

The Impact of Classroom Gamification Activities on Learners' Engagement in Mathematics

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ABSTRACT

This study investigated the extent to which classroom gamification activities affect learners' engagement in Mathematics at Prieto-Diaz District Schools, providing evidence-based guidance for instructional improvement and learner-centered teaching practices. Specifically, the study sought to identify the different classroom gamification activities employed by teachers in teaching Mathematics, determine the extent to which these activities influence student engagement, examine learners' attitudes toward Mathematics before and after the use of gamified activities, identify the challenges teachers face in designing, implementing, and managing gamified learning activities, and propose a Learning Action Cell session to improve teachers' competence in effectively using gamification in Mathematics instruction.

Utilizing a mixed-methods research design, data were gathered from forty elementary school teachers across nineteen schools in the Prieto-Diaz District, including Bulawan Elementary School, Calao Elementary School, Carayat Elementary School, Gogon Elementary School, Lupi Elementary School, Manlabong Elementary School, Nenita E. Oandasan Memorial School, Prieto Diaz Central School, Quidolog Elementary School, San Antonio Elementary School, San Fernando Elementary School, San Isidro Elementary School, San Juan Elementary School, San Rafael Elementary School, San Ramon Elementary School, Santa Lourdes Elementary School, Santo Domingo Primary School, Talisayan Elementary School, and Ulag Elementary School. Data were collected through researcher-made questionnaires, with qualitative data gathered through semi-structured interviews and focus group discussions to capture teachers' experiences, insights, and challenges in implementing gamification.

The findings revealed that Math Board Games and Card Games were the most frequently employed gamified activities, followed by Digital Quiz Platforms and Adapted Traditional Games. The extent of influence of gamified activities on student engagement was consistently High across Math Board Games and Card Games, Digital Quiz Platforms, Whiteboard or Relay Races, and Simulation Games. Learners demonstrated positive transformations from being inattentive to becoming curious problem-solvers, with the highest indicator focusing on the shift from inattentiveness to curiosity. However, teachers faced significant challenges, with the primary difficulty being the struggle to design gamified activities aligned with mathematics learning objectives, while the lowest-ranked challenge was assessing learners' performance during gamified activities.

The study concluded that gamified learning activities significantly influence student engagement and positively transform learners' attitudes toward Mathematics. To address the challenges identified, a Learning Action Cell session entitled Project Factor (Facilitating Active Competence Through Organized and Responsive Gamification in Mathematics): A LAC Session for Building Teacher Readiness in Gamified Math Activities was proposed to enhance teachers' competence in effectively utilizing gamification in Mathematics instruction. Recommendations included sustaining the use of identified gamified activities, continuing integration of gamification to foster positive learner transformation, providing targeted professional development programs focused on alignment of games with learning objectives, and implementing the proposed LAC sessions to strengthen teachers' capacity in gamification implementation.

Keywords — Challenges, Gamified Learning Activities, Learner Engagement, Mathematics Instruction, Teacher Competence

INTRODUCTION

Education in the twenty-first century has been reshaped by advances in technology, rapid globalization, and widespread access to information. These changes have transformed how learners interact with knowledge, with one another, and with the learning environment. Traditional teacher-centered approaches, once considered sufficient, are now increasingly questioned because they often fail to engage learners effectively. Global discussions on education now stress not only the acquisition of knowledge but also the development of critical thinking, creativity, and lifelong learning skills. Within this broader context, mathematics—often seen as abstract and difficult—requires innovative approaches that can capture learners' attention and sustain their interest.

Despite worldwide efforts to improve education, serious challenges remain. Mathematics continues to be a subject that many learners find intimidating. Studies from various countries show that learners often experience anxiety, low self-confidence, and disengagement when confronted with complex mathematical tasks. Mathematics anxiety, characterized by fear and apprehension toward the subject, has been linked to decreased participation, lower achievement, and reluctance to pursue STEM-related fields. The problem becomes worse in classrooms where instruction depends heavily on rote memorization, repetitive exercises, and teacher-centered explanations. In such environments, learners may become passive recipients of knowledge rather than active constructors of understanding, which leads to diminished motivation and a sense of alienation from mathematics.

Motivation is closely connected to engagement and plays a major role in shaping learners' educational experiences. Intrinsic motivation, driven by curiosity, interest, and the satisfaction derived from learning itself, promotes deep understanding and sustained effort. Extrinsic motivation, influenced by rewards, recognition, and social reinforcement, can also drive engagement when used thoughtfully. Effective instructional strategies combine both intrinsic and extrinsic motivators to create a balanced learning environment that encourages participation and persistence. Gamification, by integrating points, badges, challenges, and collaborative tasks, offers an innovative way to enhance motivation while providing tangible markers of progress and achievement.

In classrooms around the world, educators have observed that learners respond positively when instruction includes play, challenge, and immediate feedback. Game-like activities transform ordinary exercises into interactive experiences that spark curiosity and foster a sense of achievement. For example, problem-solving activities framed as quests or challenges can encourage learners to explore multiple strategies, test hypotheses, and collaborate with peers. The social component of gamified learning, including teamwork and friendly competition, further strengthens emotional and behavioral engagement. These observations highlight gamification's potential not only to make mathematics more enjoyable but also to address deeper motivational and cognitive challenges.

The integration of technology has expanded gamification's potential impact. Digital platforms, learning apps, and interactive simulations provide dynamic environments where learners can receive immediate feedback, track their progress, and adjust strategies accordingly. Even in low-tech contexts, analog gamification methods—such as classroom point systems, leaderboards, and collaborative problem-solving games—have been found to improve learner participation and motivation significantly. What remains consistent across settings is the principle that learning becomes more effective when it is active, personalized, and engaging. Gamification serves as a bridge between instructional content and learner motivation, creating a classroom culture where learners feel competent, autonomous, and socially connected.

At its core, gamification relies on principles well understood in psychology, education, and game design. Learners are motivated by clear goals, immediate feedback, and opportunities to experience success in incremental steps. Points, badges, leaderboards, levels, and challenges are among the most common gamification elements. When thoughtfully integrated into lesson plans, these elements can transform traditional learning tasks into interactive experiences that encourage exploration, collaboration, and problem-solving. Gamification is also adaptable; it can be applied in high-tech environments using digital platforms or in low-tech, resource-limited classrooms using analog methods such as point systems, role-playing activities, and collaborative challenges.

The concept of gamification is grounded in established theories of learning and motivation. Self-Determination Theory, for example, proposes that individuals are more likely to engage in activities when they experience autonomy, competence, and relatedness. Gamified activities address these psychological needs: autonomy is promoted by allowing learners to make choices in how they approach tasks, competence is reinforced through challenges that match learners' skill levels, and relatedness is fostered through collaborative or competitive interactions. By addressing intrinsic motivational drivers, gamification not only makes learning more enjoyable but also cultivates sustained engagement that extends beyond superficial participation. It can enhance emotional engagement by transforming repetitive or challenging tasks into enjoyable experiences, promoting positive emotions, and reducing anxiety. Cognitive engagement involves the mental effort learners invest in understanding content, analyzing problems, and applying knowledge creatively. Gamified learning tasks encourage cognitive engagement by presenting problems in incremental difficulty, encouraging exploration, and requiring learners to strategize, reflect, and apply multiple problem-solving approaches.

