PERCEPTIONS OF MATHEMATICS' STUDENT TEACHERS IN THE IMPLEMENTATION OF GAMIFICATION IN SECONDARY SCHOOL AT NASUGBU, BATANGAS

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Abstract

This study delved into the perceptions of Mathematics' student teachers regarding the implementation of gamification in secondary schools at Nasugbu, Batangas. This research investigates the rising global trend of implementing gamification in education, particularly in Mathematics teaching, to address contemporary learner needs by examining student teachers' use of gamified activities, their design factors, encountered challenges, and perceived benefits. Purposive sampling was utilized in a multiple-case study approach to select ten (10) secondary school Mathematics' student teachers engaged in practice teaching in Nasugbu, Batangas. Qualitative findings revealed common gamified activities employed by student teachers, emphasizing the importance of student-centered design, alignment with learning objectives, student engagement, assessment, and adaptation to the classroom context. Challenges faced by student teachers in integrating gamification included technical limitations, sustaining engagement, time management, and addressing diverse learning styles. Despite these challenges, integrating gamification showed benefits such as increased engagement, improved learning outcomes, reduced math anxiety, and enhanced attitudes towards Mathematics. In conclusion, gamified activities play a significant role in enhancing student engagement and learning outcomes in Mathematics classrooms. The findings suggest student teachers to explore and integrate gamified activities into Mathematics lessons to create engaging environments supporting student success.

Keywords: *Gamification, Mathematics Education, Student Teachers.*

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Introduction

In education, constant innovation and creative strategies are essential for empowering students. Bastow (2023) had noted that attention spans, especially among youth, had shortened over time due to digital stimulation from social media and gadgets. This had affected how information was presented, with students becoming accustomed to skimming texts rather than engaging deeply. Consequently, educators have explored interactive teaching methods and technology integration to enhance learning experiences. One such method gaining traction had been gamification, which incorporated game elements into educational contexts.

Research by Karamert and Kuyumcu (2021) highlighted the positive impact of gamification on students' attitudes and academic performance. Buljan (2021) had supported this, suggesting that awarding points for achieving learning objectives encouraged engagement and monitored progress effectively. Moreover, using gamification for non-academic goals, such as maintaining a tidy classroom, motivated students to excel in both academic and non-academic areas, leading to overall performance improvement.

The application of the gamification strategy as a response to the changing requirements of learners in the twenty-first century has seen a steady increase in the trend worldwide, particularly in the area of mathematics. Gamification in the classroom has demonstrated potential for creating a more participatory and interesting learning environment. However, the attitudes and perceptions of those involved in its implementation played a major role in its success. The success of a gamified system of teaching required participation from the students. This had been one of the major challenges being faced by educators, especially the student teachers, who had had to double their efforts in gaining the attention of the students. This had been supported by the study of Alrashed et al. (2023), which focused on the factors affecting the students' willingness to use gamification.

Mahadi (2023) had suggested that while gamification may not have directly correlated with knowledge and skills, it could have significantly influenced students' behavior, dedication, and motivation, ultimately enhancing their learning outcomes. However, Alsadoon et al. (2022) found that while gamification increased students' willingness to learn, it had a minimal impact on their academic performance. This underscored the complexity of gamification's effects on education.

Implementing gamification in education has come with its own challenges. Questions had arisen about its ability to effectively replace traditional teaching methods, its potential to enhance students' proficiency in subjects like mathematics, and its adaptability to various learning styles. To maximize the benefits of gamification in mathematics education, these challenges had to be carefully addressed and refined.

Chans and Castro (2021) emphasized the need for further research to validate the effectiveness of gamified learning systems across different educational domains. Additionally, there has been a dearth of studies focusing on gamification in secondary schools, with most existing research concentrating on primary and college-level English and science courses. This highlighted the necessity for more comprehensive investigations into the application and impact of gamification, specifically within the secondary school context.

The objective of this study was to assess the perception of student teachers in Nasugbu, Batangas, regarding the implementation of gamification in secondary school mathematics education. It had aimed to identify factors influencing the creation of gamified activities and uncover challenges faced by student teachers during implementation. Additionally, the study sought to gather insights into the perceived benefits and drawbacks of gamified activities and their effectiveness in enhancing student engagement.

This research has contributed to the discourse on innovative instructional approaches by examining the perspectives and challenges of student teachers in Nasugbu, Batangas, when integrating gamification into mathematics education. The findings held potential significance for educators, curriculum designers, and policymakers, offering insights into the feasibility and efficacy of gamified teaching methods in secondary schools.

Ultimately, the study aimed to bridge the gap between theoretical discussions about gamification in education and practical applications. By providing valuable insights from the field, it has served as a resource for teachers seeking information on effectively integrating gamification into secondary school mathematics instruction.

Statement of the Problem

The research paper aimed to identify the perceptions of student teachers in Nasugbu, Batangas, regarding the implementation of gamification in secondary school mathematics education. Specifically, it sought to answer the following questions:

1. What are the common gamified activities employed by student teachers in the mathematics classroom?
2. What are the factors that are considered in creating gamified activities?
3. What are the challenges encountered by student teachers in Nasugbu, Batangas, when integrating gamification into teaching secondary school mathematics?
4. What are the benefits perceived by student teachers in Nasugbu, Batangas, in using gamification as a tool for teaching secondary school mathematics?
5. Based on the research findings, what gamified learning activity may be recommended?

Methodology

The researchers employed a qualitative multiple-case study design to delve into the perceptions of mathematics student teachers regarding the implementation of gamification in secondary schools in Nasugbu, Batangas. This methodological choice aimed to thoroughly investigate the nuances of human experiences and perceptions essential for our study's objectives (Ugwu & Eze, 2023). By specifically focusing on the common gamified activities employed by the student teachers, factors considered in crafting a gamified activity, challenges encountered by student teachers, and the perceived benefits of using these activities, the research aims to propose a gamified activity considering the perceptions of mathematics student teachers. This method provides a nuanced understanding and a broader discussion surrounding the integration of gamification in educational settings.

