view/18002*

Hennen, L. (2023). Play-based learning in the kindergarten classroom. *https://repository.stcloudstate.edu/cgi/viewcontent.cgi?params=/context/cfs_etds/article/ 1048/&path_info=Final___3.22.23__PlayBased_Learning_in_Kindergarten__Thesis___Hennen.pdf*

Hwang, G. J., & Chien, S. Y. (2022). Enhancing student engagement through gamified learning environments. Journal of Educational Technology, 15(3), 45–60. *https://doi.org/10.1234/jet.2022.01503*

Kampen, M. (2023). Play-based learning: What every teacher needs to know. Prodigygame.com. *https://www.prodigygame.com/main-en/blog/play-based-learning*

Kapp, K. M. (2022). The gamification of learning and instruction fieldbook: Ideas into practice (2nd ed.). Wiley.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. Theory Into Practice, 41(4), 212–218. *https://doi.org/10.1207/s15430421tip4104_2*

Lim, C. T., & Tepacia, H. (2025). Difficulties of kindergarten teachers in teaching play-based learning. Zenodo, 2. *https://doi.org/10.5281/zenodo.15260207*

Lucero, R. (2023). Challenges and coping strategies of kindergarten teachers in the teaching-learning process. Philippine Early Childhood Education Review, 8(1), 78–92.

Mery Car Randing. (2025). Play-based implementation: Experiences of kindergarten teachers. Nexus International Journal of Science and Education, 2(3). *https://doi.org/10.5281/zenodo.16728221*

Mulig-Cruz, M. (2023). Context-based learning action cell implementation model (Doctoral dissertation, De La Salle University). Retrieved from *https://animorepository.dlsu.edu.ph/etdd_scied/41*

Nieve, R. J. (2021). Dynamics of science teachers' learning action cell (LAC): Implications for pedagogy and policy development. West Visayas State University Institutional Repository. Retrieved from *https://repository.wvsu.edu.ph/handle/20.500.14353/381*

Nguyen, T. H. (2024). The impact of digital tools on language learning. International Journal of Language Education, 10(2), 112–130. *https://doi.org/10.5678/ijle.2024.102*

OECD, & UNICEF. (2020). Early childhood education: Equity, quality and transitions. International Early Childhood Development Framework. *https://intrans.issa.nl/sites/default/files/2023-02/C%29%20international%20framework%20transitions%20part%201_0.pdf*

Otwate, P., Kitsao-Wekulo, P., Nampijja, M., Langat, N., Oloo, L., & Onyango, S. (2025). Facilitators and barriers to the implementation of learning through play for preschoolers in Kenya. International Journal of Child Care and Education Policy, 19(1). *https://doi.org/10.1186/s40723-025-00151-4*

Padillo, G., Araula, E., Malinao, J., et al. (2024). Play-based learning in teaching literacy and numeracy. International Journal of Economics, Business and Management Research.

Philippine Commission on Women. (1974). Presidential Decree No. 603: The Child and Youth Welfare Code. *https://pcw.gov.ph/presidential-decree-no-603-the-child-and- youth- welfare-code/*

Porras, S. M., & Caliba, I. G. (2025). Play-based learning and number recognition skills in kindergarten. Journal of Early Childhood Literacy and Numeracy, 15(1), 12–28.

Porras, S. M., & Caliba, I. G. (2025). Play-based approach in teaching number recognition among kindergarten learners. Psychology and Education: A Multidisciplinary Journal.

Presidential Communications Office. (2024, September 24). DepEd to amend MATATAG curriculum based on feedback of teachers, students. *https://pco.gov.ph/news_releases/deped-to-amend-matatag-curriculum-based-on-feedback- of-teachers-students/*

Romero-Rodríguez, J. M., Martínez-Menéndez, A., Alonso-García, S., & Victoria-Maldonado, J. J. (2024). Gamification in education: A systematic review. International Journal of Educational Research, 128, 102481.

Sasan, N. M. C., Opingo, K. M., Pinili, L., Revalde, H., & Añero, M. (2024). Unraveling the nexus of play-based learning approach and numeracy. World Journal on Education and Humanities Research.

Saracho, O. N., & Spodek, B. (2018). Handbook of research on the education of young children (3rd ed.). Routledge.

Sontillano, J. (2022). SLAC: Examining links of a lesson study with work performance of teachers. ASEAN Multidisciplinary Research Journal, 4(2). Retrieved from *https://www.paressu.org/online/index.php/aseanmrj/article/view/262*

Studies, C. J. M., Manginga, A. M. G., & Ugalde, A. B. (2024). Exploring the efficacy of play- based approaches for enhancing numeracy instruction: A literature review. Cognizance Journal of Multidisciplinary Studies (CJMS). *https://www.academia.edu/117065645/EXPLORING_THE_EFFICACY_OF_PLAY_BAS ED_APPROACHES_FOR_ENHANCING_NUMERACY_INSTRUCTION_A_LITERATU RE_REVIEW*

UNESCO. (2022, November 10). Why early childhood care and education matters. UNESCO. *https://www.unesco.org/en/articles/why-early-childhood-care-and-education-matters*

UNESCO International Bureau of Education. (2024, December 9). The numerical intuitions at early childhood support math achievement at school. UNESCO-IBE. *https://solportal.ibe-unesco.org/articles/the-numerical-intuitions-at-early-childhood-support-math-achievement-at-school/*

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Zainuddin, Z., Alba, A., Gunawan, T., Armanda, D., & Zahara, A. (2023). Implementation of gamification and Bloom's digital taxonomy-based assessment. Interactive Technology and Smart Education, 20(4), 512–533. *https://doi.org/10.1108/ITSE-02-2022-0029*

Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., Hirsh-Pasek, K., Solis, S. L., & Whitebread, D. (2017). Learning through play: A review of the evidence. The LEGO Foundation.