Gamification is not a one-size-fits-all solution. Its success depends on careful design, alignment with learning objectives, and sensitivity to learners' context. Factors such as age, prior knowledge, cultural norms, and available resources influence how gamification is implemented and received. Teachers play a pivotal role as facilitators, designers, and motivators, ensuring that gamified activities are inclusive, meaningful, and aligned with curricular goals. When thoughtfully applied, gamification can enhance motivation, promote equity in participation, and support learners in developing both academic skills and social competencies.

Across the globe, educators have increasingly recognized the need to make mathematics learning both engaging and meaningful in response to challenges involving learner motivation, participation, and anxiety. In the United States, studies in middle and secondary schools have shown that gamified learning platforms such as Kahoot!, Quizizz, and Prodigy significantly enhance learners' motivation, problem-solving skills, and overall engagement. These tools allow learners to receive immediate feedback, track their progress, and participate in friendly competitions, creating a dynamic and interactive learning environment that contrasts with traditional lecture-based instruction.

The Philippine education system has undergone significant reforms aimed at improving learner outcomes and fostering holistic development. The implementation of the Enhanced Basic Education Act of 2013, or RA 10533, also known as the K–12 Program, emphasizes learner-centered, developmentally appropriate, and contextualized teaching approaches. This legislation reflects the recognition that learners learn best when instruction is engaging, meaningful, and aligned with their needs and experiences. Mathematics, as a core subject, is given special attention because it equips learners with essential problem-solving skills, logical reasoning, and analytical thinking. However, national assessments and studies have highlighted persistent challenges, such as low learner motivation, difficulty in understanding abstract concepts, and disparities in performance across regions. These challenges underscore the need for innovative instructional strategies that can enhance engagement, promote active participation, and improve mastery of mathematical competencies.

Department of Education policies further reinforce the national emphasis on learner-centered and innovative instruction. The MATATAG Curriculum Framework promotes the development of strong foundational skills and encourages teachers to adopt interactive and meaningful strategies, particularly in mathematics. DepEd Order No. 8, s. 2015, which outlines policy guidelines on classroom assessment, highlights the importance of formative assessment, immediate feedback, and strategies that sustain learner motivation. Additionally, the Philippine Professional Standards for Teachers, or DepEd Order No. 42, s. 2017, requires educators to employ varied, innovative, and research-based strategies that foster engagement and enhance learning outcomes. These national laws and policies create an enabling environment for teachers to integrate gamification in the classroom, aligning instructional practices with the broader goal of producing motivated, confident, and competent learners.

Local education mandates and school improvement initiatives at Prieto-Diaz District further reinforce the relevance of adopting innovative strategies like gamification. School Improvement Plans, Annual Implementation Plans, and Learning Action Cell initiatives encourage teachers to experiment with learner-centered methods that address low engagement and enhance learning outcomes. By aligning classroom practices

with these local policies and initiatives, teachers are empowered to design lessons that are both contextually meaningful and pedagogically sound. Gamification is therefore not only a response to observed classroom challenges but also a strategy that harmonizes with the school's broader goals of fostering active, motivated, and confident learners.

LITERATURE REVIEW

In recent years, gamification has emerged as a promising strategy to make Mathematics learning more engaging, motivating, and meaningful for learners. Research from various countries shows that incorporating team-based and collaborative gamified activities, such as group challenges, collaborative puzzles, and board games, encourages learners to participate actively, share ideas, and apply critical thinking to solve problems (Garcia & Lopez; Kim & Park; Wang & Chen; Nguyen et al.).

Similarly, local studies in the Philippines reveal that team-based activities in Mathematics classrooms increase learners' willingness to contribute, foster social interaction, and strengthen problem-solving skills (Reyes & Cruz; Garcia & Ramos; Navarro & Villanueva). In the context of Prieto-Diaz District Schools, implementing such collaborative gamified tasks could cultivate a sense of teamwork, sustain learners' motivation, and encourage persistence, especially in classrooms where participation tends to be low.

Competition has also been shown to drive engagement. International studies demonstrate that point systems, badges, and leaderboards inspire learners to stay motivated, persist in challenging tasks, and develop analytical skills (Johnson et al., Kumar & Singh; Ali & Hassan; Garcia & Mendoza). Local evidence confirms that competitive gamification can increase participation, excitement, and recognition while reinforcing cognitive engagement (Del Rosario & Bautista; Garcia & Bautista). Introducing friendly competition in Prieto-Diaz District Schools could create a motivating environment where learners strive to improve, celebrate achievements, and enjoy Mathematics more fully.

Narrative-driven and story-based gamification has also been effective in making abstract mathematical concepts relatable and interesting. International research shows that story-based quests and problem-solving scenarios enhance learners' interest, enjoyment, and confidence while promoting deeper thinking (Silva & Rodriguez; Hernandez & Rivera; Nguyen & Pham).

In the Philippines, similar approaches have increased engagement, reduced anxiety, and encouraged learners to think critically in Mathematics lessons (Lopez & Santos; Santos & dela Rosa; Del Rosario & Bautista). For Prieto-Diaz District Schools, narrative-based gamified activities could provide meaningful contexts for abstract concepts, make learning enjoyable, and foster sustained cognitive and emotional engagement.

The use of mobile-assisted and digital gamification has become increasingly relevant, as studies indicate that interactive apps, adaptive challenges, and immediate feedback enhance learners' participation, enjoyment, and self-efficacy (Kim & Park; Lopez & Martinez; Almeida et al.; Delos Santos & Cruz; Torres & Aguilar; Reyes & Santos). Local research supports this, showing that mobile or low-tech gamified apps help learners practice problem-solving, reduce anxiety, and build confidence (Dela Cruz & Mendoza; Torres & Delgado). In Prieto-Diaz District Schools, similar digital or interactive low-tech tools could provide engaging, scaffolded experiences that enhance learners' motivation and persistence in Mathematics.

Reward systems, such as badges, points, and progress tracking, consistently appear as effective methods to recognize achievements and encourage sustained effort. International studies report that these systems not only increase participation but also support learners' cognitive growth and strategic thinking (Johnson et al.; Rodriguez & Morales; Torres & Garcia; Mendoza & Torres). Philippine studies similarly highlight improvements in engagement, motivation, and analytical skills when badges and points are integrated into classroom activities (Torres & Garcia; Garcia & Bautista). Applying these systems in Prieto-Diaz District

Schools could reinforce positive learning behaviors, reward participation, and strengthen learners' confidence in solving mathematical tasks.

Quest- and challenge-based gamification also appears to encourage persistence and deeper learning. Both international (Chen & Li; Peterson et al.; Martinez & Gomez) and local studies (Del Rosario & Cruz; Reyes & Bautista) show that structured sequences of challenges help learners remain engaged, collaborate effectively, and apply problem-solving strategies consistently. Implementing quest-based or challenge-driven gamified tasks in Prieto-Diaz District Schools could provide learners with meaningful, motivating challenges that sustain attention, foster teamwork, and deepen understanding of Mathematics concepts.