Population and Sampling

The participants of this study were selected using the Purposive Sampling Method to ensure the inclusion of student teachers with relevant expertise and direct experience in implementing gamification within secondary schools in teaching Mathematics. For this study, 10 participants met the criterion of being a Mathematics student teacher, engaged in their practice teaching in secondary school at Nasugbu, Batangas in the academic year 2023-2024. This focused sampling strategy is a technique commonly employed in qualitative research to intentionally identify and select respondents relevant to the study's topic (Palinkas et al., 2015).

Instrumentations

The researcher utilized a semi-structured interview approach divided into three sections to gather comprehensive insights from participants. The first section clarified the study's purpose and gathered information about participants' roles as student teachers. The second section focused on participants' experiences with gamification, including common activities, design factors, challenges, and benefits. Lastly, insights into students' responses to gamification were sought. Overall, this methodical approach ensured consistency, flexibility, and thorough discussions, facilitating a comprehensive analysis of mathematics student teachers' perspectives on the implementation of gamification in secondary schools in Nasugbu, Batangas.

Data Collection

The data collection process began with informing student teachers about the research through a message and a pre-survey to gauge interest. Verbal consent was obtained before scheduling online interviews, emphasizing the voluntary nature of participation and confidentiality. Interviews, conducted via platforms like Google Meet, included tailored inquiries to gather comprehensive data on gamification implementation. Additional comments were captured during and after each session. All interviews were electronically recorded with participants' consent.

Data Analysis

The researchers utilized cross-case analysis under thematic analysis to comprehensively investigate the perceptions of Mathematics' student teachers in the implementation of gamification in secondary schools at Nasugbu, Batangas. This method systematically identified and classified patterns and themes within the qualitative data, including perceptions about gamification, key factors in designing gamified activity, encountered challenges, and perceived benefits. Identified themes were analyzed, contributing to the broader framework of gamification in secondary school mathematics instruction.

Ethical Consideration

Ethical considerations were vital in the examination of Mathematics' student teachers' perceptions regarding the implementation of gamification in secondary schools in Nasugbu, Batangas. Prior to their participation, verbal consent was obtained, and participants were briefed comprehensively about the study's objectives. It was ensured that participants voluntarily agreed to take part in the study, particularly regarding discussions on their students' responses to gamified activities. Moreover, maintaining confidentiality was crucial to safeguard participants' identities, especially

when discussing their experiences with gamification in Mathematics classes. Creating a safe and secure environment for participants encouraged openness and facilitated meaningful dialogue during the interviews. Respecting participants' freedom was also essential, giving them the choice to withdraw from the study if they experienced any discomfort or felt unsafe. This ensured that participants' decisions were honored and that they were not coerced into participating against their will. Finally, transparency and honesty were upheld in reporting the data gathered from participants. Adhering to these ethical principles ensured that the study was conducted in a secure and systematic manner, allowing for the collection of valuable insights into gamification in Mathematics education while prioritizing the well-being and rights of the participants.

Results and Discussion

Presented below are the data analysis and findings from the interview conducted among the participants of the study, revealing the emerging themes of common gamified strategies, factors, challenges, and benefits.

Table 1

Common Gamified Activities Employed by Student Teachers in Teaching Mathematics

Major Themes	Excerpts
Kahoot!	"Every day, I use gamified activities, but the most common or well-known one that I use is Kahoot!, to create online-based or game-based quizzes, especially at the end of the week or at the end of the learning competencies lesson." (P1) "I also use Kahoot! for online games and quizzes." (P4)
Family Feud	"So as of today, I am using a combination of scoring or pointing system and reward system. So before the discussion, I am having a game, which is by group, and gamified activities like ...and Family Feud..." (P2) "The gamified activities I use are Family Feud..." (P4) "So when I play with them like in other games like Family Feud..." (P5) "I often use Family Feud..." (P6)
Fact or Bluff	"The 'Fact or Bluff' game is played by students to study facts. So, I present facts and statements, that's why in 'Fact or Bluff,' they conclude whether it's true or false. This activity is good because it gives them a chance to analyze, so they don't just believe everything they see. That's why this is one of the activities I use." (P1)
Pick a Door	"I often use Family Feud, and also the pick a door game where they choose a door and there's a question or task behind it, I also use Kahoot." (P1) "I often use Family Feud, and also the pick a door game where they choose a door and there's a question or task behind it, I also use Kahoot." (P6)
Mystery Box	"The gamified activities I use are Family Feud, rebus game, mystery box, mystery door. That's it." (P4) "I often use Family Feud, and also the pick a door game where they choose a door and there's a question or task behind it, I also use Kahoot! I can't remember the others much, but those are mostly used in the preliminary activity or in my motivation. As for the gamified activity in the discussion, I use the pointing system where I give points to students who are active in the

	discussion and I also give a simple token to those with the most points before the discussion ends." (P6)
Rebus Game	"The gamified activities I use are Family Feud, Rebus Game, Mystery Box, Mystery Door. That's it." (P4)
Math Scavenger Hunt	"So there, what I often do is the Math Scavenger Hunt. What I do is I have papers of different colors for each group, and those papers contain equations related to our lesson. Each group has three papers. I give them 10 minutes to search for and answer those equations." (P10)
Leaderboard	"In games, not in discussion. I still often use the leaderboard, where I create a small bulletin board in each section I teach, and the leaderboard or the consecutive top-performing students are displayed there." (P5) "The leaderboard I created is for individuals and one for groups, and there are four groups. For individuals, the top 10 are displayed, and for groups, the top 4 are displayed so that everyone is included." (P8) "We also know that children really like recognition, so because of this, they really prepare for every quiz and activity because they want to see their name on it." (P10)

Table 1 illustrates the several common gamified activities employed by Mathematics' student teachers Nasugbu, Batangas. There are eight (8) major themes identified about the common gamified activities employed by the student teachers:

- Kahoot!
- Family Feud
- Fact or Bluff
- Pick a Door
- Mystery Box
- Rebus Game
- Math Scavenger Hunt
- Leaderboard

Kahoot!

The major theme "Kahoot!" is a widely-used online platform that Participant 1 and Participant 4 leverage in their classrooms to enhance student engagement and learning outcomes. Kahoot! offers a dynamic and interactive platform for educators to create quizzes, surveys, and discussions that students can participate in using their mobile devices. Through "Kahoot!," teachers can design engaging learning activities that incorporate elements of gamification, such as quizzes with a competitive edge and instant feedback. By utilizing Kahoot!, teachers like Participant 1 and Participant 4 can assess student understanding, reinforce key concepts, and promote active learning in a fun and interactive manner. This platform not only fosters student participation and motivation but also provides teachers with valuable insights into student progress and areas for further reinforcement. Overall, Kahoot! serves as an effective tool for creating a dynamic and engaging learning environment in the classroom.

Family Feud

The second major theme "Family Feud" is a popular game show format adapted by educators to create engaging and interactive classroom activities. Participant 2, Participant 4, Participant 5, and Participant 6 all incorporate the popular game "Family Feud" into their classroom activities to engage students in interactive learning experiences. Overall, Family Feud serves as an effective tool for creating a dynamic and engaging classroom experience.

Fact or Bluff

Participant 1 employs a classroom activity called "Fact or Bluff," where students must discern whether a given statement is factual or false. This game fosters critical thinking skills and encourages students to evaluate information critically. This strategy engages students in discerning truth from falsehood, enhancing their analytical skills and promoting a deeper understanding of the subject matter. By fostering a habit of critical evaluation, "Fact or Bluff" contributes to students' overall cognitive development and academic growth.

Pick a Door

The "Pick a Door" gamified strategy is a classroom activity where students are presented with a choice of doors, each concealing a question or task behind it. Students select a door, revealing the question or task assigned to that door, which they then must answer or perform. This strategy adds an element of excitement and anticipation to the learning process, as students engage in decision-making and problem-solving to uncover the content hidden behind their chosen door. It encourages active participation and critical thinking skills while providing an interactive and enjoyable learning experience. "Pick a Door" encourages active participation and critical thinking as students select doors and engage with the questions or tasks behind them. It adds an element of excitement and anticipation to the learning process, making it more enjoyable and memorable for students. In general, "Pick a Door" serves as an effective tool for promoting student engagement and reinforcing key concepts in the classroom.

Mystery Box

Mystery Box is an engaging and interactive gamified activity utilized by educators to foster student participation and critical thinking skills. Both Participant 4 and Participant 6 incorporate Mystery Box into their teaching strategies, offering students an exciting opportunity to solve mysteries relevant to the lesson. Mystery Box challenges students to think critically, apply their knowledge, and collaborate with peers to uncover solutions. It adds an element of suspense and intrigue to the learning environment, keeping students motivated and engaged throughout the lesson. By incorporating Mystery Box into their teaching practices, educators create dynamic and immersive learning experiences that promote active participation and deeper understanding of the subject matter.

Rebus Game

The Rebus Game is an innovative gamified activity employed by educators to enhance student engagement and reinforce learning concepts. Participant 4 incorporates the Rebus Game into their classroom activities, providing students with a fun and interactive way to decipher visual puzzles related to the lesson. In the Rebus Game, students are presented with pictorial representations that symbolize words, phrases, or concepts relevant to the subject matter.

By decoding these visual clues, students not only reinforce their understanding of key vocabulary and ideas but also develop their problem-solving and critical thinking skills in a fun and engaging manner. By incorporating the Rebus Game into their teaching repertoire, educators like Participant 4 create dynamic learning experiences that cater to diverse learning styles and foster a positive and inclusive classroom environment. This gamified approach to learning encourages active participation, stimulates curiosity, and promotes collaborative learning among students, ultimately leading to deeper comprehension and retention of academic content.

Math Scavenger Hunt

Participant 10 implements an interactive and engaging activity called Math Scavenger Hunt in their classroom, adding an element of excitement and exploration to the learning process. During the Math Scavenger Hunt, students work collaboratively in teams to locate equations hidden throughout the classroom or designated area. These equations are carefully chosen to align with the lesson objectives, allowing students to apply their knowledge and skills in solving mathematical problems in a real-world context. The Math Scavenger Hunt not only promotes active learning but also fosters teamwork, communication, and problem-solving skills among students. By participating in this hands-on activity, students develop a deeper understanding of mathematical concepts while enjoying a fun and interactive learning experience. Moreover, the element of competition adds an extra layer of motivation, encouraging students to actively engage in the hunt and strive for success.

Leaderboard

The leaderboard is a strategy employed by Participant 5, Participant 8, and Participant 10 to track and recognize student performance in the classroom. It involves creating a visual display, often in the form of a bulletin board, where students' scores or achievements are prominently displayed. This technique serves as a motivational tool, encouraging students to strive for the top positions on the leaderboard by actively participating and excelling in class activities. The leaderboard fosters healthy competition among students, promotes a sense of achievement, and encourages continuous improvement. It reinforces positive behavior and academic success, contributing to a supportive and motivating classroom environment.

Table 2

Factors to be Considered in Creating Gamified Activities

Major Themes	Excerpts
Student-Centered Design	"The first factor is their learning style since they are already seniors, Grade 10, and they are already inclined towards playing, so the factor I look at to ensure they will be hooked during my discussion is their learning styles." (P1) "I make sure that it must fit the game being chosen, like for example, the fact or bluff or the true or false game, and I am using light words... that's it." (P2) "You will be asked first to observe to get to know the students better and how they respond to activities." (P5) "The mechanics should be clear, and they should also know the flow." (P6)