The evidence from both international and local research demonstrates that gamification, whether through collaboration, competition, storytelling, digital tools, reward systems, or structured challenges, enhances learners' behavioral, emotional, and cognitive engagement in Mathematics. For Prieto-Diaz District Schools, integrating these gamified strategies offers the opportunity to make lessons more interactive, enjoyable, and motivating, helping learners develop problem-solving skills, build confidence, and maintain sustained participation in the subject.

THEORETICAL FRAMEWORK

This study is anchored on the belief that learners' motivation, engagement, and performance in Mathematics can be significantly enhanced through thoughtfully designed gamified classroom activities. The researcher's perspective, here called the Researcher's Theory, posits that integrating collaboration, competition, narratives, and reward systems in Mathematics instruction fosters behavioral, emotional, and cognitive engagement while also improving learners' confidence and attitudes toward the subject. Motivation and enjoyment are not merely byproducts of fun activities, but essential components that drive learners to persist in problem-solving, think critically, and actively participate in the learning process. Gamified activities increase learners' interest, confidence, and cognitive engagement in Mathematics. This study is anchored in the following theories:

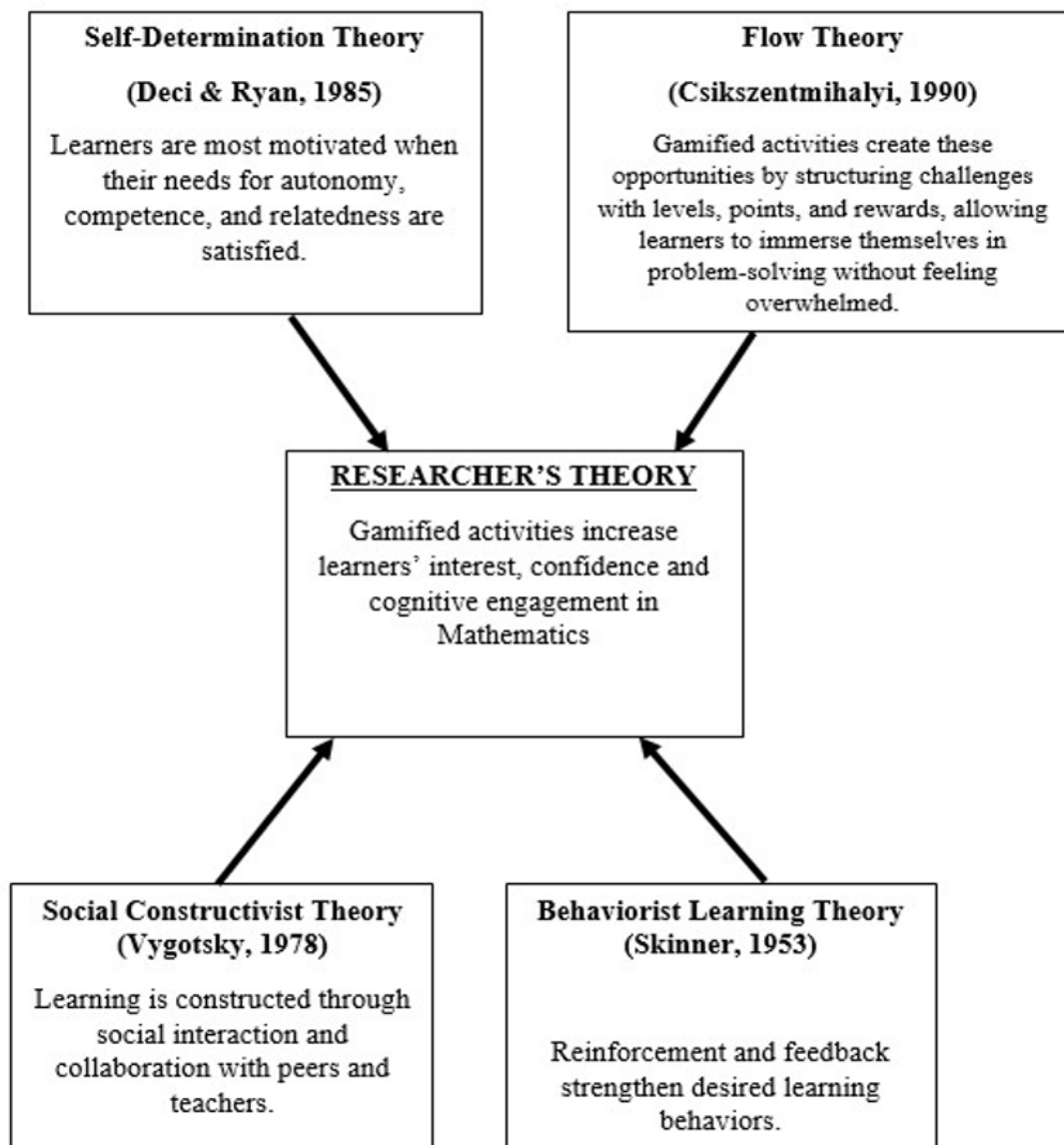
Deci and Ryan's Self-Determination Theory. Learners are more motivated when their needs for autonomy, competence, and relatedness are fulfilled. Gamified activities, such as collaborative challenges or point-based competitions, provide learners with a sense of competence as they master tasks, autonomy in choosing strategies or roles, and relatedness through teamwork, demonstrating how gamification nurtures intrinsic motivation and sustained engagement in Mathematics.

Csikszentmihalyi's Flow Theory. Learners experience deep engagement when tasks are challenging yet achievable, with immediate feedback and clear goals. Gamified activities create these opportunities by structuring challenges with levels, points, and rewards, allowing learners to immerse themselves in problem-solving without feeling overwhelmed.

Vygotsky's Social Constructivist Theory. Emphasizes learning as a socially mediated process, where learners construct knowledge through interaction with peers and teachers. Collaborative gamified tasks, such as team challenges or peer-assessment games, encourage dialogue, shared problem-solving, and scaffolding, highlighting how engagement and understanding improve when learners actively participate and learn from one another in a gamified environment.

Skinner's Behaviorist Learning Theory. The use of reinforcement in learning emphasizes that consistent feedback and rewards strengthen desired behaviors. Gamification incorporates immediate feedback, points, badges, and other rewards to reinforce task completion and active participation. Collectively, these theories provide a strong foundation for the study, illustrating that motivation, engagement, and learning are influenced by intrinsic needs, social interaction, structured challenges, and reinforcement. Integrating these principles, the researcher's theory proposes that teacher-designed gamified activities in Mathematics can holistically enhance learners' behavioral, emotional, and cognitive engagement while simultaneously boosting confidence, positive attitudes, and persistence in problem-solving.

Figure 1. Theoretical Paradigm



CONCEPTUAL FRAMEWORK

The conceptual framework of this study illustrates how teacher-designed gamified activities in Mathematics influence learners' engagement and achievement. It highlights the interconnected flow from the inputs provided by teachers and learners, through the learning processes, to the resulting outputs and long-term outcomes, with feedback serving as a mechanism for continuous improvement. This framework emphasizes the dynamic relationship between instructional strategies, learner participation, and academic growth, guiding the implementation and evaluation of gamification in the classroom.