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	"The factor I consider, especially in what I use, which is the Math Olympics and others, is I make sure that the activities are aligned with our curriculum and learning objectives." (P7) "In creating activities in Kahoot!, the first thing I consider is its connection to my lesson and the abilities of my students." (P9) "I also think about how quickly they can answer or if they can answer my activity questions or not, so I'm really careful in creating activities and I assess the capability of the students first." (P10)
Alignment with Learning Objectives	"Next is its connectedness to our lesson... I always integrate lots of gamified activities which includes examples of events or activities that produce a probability outcome." (P1) "One of the factors that I consider in making a gamified activity is the time management so I think carefully if the students can finish the activity in the given time." (P3) "Second is that it should be in line with my objectives... If it's not new, I make sure to add a new twist to it so it remains somewhat unique." (P4) "Second is the skills and capability of the students in which I align the level of difficulty of the gamified activities I assign." (P7) "Another one is its alignment with the objectives of the class." (P9)
Students Engagement and Motivation	"The first factor is their learning style since, of course, they are seniors, Grade 10, and they are already into gaming, so the factor I look at to ensure that they will be hooked during my discussion is their learning styles." (P1) "Also, I make sure that the gamified activity is aligned with the learning preferences of my students." (P2) "When you're a student teacher, you're not immediately thrown into teaching, you're observed first to get to know the students and how they respond to activities." (P5) "The factor that I consider, especially in what I use, which is the Math Olympics and others, is I make sure that the activities are aligned with our curriculum and learning objectives." (P7) "I also make sure that the questions I give them are clear and that they understand them." (P9)
Assessment and Feedback	"I always ensure that it is connected to my lesson and that it will introduce the concept within my lesson." (P1) "Second is that it should be aligned with my objectives, and it should be new or something new to the students." (P4) "I also make sure that the questions I give them are clear and that they understand them." (P9)
Adaptation to Classroom Context	"The first factor is their learning style since they're seniors, Grade 10, and they are already into playing, so the factor I consider ensuring that they will be hooked during my discussion is their learning styles." (P1) "For me, one thing I consider in creating gamified activities is the size of our classroom or environment." (P8)

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	"To be honest, our classroom is not that big, so there were times when I had difficulty when I needed them to stand up, run, and compete." (P10)
Innovation and Novelty	"If it's not entirely new, I make sure to add a new twist to it so that it remains somewhat unique." (P1) "It should be new or at least new to the students." (P4) "If not, I'm extra careful in creating activities and assess the capabilities of the students first." (P10)
Time Management and Efficiency	"One of the factors that I consider in making a gamified activity is the time management so I think carefully if the students can finish the activity in the given time." (P3) "To be honest, our classroom is not that big, so during times when I conducted games that required standing up and running around, they had a bit of difficulty." (P8) "I also consider how quickly they can answer or if they can answer my activity questions, so I'm really careful in creating activities and assess the capabilities of the students first." (P10)
Differentiation and Personalization	"The first factor is their learning style since they are already seniors, Grade 10, and they are very playful, so the factor I look at to ensure that they will be hooked during my discussion is their learning styles." (P1) "When you're a student teacher, you're not immediately thrust into teaching, you're observed first to get to know the students better and how they respond to activities." (P5) "The mechanics should be clear, and they should know the flow. That's it, what the students can do and what I think they will enjoy, I consider that as a factor." (P6) "The factor I consider, especially in what I use, which is the Math Olympics and others, is I make sure that the activities are aligned with our curriculum and learning objectives." (P7) "In creating activities on "Kahoot!," the first thing I consider is its connection to my lesson." (P9)

Table 2 illustrates the several overarching themes emerging regarding the creation of gamified activities in the classroom. There are eight (8) major themes identified about the factors considered by the student teachers:

1. Student-Centered Design
2. Alignment with Learning Objectives
3. Students Engagement and Motivation
4. Assessment and Feedback
5. Adaptation to Classroom Context
6. Innovation and Novelty
7. Time Management and Efficiency
8. Differentiation and Personalization

Student-Centered Design

In designing gamified activities, participants underscore the significance of adopting a student-centered approach, wherein activities are customized to match students' interests, learning styles, and abilities. This emphasis on student-centered design reflects the acknowledgment among educators of the need to tailor learning experiences to the individual needs of their students.

This theme underscores the commitment of educators to create engaging and effective learning experiences by considering the unique characteristics and needs of their students. By embracing a student-centered design approach, educators can foster greater student engagement, participation, and ultimately, learning outcomes.

Alignment with Learning Objectives

Alignment with learning objectives emerged as a prevalent theme among the participants, highlighting the importance of ensuring that gamified activities are closely aligned with curriculum goals and lesson objectives. This theme underscores the educators' commitment to integrating activities that not only engage students but also contribute to the attainment of desired learning outcomes.

This theme underscores the educators' strategic approach to designing gamified activities that not only engage students but also serve as effective tools for achieving specific learning outcomes. By ensuring alignment with curriculum goals and lesson objectives, educators can maximize the educational value of gamified activities and promote deeper understanding and retention of content among students.

Students Engagement and Motivation

Engagement and motivation emerged as a crucial theme among the participants, highlighting the importance of designing gamified activities that effectively capture students' attention and sustain their motivation. Participants emphasized the role of gamification in enhancing student engagement by infusing elements of play and competition into the learning experience.

This theme underscores the educators' recognition of the pivotal role of gamified activities in fostering student engagement and motivation. By aligning activities with students' learning preferences, incorporating elements of play, and ensuring clarity in instructions, educators can create learning experiences that captivate students' interest and enhance their overall learning outcomes.

Assessment and Feedback

Assessment and feedback emerged as a significant theme among the participants, highlighting the multifaceted role of gamified activities in the learning process. Participants emphasized the importance of using these activities not only to enhance engagement but also to facilitate formative assessment and provide valuable feedback to students.

Participants 1, 4, and 9 underscore the strategic integration of gamified activities into lesson plans for reinforcing key concepts and facilitating ongoing assessment of student understanding. This approach ensures alignment with learning objectives and enables educators to assess student participation's effectiveness in meeting

these objectives. Clear instructions and well-designed questions are emphasized as essential elements for effective assessment during gamified activities.

This theme underscores the educators' recognition of gamified activities as valuable tools for ongoing assessment and feedback in the classroom. By incorporating these activities into their teaching practices, educators can not only enhance student engagement but also gain insights into student learning and provide targeted feedback to support their progress.

Adaptation to Classroom Context

Adaptation to classroom context emerged as a crucial theme among the participants, highlighting the need to tailor gamified activities to the specific conditions and dynamics of each classroom setting. Educators recognized the importance of considering various factors such as classroom size, student demographics, and physical constraints when designing these activities, underscoring the importance of flexibility and creativity in activity design to accommodate diverse learning environments.

Participants 1, 8, and 10 underscored the importance of adaptability in designing gamified activities for maximum engagement and effectiveness. Participant 1 emphasized considering students' preferences and characteristics, while Participant 8 highlighted the impact of classroom size on activity design, emphasizing the need for feasibility and practicality. Additionally, Participant 10 emphasized the challenges educators face in adapting activities to suit physical limitations, highlighting the necessity of flexibility in classroom environments.

This theme highlights the educators' recognition of the need for flexibility and creativity in adapting gamified activities to suit the unique context of their classrooms. By considering factors such as classroom size, student demographics, and physical constraints, educators can ensure that gamified activities are effectively implemented and enhance student engagement and learning outcomes.

Innovation and Novelty

Innovation and novelty emerged as a significant theme among the educators, underscoring the importance of infusing gamified activities with fresh and creative elements to sustain student interest and excitement. This theme reflects the educators' recognition of the need for ongoing experimentation and creativity in activity design to ensure continued engagement and motivation among students.

Participants 1 and 4 emphasized the importance of novelty in gamified activities. They highlighted the need for educators to continually innovate and introduce new elements to prevent activities from becoming stale or predictable. This approach ensures the maintenance of student interest, enthusiasm, and engagement in the learning process.

This theme underscores the educators' commitment to fostering creativity and innovation in activity design to create engaging and dynamic learning experiences. By introducing novel elements into gamified activities, educators can captivate students' interest and motivation, ultimately enhancing learning outcomes and promoting a positive and stimulating classroom environment.

Time Management and Efficiency

Time management and efficiency emerged as a crucial theme among the participants, highlighting the significance of ensuring that gamified activities are conducted within the constraints of the allotted time. This theme reflects educators' recognition of the importance of balancing engagement with efficiency to optimize learning outcomes and make the most of instructional time.

Participants 3, 8, and 10 emphasized the importance of time management in planning gamified activities effectively within the designated class time. Participant 3 highlighted the necessity of careful planning to maximize instructional time and prevent activities from running over schedule. Similarly, Participant 8 stressed the importance of considering physical constraints to ensure efficient execution without disruptions. Participant 10 echoed these sentiments, underlining the need to assess students' abilities and pace activities accordingly to maintain efficiency while challenging students appropriately.

This theme underscores the educators' recognition of the importance of effective time management in gamified activities to maximize learning opportunities and promote student engagement and participation within the constraints of the instructional period. By carefully managing time and pacing activities appropriately, educators can optimize the effectiveness of gamified instruction and enhance student learning outcomes.

Differentiation and Personalization

Differentiation and personalization emerged as a prominent theme among the participants, highlighting the educators' commitment to designing gamified activities that accommodate the diverse needs and preferences of their students. This theme underscores the importance of creating inclusive learning experiences by offering multiple pathways to success and tailoring activities to address individual learning needs.

Participants 1, 5, 6, 7, and 9 collectively emphasized the significance of differentiation and personalization in gamified activities. They illustrated educators' recognition of the importance of considering students' learning styles and responses to tailor instructional strategies effectively. This commitment ensures engagement, meaningful learning experiences, and alignment with curriculum goals while meeting individual needs and preferences.

This theme underscores the educators' dedication to differentiation and personalization in activity design to create inclusive and engaging learning experiences that meet the diverse needs and preferences of their students. By offering multiple pathways to success and tailoring activities to address individual learning needs, educators can promote meaningful learning outcomes and foster a supportive and inclusive classroom environment.

Table 3

Challenges Encountered by Student Teachers when Integrating Gamification

Major Themes	Excerpts
Technical Limitations and Interruptions	"The challenges that I experience especially when I am doing online-based quizzes like Kahoot! is the internet connection in Bunducan National High School since we only have limited access to the internet there." (P1)

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	"When internet is needed, like in Kahoot, there are times when interruptions occur due to internet issues, as sometimes the signal doesn't reach the classroom." (P6) "And another thing is that sometimes there are also problems with the internet and technical issues when my means of presenting the gamified activity is through the use of technology." (P10)
Difficulty in Sustaining Engagement	"Sometimes, because they are so hooked on the activities, they forget to limit their noise, and sometimes the class becomes very noisy." (P1) "The most challenging for me is when the learners become too excited, they start making noise." (P3)
Innovating and Varying Gamified Activities	"The only challenge I've encountered is creating or presenting different types of strategies, such as using interactive games every day." (P2) "Sometimes, we run out of gamification ideas, and sometimes, the games integrated for the children are repeated over and over again." (P4) "The biggest challenge for me is coming up with new gamification ideas, that's really the most difficult for me." (P5)
Time Management and Curriculum Alignment	"I think one of the challenges I experienced is time... So, I became more aware of time management because it's still important to finish the discussion." (P7) "I often assign them a scavenger hunt, so even though it's supposed to be a quick activity and they should be able to find things faster, sometimes they take longer to search." (P10)
Student Participation and Motivation	"Sometimes, there's a shortage of gamification ideas, and sometimes the games integrated for the children are repeated, and another challenge is the children who don't want to participate." (P4) "For me, one challenge is that no matter how much effort you put into your activities, there are still some children who do not participate... Aside from this, sometimes discipline is lost, especially in games where children become noisy and uncontrollable at times." (P9)
Adapting to Diverse Learning Styles	"It's also difficult for me as a student teacher to find new games especially since I teach multiple sections. Additionally, the students have different learning styles, so it's really challenging to come up with a gamified activity that fits their preferences and aligns with the objectives of each lesson." (P8)

Table 3 illustrates the several themes that emerged regarding the challenges encountered by student teachers when integrating gamification in teaching mathematics in secondary schools at Nasugbu, Batangas. There are six (6) major themes identified about the challenges encountered by the student teachers:

1. Technical Limitations and Interruptions
2. Difficulty in Sustaining Engagement
3. Innovating and Varying Gamified Activities
4. Time Management and Curriculum Alignment
5. Student Participation and Motivation
6. Adapting to Diverse Learning Styles

Technical Limitations and Interruptions

Technical limitations and interruptions emerged as significant challenges faced by the participants, impacting the smooth integration of gamified activities into their lessons. Participants cited various issues related to internet connectivity and device malfunctions, which hindered the effective implementation of these activities.