The Input Phase represents all the essential resources and elements that initiate the study. This includes the teacher-designed gamified activities such as points, badges, challenges, collaborative tasks, and digital or low-tech tools, as well as learner characteristics like prior knowledge, motivation, and self-efficacy. Its importance lies in establishing the foundation for the learning experience; without thoughtful inputs, the gamified activities may not effectively engage learners or target their needs, making it critical to align these elements with the goals of the study.

The Process Phase focuses on the implementation of these gamified activities during Mathematics lessons. Learners actively participate, collaborate, solve problems, and receive feedback from teachers and peers while

their behavioral, emotional, and cognitive engagement is observed. This box is crucial because it shows how inputs are transformed into learning experiences; it captures the interactions, strategies, and activities that drive engagement and learning, illustrating the dynamic nature of teaching and learning in a gamified environment.

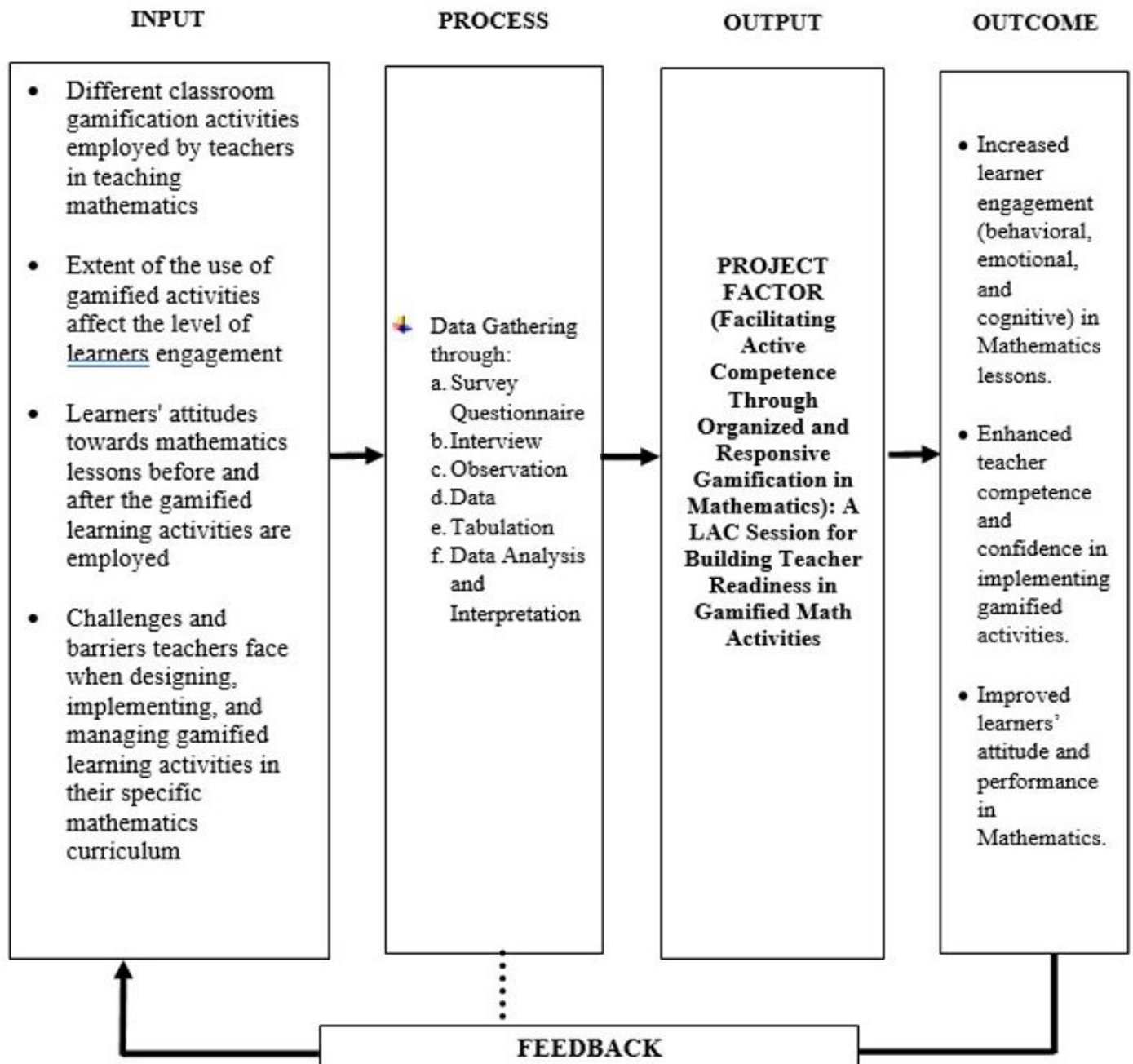


Figure 2. Conceptual Framework

The Output Phase represents the immediate results of the instructional process, such as increased learner participation, enthusiasm, collaboration, and improved problem-solving skills. Its importance lies in providing tangible evidence that the gamified activities are working; outputs reflect short-term achievements and allow teachers and researchers to see whether learners are actively engaging and applying their skills during lessons.

The Outcome box captures the enhanced engagement, motivation, and learning performance of Mathematics learners in Prieto-Diaz District Schools. Specifically, learners are expected to show increased behavioral engagement through active participation and persistence in tasks, heightened emotional engagement through

enjoyment and reduced anxiety, and improved cognitive engagement by applying critical thinking and problem-solving strategies effectively.

The Feedback box gathers information from learners' responses, teacher observations, and assessment results, which can guide adjustments in the design and delivery of gamified activities. Feedback is important as it closes the loop in the conceptual framework, allowing continuous improvement and refinement of instructional strategies to enhance engagement, learning outcomes, and overall effectiveness of Mathematics instruction.

METHOD AND PROCEDURES

This chapter discusses the research design, the presentation of the methods used, the respondents of the study, the data gathering procedures, sources of data, the research instrument, and the statistical treatment. This page of the research is useful quantitatively and is the basis for the formulation of results and conclusions.

Method

The study utilized a mixed-methods research design employing both quantitative and qualitative approaches to comprehensively examine the impact of classroom gamification activities on learners' engagement in Mathematics. This method is appropriate as it allows the researcher to describe the existing gamification practices employed by teachers, determine the relationship between these practices and learners' levels of behavioral, emotional, and cognitive engagement, while also gaining an in-depth understanding of teachers' experiences, challenges, and perspectives in implementing gamified activities.

The data were gathered through researcher-made questionnaire administered to selected elementary school teachers and learners in Prieto-Diaz District Schools. Statistical tools such as frequency counts, weighted means, and correlation analysis will be used to analyze the data and establish the extent to which gamified classroom activities influence learner engagement. This quantitative approach ensures an objective, systematic, and evidence-based assessment of how gamification contributes to Mathematics teaching and learning.

For the qualitative component, semi-structured interviews or focus group discussions will be conducted with a subset of teacher and learner participants to explore their lived experiences, challenges encountered, and insights gained from using gamified learning activities in Mathematics. Thematic analysis will be employed to identify patterns, themes, and underlying meanings embedded in their responses. This qualitative approach provides depth and context to the numerical findings, capturing the richness of participant experiences that cannot be quantified.