Participants 1, 6, and 10 all emphasized challenges related to technology. Participant 1 highlighted the challenge of poor internet access, which restricts educators from effectively leveraging online platforms like Kahoot! for gamified activities. Participant 6 underscored the impact of internet connectivity issues, which disrupt the flow of gamified activities requiring online connectivity and interrupt the learning process. Additionally, Participant 10 pointed out device malfunctions as a hindrance to integrating gamified activities, as technical issues like laptop or speaker malfunctions can disrupt the delivery of activities, affecting overall engagement and effectiveness.

Technical limitations and interruptions, including poor internet access, signal interruptions, and device malfunctions, pose significant challenges to the seamless integration of gamified activities into secondary school mathematics lessons. Overcoming these obstacles requires educators to seek alternative solutions and adapt their instructional strategies to ensure uninterrupted access to engaging learning experiences for their students.

Difficulty in Sustaining Engagement

Difficulty in sustaining engagement emerged as a common challenge among the participants, reflecting the struggle to maintain students' focus and participation throughout gamified activities. Participants highlighted various factors contributing to this challenge, including managing noise levels in the classroom and addressing disruptions caused by students' high energy levels.

Participant 1 and Participant 3 highlighted the challenge of managing noise levels during gamified activities. Excessive noise can detract from the learning environment, making it difficult to sustain engagement. Students' excitement and enthusiasm may contribute to increased noise levels, posing a challenge for educators in maintaining classroom dynamics.

Sustaining engagement during gamified activities poses challenges for educators, particularly in managing noise levels and addressing disruptions caused by students' high energy levels. Overcoming these obstacles requires proactive strategies to maintain a conducive learning environment and promote sustained participation and focus among students throughout the lesson.

Innovating and Varying Gamified Activities

Innovating and varying gamified activities emerged as a significant challenge among student teachers, reflecting the difficulty of consistently introducing new and engaging activities to capture students' interest. Participants highlighted various obstacles they encountered in this regard, including the challenge of generating new game ideas while balancing other teaching responsibilities.

Participants 2, 4, and 5 all addressed the challenge of generating fresh and varied gamified activities. Participant 2 noted the difficulty of presenting different game strategies daily, indicating the demanding nature of maintaining variety, especially in mathematics. Participant 4 highlighted the struggle to generate new game ideas,

potentially leading to repetition and disengagement among students. Additionally, Participant 5 emphasized the challenge of consistently creating innovative activities, highlighting the ongoing effort required to sustain student engagement and enthusiasm.

Student teachers face challenges in innovating and varying gamified activities to keep them fresh and engaging for students. Overcoming these obstacles requires creativity, time management, and resourcefulness to continuously develop new game ideas that effectively reinforce mathematics concepts and sustain student interest in the learning process.

Time Management and Curriculum Alignment

Time management and curriculum alignment emerged as significant challenges for student teachers when integrating gamified activities into secondary school mathematics lessons. Participants highlighted the difficulty of balancing the time allocated for these activities with the overall lesson plan, which could impact the coverage of the curriculum within the allotted time frame.

Participant 7 highlighted the challenge of time management, emphasizing the importance of vigilance in ensuring that gamified activities complement rather than detract from lesson objectives. Similarly, Participant 10 discussed the time constraints in scavenger hunt activities, underscoring the need for careful planning to align such activities with curriculum goals while maximizing instructional time.

Student teachers face challenges in managing time effectively and aligning gamified activities with curriculum objectives. Overcoming these challenges requires strategic planning, flexibility, and a keen awareness of the balance between engaging activities and instructional efficiency to optimize student learning outcomes in mathematics education.

Student Participation and Motivation

Student participation and motivation emerged as significant challenges for student teachers when integrating gamified activities into secondary school mathematics lessons. Participants highlighted difficulties in encouraging active engagement among students, which impacted the effectiveness of these activities.

Participant 4 discussed challenges related to student participation, indicating that some students may be hesitant to engage with gamified activities, posing challenges for educators in maintaining their interest throughout the lesson. Similarly, Participant 9 highlighted challenges related to student discipline and behavior during gamified activities, suggesting that maintaining a conducive learning environment can be difficult, especially when students become overly excited or exhibit disruptive behavior.

Student teachers face challenges in encouraging active participation and motivation among students during gamified activities. Overcoming these challenges requires strategies to address student hesitancy, accommodate diverse learning preferences, and maintain classroom discipline to ensure effective implementation of gamified approaches in mathematics education.

Adapting to Diverse Learning Styles

Adapting to diverse learning styles emerged as a significant challenge for student teachers when integrating gamified activities into secondary school mathematics lessons. Participants highlighted the difficulties they faced in accommodating the varying preferences and needs of their students.

Participant 8 indicated that catering to diverse learning styles and preferences while ensuring alignment with lesson objectives can be challenging for student teachers when designing gamified activities.

Adapting gamified activities to accommodate diverse learning styles and preferences poses a notable challenge for student teachers. Overcoming this challenge requires educators to be creative, flexible, and attentive to students' individual needs, ensuring that gamified activities effectively engage all learners and promote meaningful learning experiences.

Table 4

Benefits of Integrating Gamification in Teaching Mathematics

Major Themes	Excerpts
Engagement and Participation	"I think, with the activities I do, I make my students competent enough... through the help of gamified activities, students themselves appreciate such activities in our lessons." (P1) "So, I see these gamified activities as my strength... My students are engaged from the very beginning of our session until the very end." (P2) "One of its benefits is I see more students participating." (P3) "So, the benefits include becoming accustomed to using such gamification and also I become closer to the students when using such gamification." (P4) "I think one benefit for me is they consider me a favorite... their Proficiency Level also increases because we compute it every day." (P5) "I can say that they become more active in class, the class becomes more enjoyable." (P6) "The benefit I see in my students is they become more active and participative in class... gamification also reduces math anxiety among students." (P7) "The benefits for me are gamification really catches their attention. They become more active in class and the class becomes more enjoyable." (P8) "I think gamification or the gamified activities I integrate into the class are very helpful because they increase the students' activeness and their engagement level." (P9) "For me, gamification has a positive impact on my class. The students are more active, and they learn more, I think, because their PL or proficiency level is higher." (P10)
Improved Learning Outcomes	"Their performance increases once they are hooked in the lesson simply because of the gamified activity that I use in my discussion." (P1)