The integration of quantitative and qualitative data through a convergent parallel design will enable the researcher to triangulate findings, validate results across data sources, and develop a more complete understanding of how gamification influences engagement in Mathematics education. This mixed-methods approach ensures that the study captures both the breadth and depth of the phenomenon under investigation.

Respondents

The respondents of this study were selected using purposive sampling, a non-probability sampling technique that enables the researcher to choose participants who are most relevant to the objectives of the study. In this research, the respondents consisted of forty (40) elementary school teachers from Prieto-Diaz District Schools during the School Year 2024–2025 namely: Bulawan Elementary School, Calao Elementary School, Carayat Elementary School, Gogon Elementary School, Lupi Elementary School, Manlabong Elementary School, Nenita E. Oandasan Memorial School, Prieto Diaz Central School, Quidolog Elementary School, San Antonio Elementary School, San Fernando Elementary School, San Isidro Elementary School, San Juan Elementary School, San Rafael Integrated School, San Ramon Elementary School, Santa Lourdes Elementary School, Santo Domingo Elementary School, Talisayan Elementary School, and Ulag Elementary School. The teachers were

selected based on their direct involvement in teaching Mathematics and their experience in implementing or being exposed to classroom gamification activities.

Purposive sampling was considered appropriate for this study because it focuses on individuals who possess first-hand knowledge and experience related to the use of gamified instructional strategies in Mathematics. By including teachers with varying years of teaching experience, grade levels handled, and instructional practices, the study ensured that the respondents represented diverse perspectives within the district. This approach allowed the researcher to capture a comprehensive view of how gamification is employed across different classroom contexts.

Research Instruments

To gather the necessary data for this study, the researcher employed a researcher-made structured questionnaire designed to assess classroom gamification activities and learners' engagement in Mathematics in Prieto-Diaz District Schools. The research instrument was carefully developed to ensure that all key variables of the study—such as the types of gamification activities used, learners' behavioral, emotional, and cognitive engagement, and teachers' challenges in implementing gamified instruction—were adequately and systematically measured.

The questionnaire consisted of several parts. The first part of the questionnaire were focused on Different Classroom Gamification Activities Employed by Teachers in Teaching Mathematics. This is a checklist-type questionnaire. The second part highlighted the Extent to which the Use of Gamified Activities Affects the Level of learners' engagement, which was gathered through a Likert scale.

The third part of the questionnaire is focused on learners' attitudes towards mathematics lessons before and after the gamified learning activities are employed, and the last part shifts to the challenges that teachers face when designing, implementing, and managing gamified learning activities in their mathematics curriculum, both of which were presented through a Likert Scale.

Statistical Treatment

To ensure accurate analysis and interpretation of the data collected from the respondents, the study employed appropriate statistical tools aligned with each research objective. This approach allowed for a comprehensive understanding of the impact of classroom gamification on learners' behavioral, emotional, and cognitive engagement in Mathematics, ensuring that the findings were reliable, valid, and actionable for improving instructional practices.

For Problem number 1, to know the Different Classroom Gamification Activities Employed by Teachers in teaching Mathematics, the researcher used frequency and Rank. For the second problem, which focused on the extent to which the Use of Gamified Activities Affects the Level of learners' engagement, which was gathered through a Likert scale, the researcher utilized the weighted mean.

Numerical	Descriptive Equivalent
4.20 – 5.00	Very High Extent
3.40 – 4.19	High Extent
2.60 – 3.39	Moderate Extent
1.80 – 2.59	Low Extent
1.00 – 1.79	Very Low Extent

In the third part, which assessed learners' engagement, weighted mean and Likert-scale analyses were also applied to determine the learners' attitudes towards mathematics lessons before and after the gamified learning activities were employed.

Numerical	Descriptive Equivalent
4.20 – 5.00	Very much agree
3.40 – 4.19	Agree
2.60 – 3.39	Less Agree
1.80 – 2.59	Never Agree

For the fourth part, which explored teachers' challenges and barriers in implementing gamified learning, both descriptive statistics and thematic analysis were utilized. Weighted mean highlighted the most common challenges, such as time constraints, lack of resources, and training needs, while qualitative responses from open-ended items were analyzed thematically to provide deeper insights into the experiences and recommendations of teachers.

Presentation, Analysis, and Interpretation of Data

This chapter presents the data gathered from the respondents by the researcher. These data are analyzed and interpreted in this section.

Different Classroom Gamified Learning Activities Employed by Teachers in Teaching Mathematics

Gamified learning activities are increasingly becoming part of classroom teaching engagement because they transform lessons into interactive experiences. By integrating play-like elements, teachers create a learning environment that captures learners' attention and sustains their involvement. These activities encourage active participation, making learners more responsive and motivated to engage in mathematical concepts. As a result, classroom instruction shifts from passive reception to dynamic interaction, fostering deeper interest and enjoyment in learning.

Table 1 shows the list of gamified learning activities that mathematics teacher respondents commonly integrate into their classroom instruction. These activities were identified as strategies that help sustain learner engagement and foster active participation in lessons. The inclusion of such approaches reflects the teachers' efforts to make mathematics more interactive, motivating, and enjoyable for learners. Presented in the table are five specific gamified learning activities most frequently employed by the teacher respondents.

Based on Table 1, the math board games and card games had a frequency of 19 and ranked 1st. This means that gamified learning engagement has been employed by most of the teachers. This was followed by digital quiz platforms and adapted traditional games like math bingo, both with a frequency of 15, and sharing the 2nd rank. Whiteboard or relay races came next with a frequency of 14 and ranked 4th, while simulation games, such as stock market or geometry design, had the lowest frequency of 11 and ranked 5th among the commonly used gamified learning activities. Math board games and card games are preferred by the majority of teachers because they are simple to implement and require minimal preparation compared to other gamified approaches. These activities naturally encourage interaction among learners, making mathematics lessons more engaging and collaborative. They also provide opportunities for practice and reinforcement of concepts in a fun and familiar format, which helps reduce anxiety toward the subject. As a result, teachers find them effective in sustaining learner interest while still aligning with instructional goals.

Digital quiz platforms were highly valued by mathematics teachers because they provide instant feedback and allow learners to track their progress in real time. These platforms also create a competitive yet enjoyable environment that motivates learners to participate actively in lessons. Teachers noted that the accessibility of these tools makes it easy to integrate them into classroom instruction without requiring extensive preparation. As a result, digital quiz platforms became one of the most frequently employed strategies, tying for second place in preference.

Adapted traditional games, such as math bingo, were equally preferred because they combine familiarity with fun, making them effective for reinforcing mathematical concepts. Teachers found that these games are simple

to organize and can be adjusted to suit different grade levels and learning objectives. Their interactive nature encourages collaboration among learners, which helps sustain engagement throughout the lesson. This practicality and adaptability explain why adapted traditional games are tied with digital quiz platforms as the second most commonly used gamified learning activities.

Table 1

Classroom Gamified Learning Activities Employed by Teachers in Teaching

Mathematics

Indicators	Frequency	Percentage	Rank
Math Board Games and Card Games	19	48	1
Digital Quiz Platforms (Kahoot, Quizziz...)	15	38	2.5
Adapted Traditional Games: Math Bingo, Math Jeopardy	15	38	2.5
Whiteboard or Relay Races	14	35	4
Simulation Games (Stock Market, Geometry Design...)	11	28	5

Whiteboard or relay races ranked 4th in the list of gamified learning activities used in teaching mathematics. This placement indicates that while teachers recognize their value in promoting active participation, they are not as widely employed as board games or digital platforms. Teachers find these activities effective in encouraging quick thinking and teamwork, which helps sustain learner engagement during lessons. However, their lower ranking suggests that they may be more situationally applied, depending on classroom dynamics and available time.

Simulation games, such as the stock market and geometry design, ranked 5th in the list of gamified learning activities used by teachers in teaching mathematics. Their lower ranking suggests that while teachers recognize their potential for deep engagement, these activities are more complex to design and implement compared to simpler options like board games or quizzes. They often require additional time, resources, and preparation to ensure alignment with learning objectives, which may limit their frequent use. As a result, simulation games are employed less often, but when used, they provide valuable opportunities for applying mathematical concepts in real-world contexts.

The study by Russo et al. provides strong empirical support for findings on teacher preferences for non-digital games in mathematics instruction. The research examined 111 Australian primary school educators and their preferences for using digital compared with non-digital games to support mathematics teaching. Their study revealed several reasons explaining why many participants preferred non-digital games, which correspond closely with the present interpretation. The most frequently coded theme was pedagogical reasons, including that non-digital games were better for promoting collaboration and communication, that they afforded opportunities for learners to use manipulatives, and that they were easily adapted and differentiated for specific groups of learners.

Extent of Influence of Using Gamified Activities on the Level of Learners' Engagement

Gamified learning activities have been shown to directly influence how learners engage with lessons and tasks. By integrating game-like features such as points, badges, and interactive challenges, these activities create a more stimulating learning environment. The playful structure encourages learners to participate actively, sustaining their interest throughout the process. In addition, gamification fosters collaboration and friendly competition, which further enhances involvement. As a result, the use of gamified strategies consistently shapes the level of learners' engagement in meaningful ways.

Table 2 presents data highlighting the extent of influence that Math board games and card games have on learners' engagement. The table serves as a structured representation of how these gamified activities impact learners' participation and involvement in classroom settings.

Table 2

Extent of Use of Gamified Activities on the Level of Learners' Engagement

Indicators	Weighted Mean	Description
Learners consistently participate in math activities, follow rules, and demonstrate sustained effort during gameplay	4.20	Very High Extent
Learners apply mathematical concepts, strategies, and problem-solving skills actively while playing games	4.19	High Extent
Learners collaborate, communicate, and explain mathematical reasoning with peers during group play	4.04	High Extent
Learners collaborate, discuss strategies, and engage in healthy competition with peers during digital quizzes	4.02	High Extent
Learners show enjoyment, enthusiasm, and positive attitudes toward math activities	4.00	High Extent
Learners show enthusiasm, enjoyment, and positive attitudes	3.97	High Extent
Average	4.07	High Extent

Based on Table 2, the indicator stating that learners consistently participate in math activities, follow rules, and demonstrate sustained effort during gameplay had a mean value of 4.20, which was described as a very high extent. This implies that gamified activities exert an exceptionally strong influence on learners' behavioral engagement, particularly in sustaining their focus and adherence to structured tasks. Similarly, the indicator showing that learners actively apply mathematical concepts, strategies, and problem-solving skills while playing games obtained a mean of 4.19, described as a high extent. This suggests that gamified activities effectively bridge theoretical knowledge and practical application, encouraging learners to think critically within an enjoyable context.

Moreover, the indicator highlighting collaboration, communication, and explanation of mathematical reasoning with peers during group play recorded a mean of 4.04, described as a high extent. This reflects the capacity of math games to foster teamwork and peer interaction, thereby strengthening engagement through shared learning experiences. In the same vein, the indicator about collaboration, discussion of strategies, and healthy competition

during digital quizzes posted a mean of 4.02, also described as a high extent, indicating that competitive yet cooperative digital elements further drive active participation and strategic thinking.

Furthermore, learners' enjoyment, enthusiasm, and positive attitudes toward math activities yielded a mean of 4.00, described as a high extent, which suggests that gamified approaches effectively cultivate intrinsic motivation and interest. Lastly, the closely related indicator on enthusiasm, enjoyment, and positive attitudes registered a mean of 3.97, still described as a high extent, reinforcing the overall positive affective response elicited by these activities.

The study conducted by Yonwilad et al. provides strong empirical support for the findings on the influence of board games in mathematics education. The research examined 59 third-year pre-service mathematics teachers who collaboratively designed educational board games integrating arithmetic operations, equations, and geometry. The findings demonstrated significant positive effects on both objectives. For mathematical reasoning and conceptual understanding, 94.72 percent of games achieved very good or excellent ratings for mathematical content integration. For creativity and teamwork skills, 94.91 percent of participants achieved very good or excellent teamwork performance levels.

Learners' Perceived Attitudes Towards Mathematics Lessons Before and After the Use of Gamified Learning Activities

Learners develop certain attitudes toward mathematics lessons that can be observed both before and after the integration of gamified learning activities. Before the use of these strategies, learners often approach math with varying levels of interest, confidence, and motivation. The introduction of gamified activities, however, provides a new dimension to learning by making lessons more interactive and engaging. This shift allows for a clearer understanding of how learners' perceptions and attitudes toward mathematics evolve when certain instruction is complemented by game-based approaches.

Table 3 presents the perceived attitudes of learners toward mathematics lessons before and after the implementation of gamified learning activities, as evaluated by the teacher-respondents. The indicators were designed to capture specific transformations in learners' disposition across multiple dimensions of affective engagement, including attention, confidence, enjoyment, willingness to participate in group tasks, and cooperation in teamwork.

The indicator stating that learners who were previously inattentive during mathematics instruction turned curious in solving problems when gamified activities were introduced obtained the highest mean of 4.54, described as very much agree. This strongly implies that gamified learning effectively captures and redirects learners' attention, sparking intrinsic curiosity and a renewed willingness to engage with mathematical content.

Similarly, the indicator reflecting that learners who were self-doubting in their mathematical abilities became confident and persistent in tackling challenges through gamified activities recorded a mean of 4.43, also described as very much agree. This suggests that the interactive and low-risk nature of gamified learning fosters academic self-efficacy, encouraging learners to embrace difficulties rather than avoid them. Likewise, the indicator showing that learners who found mathematics instruction boring turned to enjoy and have fun with math lessons when gamified activities were employed posted a mean of 4.32, described as very much agree. This indicates that gamification effectively shifts the affective climate of the classroom, replacing monotony with enjoyment and positive emotional engagement.

Furthermore, the indicator revealing that learners who were uninterested in group tasks became willing to participate and engage actively with peers during gamified math activities yielded a mean of 4.20, described as very much agree. This reflects the capacity of gamified activities to lower social barriers and promote voluntary peer collaboration. Lastly, the indicator stating that learners who were hostile to engaging in teamwork became cooperative and focused when gamified activities were integrated into math instruction registered a mean of 4.12, described as agree.

While this was the lowest rating among the indicators, it remains notably high and suggests that even learners with initially negative dispositions toward group work exhibit measurable improvements in cooperation and concentration when gamification is employed.