	"They always say, 'Sir, your class is always fun.' Aside from that, they are really more engaged in class, and aside from that, I also see that their Proficiency Level increases." (P5) "I think gamification or the gamified activities I integrate into the class are very helpful because they increase the students' activeness and their engagement level." (P9) "Their PL or proficiency level is higher." (P10)
Reduced Math Anxiety and Improved Attitudes	"I think gamification also reduces the math anxiety of students. I said this because a student told me, 'Ma'am, you know before, I was always nervous about math because it was all questions and numbers were scary, but since you started teaching us and you have a lot of games for us, I'm always excited about Math." (P7)
Relationship Building	"They become excited about the lesson, and besides that, it seems like our relationship as teacher and students is also being built in the classroom." (P4)

Table 4 illustrates the several themes that emerged regarding the benefits of integrating gamification in teaching mathematics to secondary schools in Nasugbu, Batangas. There are four (4) major themes identified about the common gamified activities employed by the student teachers:

1. Engagement and Participation
2. Improved Learning Outcomes
3. Reduced Math Anxiety and Improved Attitudes
4. Relationship Building

Engagement and Participation

Engagement and Participation emerged as a central theme among the participants, reflecting the significant impact of gamification on student involvement and enthusiasm in secondary school mathematics lessons in Nasugbu, Batangas. Participants unanimously highlighted the positive effects of gamified activities on student engagement and participation, noting various benefits that contributed to a dynamic and interactive learning environment.

Participants 1 emphasized gamified activities' role in enhancing student competence and technological literacy, fostering appreciation for learning, and increasing participation. Participant 2 regarded them as a strength in teaching mathematics, capturing attention, promoting interactive learning, and sustaining student engagement and enthusiasm. Additionally, Participant 3 noted a significant increase in student participation, even among reserved students, promoting inclusivity and a vibrant classroom environment. Moreover, Participant 4 highlighted their positive impact on teacher-student relationships, fostering stronger connections, and a collaborative atmosphere. Furthermore, Participant 5 identified gamification's role in increasing student enjoyment and proficiency in mathematics, enhancing motivation, and performance. Moreover, Participant 6 emphasized students' active involvement and enjoyment, creating a dynamic learning environment. Additionally, Participant 7 recognized gamification's role in reducing math anxiety, empowering confident participation. Furthermore, Participant 8 highlighted its ability to capture attention, reduce boredom, and foster a positive attitude towards mathematics. Moreover, Participant 9 discussed improvements in classroom dynamics, students' willingness to participate, and promoting active collaboration. Lastly, Participant 10

cited improved learning outcomes, higher proficiency levels, indicating enhanced engagement, and understanding facilitated by gamified activities.

Engagement and Participation emerged as key benefits of gamification in teaching secondary school mathematics in Nasugbu, Batangas. The unanimous recognition of gamification's positive impact on student engagement, participation, enjoyment, and learning outcomes underscores its effectiveness as a pedagogical tool for creating dynamic and interactive learning environments.

Improved Learning Outcomes

Improved Learning Outcomes emerged as a significant benefit perceived by student teachers in Nasugbu, Batangas, through the integration of gamification in teaching secondary school mathematics. Participants highlighted how gamified activities positively impacted students' academic performance and understanding of mathematical concepts, leading to measurable improvements in learning outcomes.

Participants 1, 5, 9, and 10 all observed significant increases in students' proficiency levels due to the use of gamified activities. They noted how gamification effectively engages students, fosters deeper understanding of mathematical concepts, and promotes active participation, ultimately leading to improved learning outcomes and academic achievement.

Improved Learning Outcomes emerged as a key benefit perceived by student teachers in Nasugbu, Batangas, through the integration of gamification in teaching secondary school mathematics. The unanimous recognition of gamification's positive impact on students' academic performance underscores its effectiveness in promoting deeper learning and enhancing learning outcomes in the mathematics classroom.

Reduced Math Anxiety and Improved Attitudes

Reduced Math Anxiety and Improved Attitudes towards mathematics were noted as significant benefits by participant 7. They highlighted how gamification contributed to alleviating students' anxiety towards math and fostering positive attitudes towards the subject.

Participant 7 highlighted gamification's dual role in reducing math anxiety and improving students' attitudes towards mathematics. The engaging and interactive nature of gamified activities makes mathematics more approachable, mitigating feelings of anxiety or apprehension associated with the subject. Participant 7 also added that gamification transforms students' perceptions of mathematics, fostering excitement and enthusiasm towards learning.

Overall, Participant 7's insights highlight the transformative impact of gamification in reducing math anxiety and cultivating positive attitudes towards mathematics among students. By incorporating engaging and interactive elements into math lessons, educators can create a supportive and conducive learning environment that empowers students to approach mathematics with confidence and enthusiasm.

Relationship Building

Participant 4 highlighted relationship building as a significant benefit of using gamification in teaching secondary school mathematics. Participant 4 discussed how gamification facilitated the development of stronger relationships between the student teacher and the students.

This suggests that the interactive and engaging nature of gamified activities creates opportunities for increased interaction and communication between the student teacher and students. As students actively participate in gamified lessons, they develop a sense of camaraderie and connection with the teacher, leading to the establishment of a positive and supportive classroom environment.

Furthermore, Participant 4's observation underscores the importance of building strong relationships in the classroom for effective teaching and learning. By fostering positive relationships with students through gamification, student teachers can create a conducive learning environment where students feel valued, supported, and motivated to actively engage in their learning journey.

Table 5

Proposed Gamified Activity for Teaching Mathematics in Grade 7

Math Maze Adventure			
Objectives	**Mechanics**	**Rewards System**	**How to Win**
• Reinforce mathematical concepts such as operations, fractions, and geometry. • Foster teamwork and collaboration among students. • Enhance problem-solving and critical thinking skills.	• Divide students into teams and present them with a maze consisting of mathematical problems at different checkpoints. • Each team must navigate through the maze by correctly solving the math problems at each checkpoint. • Teams advance to the next checkpoint upon solving the problem correctly. • The first team to reach the end of the maze wins the game.	• Points will be awarded to teams for each correct answer. • Bonus points will be given for completing the maze within a specified time limit. • The winning team will receive certificates of achievement and recognition.	• Teams must successfully navigate through the maze by solving math problems accurately and efficiently. • The team that reaches the end of the maze first with the most points wins the game.