Table 3

Learners' Perceived Attitudes Towards Mathematics Lessons Before and After the Use of Gamified Learning Activities

Indicators	Weighted Mean	Description
Learners who were inattentive during mathematics instruction turned curious and interested in solving problems when gamified learning activities were introduced	4.54	Very much agree
Learners who were self-doubting in their mathematical abilities became confident and persistent in tackling challenges through gamified learning activities	4.43	Very much agree
Learners who found mathematics instruction boring turned to enjoy and have fun with math lessons when gamified learning activities were employed	4.32	Very much agree
Learners who were uninterested in group tasks became willing to participate and engage actively with peers during gamified math activities	4.20	Very much agree
Learners who were hostile to engaging in teamwork became cooperative and focused when gamified learning activities were integrated into math instruction	4.12	Agree
Average	4.32	Very much agree

The study by Bhuyan and Bordoloi concludes that math games are an effective pedagogical strategy for enhancing problem-solving skills and fostering positive attitudes toward mathematics, recommending systematic incorporation of math games into instruction, teacher training for effective assistance, and reflection-based activities to strengthen metacognitive and strategic thinking skills. Similarly, the research by Naccache et al. emphasizes the importance of teacher expertise and adequate technological infrastructure in successful game-based learning implementation, while confirming the potential of well-designed interventions to enhance mathematics learning and learners' attitudes.

Challenges and Barriers Teachers Face When Designing, Implementing, and Managing Gamified Learning Activities in Mathematics

Teachers often encounter challenges and barriers when incorporating gamified learning activities into mathematics instruction. Designing such activities requires careful planning to ensure that the games align with learning objectives and maintain educational value. Implementing them in the classroom also involves managing

diverse learners' needs and balancing fun with academic rigor. Moreover, sustaining these activities over time demands effective classroom management and adaptability, making the presence of challenges a common aspect of the process.

Table 4

Challenges that Teachers Face When Designing, Implementing, and Managing Gamified Learning Activities

Challenges	Frequency	Rank
Teachers struggle to design gamified activities that are aligned with mathematics learning objectives	39	1
Lack of time to prepare gamified learning materials	30	2
Limited knowledge or training in using gamified Learning Materials	21	3
Difficulty in managing learners' behavior in time of engagement with gamified learning materials	18	4
Difficulty in integrating gamified activities in the mathematics curriculum	15	5.5
Lack of access to digital resources that are sources of gamified learning activities	15	5.5
Difficulty in assessing learners' performance during engagement with gamified activities	15	5.5
Some of the learners are passive in engaging with gamified learning activities	12	8

Table 4 revealed a range of obstacles spanning pedagogical, logistical, and technical domains. These include difficulties in aligning games with curriculum standards, limited preparation time, insufficient training, resource constraints, classroom management issues, and assessment challenges.

The result reveals that a critical barrier to implementing gamified learning is the struggle to design gamified activities aligned with mathematics learning objectives, with a frequency of 39, ranked 1st. This suggests that teachers face a severe conceptual gap in translating abstract math concepts into engaging game mechanics. This is supported by Mayrhofer et al. , who found in their systematic review that current gamification design in secondary mathematics education remains heavily reliant on performance-based game elements that do not inherently facilitate meaningful or aligned learning experiences.

This is closely followed by a lack of time to prepare gamified learning materials, with a frequency of 30, ranked 2nd. This implies that teachers are already overburdened with administrative and academic tasks, making gamification feel like an additional luxury rather than an integrated strategy. Clowser identified time constraints as the most prominent external barrier to implementing gamified adaptive learning technologies, noting that even motivated teachers cannot dedicate the hours needed to create quality content. A significant portion of the workforce feels fundamentally underprepared, as seen in limited knowledge or training in using gamified learning materials, with a frequency of 21, ranked 3rd. This points to a systemic professional development gap.

Iyer and Pushpanadham confirmed this, reporting that while teachers are aware of gamification and believe in its potential, many lack the confidence and formal training required to execute it effectively, leading to trial-and-error approaches that often fail.

The challenge of managing learners' behavior during engagement, with a frequency of 18, ranked 4th, highlights the behavioral management dilemma unique to gamified environments. The excitement, competition, and instant feedback inherent in games can trigger overstimulation, rivalry, and off-task behavior. This behavioral dilemma is noted by Turan and Akdag-Cimen, who highlighted that the competitive mechanics of gamification often lead to classroom management difficulties that teachers feel ill-equipped to handle.

A notable three-way tie occurs at rank 5.5th, with three challenges each receiving a frequency of 15: difficulty in integrating gamified activities into the mathematics curriculum, lack of access to digital resources, and difficulty in assessing learners' performance. This cluster underscores a multifaceted systemic barrier.

Chávez Marín and Pinedo Cantillo systematically identified the lack of curriculum integration and scarcity of digital resources as top-tier hurdles, noting that rigid syllabi and poor infrastructure trap teachers. Furthermore, Zainuddin et al. (2020) emphasized the assessment challenge, reporting that teachers lack proper formative tools to measure genuine learning gains amidst the noise of game scores and rewards, leaving them without clear evidence of learners' progress.

Interestingly, some learners, being passive, with a frequency of 12, ranked 8th and received the lowest rank. This indicates that teachers do not primarily blame learners' passivity for gamification failure. Instead, they recognize that if the design, time, training, resources, and curriculum alignment are properly addressed, the inherent appeal of gamification would naturally pull passive learners into participation. This aligns with Mayrhofer et al., who implied that passivity often dissipates when structural and design issues are resolved, shifting the burden of failure away from learners and onto institutional support systems.

This result demonstrates that teacher-centric and institutional factors (design difficulty, time, training, behavior management, curriculum integration, resources, and assessment) heavily outweigh learner-centric factors (passivity). These findings are corroborated by contemporary research into the psychological and systemic pressures of educational technology integration. The clear implication is that if school systems shifted to provide structured gamification templates, dedicated planning time, school-wide access to digital repositories, and competency-based training, teachers believe they could successfully manage even passive or difficult classes.

LAC session to improve teachers' competence in effectively using gamification learning activities in Mathematics

Project Factor (Facilitating Active Competence Through Organized and Responsive Gamification in Mathematics): A Lac Session for Building Teacher Readiness in Gamified Math Activities

Maria Kristel V. Ebuenga Proponent

SHIELD 2: School Heads' Integrated Empowerment and Leadership Development for 2 (Years)

An Intervention for Newly Assigned School Administrators

Ronell A. Domanais Proponent

Rationale

The Learning Action Cell (LAC) approach, mandated by the Department of Education as a school-based continuing professional development strategy, offers an ideal framework for addressing these needs. LAC sessions are characterized by collaborative, participatory, and context-specific learning among groups of teachers who share common grade levels, subject areas, or professional interests. Unlike traditional top-down training, LAC sessions empower teachers to identify their own learning needs, draw on collective expertise, and develop

solutions grounded in their specific classroom realities. The small-group structure fosters trust, encourages risk-taking, and allows for sustained engagement with complex pedagogical challenges over time.

This LAC session, titled "Level Up Mathematics Teaching: A LAC Session on Designing, Implementing, and Managing Gamified Learning Activities," is designed to respond directly to the challenges documented in teacher data. The session is grounded in the principle that effective professional development must be active, collaborative, and directly connected to classroom practice. Rather than simply presenting information about gamification, the session engages teachers in the actual work of designing, playtesting, and refining gamified mathematics activities. Through a series of structured workshops, participants will practice aligning games with learning objectives, creating or adapting activities for their grade levels, developing classroom management strategies, and designing authentic assessment tools.

The session design draws on established principles of adult learning theory, recognizing that teachers, like their learners, learn best when they are actively engaged, when learning is relevant to their immediate needs, and when they have opportunities to reflect on and refine their practice. The activity-based format ensures that participants leave not only with increased knowledge but with concrete, ready-to-use products, including completed game designs, assessment tools, and personal action plans. The inclusion of peer feedback mechanisms, gallery walks, and playtesting sessions creates a supportive yet rigorous environment where ideas are challenged, refined, and improved through collective wisdom.

Moreover, the session acknowledges that building competence in gamification is not a one-time event but an ongoing process. The action planning component encourages teachers to commit to specific implementation steps, while follow-up mechanisms built into the evaluation plan support continued learning and refinement. By pairing participants with accountability partners and scheduling follow-up sharing in subsequent LAC sessions, the intervention promotes sustained engagement with gamification beyond the initial training.

The ultimate goal of this intervention is to empower mathematics teachers with the confidence, knowledge, and practical skills needed to use gamified learning activities effectively. When teachers can design games that truly align with learning objectives, manage classrooms skillfully during gameplay, and assess learning accurately within gamified contexts, the full potential of gamification can be realized.

Once inattentive learners become curious and engaged. Those who doubted their mathematical abilities develop confidence and persistence. Learners who found mathematics boring discover enjoyment and fun. And learners resistant to collaboration become cooperative team members. These transformations, documented in teacher perceptions, are not automatic; they require skilled facilitation by educators who understand both mathematics and game design.

This LAC session represents a deliberate investment in building that skilled facilitation. By addressing the specific barriers teachers face and providing structured, supportive opportunities for practice and reflection, the intervention aims to close the gap between the promise of gamification and its practical realization in mathematics classrooms. In doing so, it contributes to the broader goal of creating mathematics learning environments where all learners can experience success, engagement, and genuine enthusiasm for the subject.

SUMMARY, FINDINGS, CONCLUSIONS, RECOMMENDATIONS

This chapter presents the salient results of the study about the statement of the problem. It also explains the conclusions and recommendations made based on the relevant outcome of the present work.

Findings

The following are the salient findings from the study:

- The different classroom gamified learning activities employed by teachers in teaching Mathematics, the indicator identified is Math Board Games and Card Games, which obtained a frequency of 19 and was ranked

1st. This was followed by Digital Quiz Platforms and Adapted Traditional Games, both with a frequency of 15 and sharing the 2nd rank. Whiteboard or Relay Races emerged as the next most frequently employed activity with a frequency of 14 and ranked 4th.

- The extent of influence of gamified activities employed by the teachers are: Learners consistently participate in Math activities, follow rules and demonstrate sustained effort during gameplay, got a weighted mean of 4.20 described as a very high extent. This was followed by learners apply mathematical concepts, strategies, and problem-solving skills actively while playing games with a weighted mean of 4.19 described as High Extent, and learners collaborate, communicate, and explain mathematical reasoning with peers during group play with a weighted mean of 4.04 also described as High Extent.
- The learners' attitudes towards mathematics lessons before and after the gamified learning activities were employed are: Learners who were inattentive during mathematics instruction turned curious and interested in solving problems when gamified learning activities were introduced got a weighted mean of 4.54 and is described as Very much agree, followed by Learners who were self-doubting in their mathematical abilities became confident and persistent in tackling challenges through gamified learning activities got a weighted mean of 4.43 described as very much agree, and Learners who found mathematics instruction boring turned to enjoy and have fun with math lessons when gamified learning activities were employed got the weighted mean of 4.32, also described as very much agree, respectively.
- The challenges and barriers teachers face when designing, implementing, and managing gamified learning activities in Mathematics are: teachers struggle to design gamified activities that are aligned with mathematics learning objectives ranked 1st with a frequency of 39; followed by lack of time to prepare gamified learning materials ranked 2nd with a frequency of 30; and limited knowledge or training in using gamified learning materials ranked 3rd with a frequency of 21.
- LAC sessions was designed to improve teachers' competence effectively in using gamified learning activities in Mathematics.

Conclusions

Based on the salient findings of the study, the following are the conclusions:

- The different classroom gamified learning activities employed by teachers in teaching Mathematics are Math Board Games and Card Games, Digital Quiz Platforms, and Adapted Traditional Games.
- The Extent of Influence of Using Gamified Activities on the Level of learners' engagement, along with math board games and Card Games, digital quiz platforms, whiteboard or relay races, and simulation games, is High.
- The learners' attitude before the use of gamified activities is from being inattentive to learners into curious problem solvers after the use of gamified activities.
- The challenges and barriers teachers face when designing, implementing, and managing gamified learning activities in mathematics are the struggle to design gamified activities that are aligned with mathematics learning objectives, the lack of time to prepare gamified learning materials, and the limited knowledge or training in using gamified learning materials.
- LAC session guide entitled "Project Factor (Facilitating Active Competence Through Organized and Responsive Gamification in Mathematics): A LAC Session For Building Teacher Readiness in Gamified Math Activities" is proposed to improve teachers' competence in effectively using gamified learning activities in Mathematics.

Recommendations

Based on the following findings obtained and the conclusions drawn from them, the following are recommended:

- Math Board Games and Card Games, Digital Quiz Platforms, and Adapted Traditional Games be utilized by mathematics teachers.
- The use of Math Board Games and Card Games, Digital Quiz Platforms, Whiteboard or Relay Races, and Simulation Games in their instruction be sustained.

- Integrating gamified learning activities in their instruction to sustain the positive transformation of learners be continued.
- The use of structured gamification design guides, dedicated planning time, and competency-based training programs on gamified learning materials be provided to address the challenges teachers face in designing, implementing, and managing gamified learning activities in mathematics.
- Project Factor (Facilitating Active Competence Through Organized and Responsive Gamification in Mathematics): A LAC Session for Building Teacher Readiness in Gamified Math Activities be implemented.
- The following topics be considered in future research:
- The Effectiveness of Teacher-Training Programs on Gamified Instruction in Enhancing Mathematics Teachers' Competence in Designing and Implementing Gamified Learning Activities.
- A Comparative Study on the Impact of Non-Digital and Digital Gamified Activities on Learners' Engagement and Mathematics Performance Across Different Grade Levels.
- Developing and Validating a Curriculum-Aligned Gamified Activity Framework for Teaching Mathematics in Elementary and Secondary Schools.
- Exploring the Relationship Between Teachers' Gamification Knowledge, Self-Efficacy, and Their Implementation Practices in Mathematics Instruction.
- The Role of Gamified Learning Activities in Reducing Mathematics Anxiety and Fostering Positive Attitudes Among Learners: A Longitudinal Study.

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