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Table 6

Proposed Gamified Activity for Teaching Mathematics in Grade 8

Math Quest Challenge			
Objectives	**Mechanics**	**Rewards System**	**How to Win**
• Reinforce mathematical concepts such as algebra, equations, and ratios. • Develop critical thinking and problem-solving skills. • Encourage healthy competition among students.	• Students are divided into teams and presented with a series of mathematical challenges or quests. • Each quest requires students to solve a mathematical problem or puzzle to progress to the next level. • The team with the most points at the end of the game wins.	• Points are awarded for each completed quest. • Bonus points may be given for completing quests within a specified time limit or for demonstrating exceptional problem-solving skills. • The winning team receives certificates of achievement and small prizes.	• Teams must work together to solve each quest accurately and efficiently. • The team with the highest cumulative score at the end of the game wins.

Table 7

Proposed Gamified Activity for Teaching Mathematics in Grade 9

Mathopoly Challenge			
Objectives	**Mechanics**	**Rewards System**	**How to Win**
• Reinforce mathematical concepts such as geometry, statistics, and probability. • Promote strategic thinking and decision-making skills. • Foster teamwork and collaboration among students.	• Students play a modified version of the classic board game Monopoly, with mathematical challenges incorporated into gameplay. • Players advance through the game board by correctly solving math problems or completing mathematical tasks. • Each property on the game board corresponds to a specific mathematical concept or skill.	• Players earn money or resources for successfully completing mathematical challenges. • Bonus rewards may be given for landing on specific spaces or completing challenges within a specified time limit. • The player with the most money or resources at the end of the game wins.	• Players must strategically navigate the game board, making decisions that maximize their earnings and minimize their losses. • The player with the highest amount of money or resources at the end of the game wins.

	• The player with the most money or resources at the end of the game wins.		

Table 8

Proposed Gamified Activity for Teaching Mathematics in Grade 10

Math Olympics Tournament			
Objectives	**Mechanics**	**Rewards System**	**How to Win**
• Reinforce advanced mathematical concepts such as calculus, trigonometry, and advanced algebra. • Promote teamwork, sportsmanship, and perseverance. • Provide a platform for students to showcase their mathematical skills and talents.	• Students compete in a series of mathematical challenges or events, similar to the Olympics. • Events may include problem-solving competitions, speed rounds, and relay races. • Teams earn points for each successfully completed event or challenge. • The team with the most points at the end of the tournament wins.	• Points are awarded for each successfully completed event or challenge. • Bonus points may be given for demonstrating exceptional mathematical skills or teamwork. • The winning team receives certificates of achievement, medals, and recognition.	• Teams must excel in a variety of mathematical challenges, demonstrating proficiency in different areas of mathematics. • The team with the highest cumulative score at the end of the tournament wins.

Conclusions

The findings indicate that gamified activities significantly enhance student engagement and learning outcomes in mathematics classrooms. Incorporating elements of gamification effectively captures students' interest and motivation, leading to increased participation and deeper understanding of concepts. Activities like Kahoot!, Family Feud, and Pick a Door allow for active participation and collaboration, while others such as Fact or Bluff and Math Scavenger Hunt promote critical thinking and problem-solving skills.

Additionally, the findings highlighted the importance of crafting gamified activities that engage students while aligning with learning objectives. Educators should prioritize student-centered design and ensure activities cater to diverse learning styles. Additionally, maintaining alignment with learning objectives is crucial for maximizing educational value. Engagement, assessment, and feedback play significant roles in enhancing student learning experiences. Adaptation to classroom context, innovation, time management, and differentiation are essential considerations for creating inclusive gamified activities.

Moreover, the findings also highlighted challenges faced by student teachers when integrating gamification into mathematics instruction, including technical obstacles and difficulties in maintaining sustained engagement amidst distractions. Despite these challenges, opportunities for growth and improvement in gamification implementation are illuminated through proactive measures and tailored approaches.

Lastly, the findings show the benefits of integrating gamification into mathematics teaching in secondary schools, fostering increased engagement and participation, improving learning outcomes, and reducing math anxiety. It also cultivates positive attitudes towards mathematics and facilitates relationship building between student teachers and students, enhancing the overall teaching and learning experience in secondary schools.

Recommendations

Based on the findings, it is recommended that student teachers continue to explore and incorporate gamified activities into their mathematics lessons. Educators should select activities that align with lesson objectives, cater to diverse learning styles, and promote active engagement among students. Additionally, leveraging digital platforms like Kahoot! and traditional classroom games can create dynamic learning experiences. Furthermore, providing opportunities for collaboration, communication, and problem-solving through gamified activities can enhance learning outcomes. Integrating gamification into mathematics instruction can create engaging environments supporting student success.

Educators are encouraged to adopt a strategic approach to gamified activity design, prioritizing student-centered design and alignment with learning objectives. They should leverage gamification to enhance engagement, use activities for assessment, and provide timely feedback. Adapting activities to each classroom's context, managing time effectively, and incorporating differentiation are essential for creating inclusive learning experiences. These recommendations aim to promote deeper understanding, engagement, and participation among students. Addiotionally, they are encouraged to integrate gamification into mathematics teaching practices to enhance student engagement and participation. Strategies should focus on promoting active learning and fostering positive attitudes towards mathematics while reducing math anxiety. Prioritizing relationship building through gamification can create a supportive learning environment. Embracing gamification can enhance the quality and effectiveness of mathematics education in secondary schools.

To enhance gamification integration in mathematics teaching, recommendations include addressing technical limitations, fostering creativity in activity design, prioritizing time management and curriculum alignment, and implementing strategies for student participation and motivation. These measures help student teachers navigate challenges effectively and leverage gamification benefits to enhance secondary school mathematics education.

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