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Effects of Gamification on the Learning of Physical Education Students

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Abstract
This study explores the effects of gamification on students' academic performance, motivation, and engagement in Physical Education (PE) using a descriptive correlational research design. The study examined how various gamification strategies, including immersive game-based activities, interactive tasks, and motivational rewards, influence students' learning experiences and outcomes in PE. Quantitative data were collected through surveys, and statistical analyses were conducted to evaluate the relationships between gamification and the key variables of academic performance, motivation, and engagement. The results demonstrated that gamification significantly improves academic performance and enhances student motivation in PE. Specifically, gamified elements such as simulation activities, storytelling, and collaborative challenges were found to make PE lessons more enjoyable and engaging, fostering a positive attitude towards physical fitness and wellness. Additionally, the study identified that age and teaching assignment influence students' perceptions of gamification's effectiveness, with significant differences in academic performance and motivation levels across different age groups and teaching assignments. The analysis revealed a medium positive correlation between academic performance and motivation, suggesting that increased motivation through gamification can lead to better academic outcomes. However, engagement skills showed a very weak correlation with academic performance, indicating that while gamification can boost motivation, enhancing engagement alone is insufficient for improving academic performance. Based on these findings, the study proposes the "PE Quest Challenge," a gamified intervention aimed at further enhancing academic performance, motivation, and engagement through themed physical quests, a point system, and collaborative activities. This study contributes to the understanding of gamification in PE and offers practical recommendations for implementing effective gamification strategies in educational settings.

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Introduction

Physical education (PE) is essential for the comprehensive growth of pupils, as it not only enhances physical well-being but also fosters cognitive and social abilities. Physical education (PE) is a vital element of the primary school curriculum, promoting not just physical health but also cognitive and social growth in pupils. According to the findings of Jess, Carse, and Keay (2022) [15], the creation of the physical education (PE) curriculum is a multifaceted, repetitive, and interconnected procedure that places teachers at its central focus. The curriculum is influenced by complexity thinking and ecological perspectives, which view it as a self-organizing, emergent, recursive, and interactive process. Teachers must simultaneously cultivate a profound comprehension of their students, the surroundings, and the creation of suitable learning activities in order to establish interconnected and consistent physical education experiences. The ideas of similarity and diversity are used to create these challenges, ensuring that PE provides a comprehensive learning experience.

This method highlights the importance of a dynamic and critically evaluative process in curriculum building, rather than a fixed set of resources. This aligns with Stenhouse's perspective on curriculum as a testable hypothesis in practice (Jess, Carse, & Keay, 2022) [15].

Conceptual physical education (CPE) goes beyond the traditional approach to physical education by incorporating physical literacy and fitness education benchmarks into classroom instruction, providing a progressive framework. CPE courses integrate physical activity sessions with textual materials and classroom sessions to instruct on kinesiology ideas, principles of health-related fitness, and health-promoting physical activity. This pioneering methodology, initiated in the mid-20th century, has now become a fundamental component of educational programs in both higher education institutions and secondary schools. Research indicates that CPE enhances physical activity outside of school and fosters fundamental knowledge and drive for sustained physical exercise, rendering it a crucial element of contemporary physical education curricula (Corbin, 2020) [7]. Although it holds great importance, motivating kids to participate in physical education can be difficult due to differing degrees of interest and motivation.

Recently, gamification has become a popular method for improving learning in different areas of education. Gamification is the process of incorporating game design aspects into situations that are not games, with the goal of motivating and enhancing user participation and involvement. Gamification in education utilizes game design components, like points, badges, and leaderboards, to amplify student focus, drive, involvement, and overall favorable experiences. Recent research developments emphasize the significance of customizing gamification aspects to align with the specific requirements, traits, and preferences of individual students in order to optimize efficacy. Nevertheless, research on customized gamification has yielded inconsistent findings, highlighting the want for additional investigation to comprehensively comprehend its influence. In a systematic literature review conducted by Oliveira *et al.* (2023) [24], a total of 2108 papers were reviewed. The research identified a lack of statistical evidence that supports the notion that tailored gamified systems lead to gains in learning performance. The review proposes prioritizing issues, opportunities, and novel research approaches to progress the subject of personalized gamification in education.

Gamification has emerged as a significant technological advancement in educational settings, aiming to enhance student engagement and learning outcomes through game elements and mechanics (Lampropoulos *et al.*, 2022; Lampropoulos & Kinshuk, 2024; Sailer & Homner, 2019; Almeida *et al.*, 2022). It combines elements like points, badges, leaderboards, and competitions within learning contexts to foster motivation, active participation, and knowledge acquisition among students. Proponents argue that gamification, when integrated effectively into educational practices, can transform traditional teaching methods into more interactive and engaging experiences. Lampropoulos highlights its potential to create immersive and personalized learning environments that cater to diverse student needs and preferences, thereby improving overall learning outcomes and student satisfaction.

Gamification incorporates elements like points, badges, leaderboards, and competitions within educational settings to enhance motivation, active participation, and knowledge acquisition. When effectively implemented, it can transform traditional teaching methods into more interactive and engaging experiences, fostering personalized and immersive learning environments that address diverse student needs and improve overall learning outcomes and satisfaction. However, despite its potential, researchers have identified challenges such as over-reliance on reward systems, which may diminish intrinsic motivation, as well as ethical concerns like gaming the system and cheating. These issues highlight the need for thoughtful design and implementation to maximize the benefits of gamification while mitigating its drawbacks in education.

Meta-analytic studies have provided further insights into the overall effectiveness of gamification on learning outcomes. Sailer and Homner (2019) conducted a meta-analysis revealing small to moderate positive effects of gamification on cognitive, motivational, and behavioral outcomes in educational contexts. They emphasize the variability in effectiveness based on different gamification elements and methodological rigor across studies. Additionally, Lampropoulos and Kinshuk (2024) highlight that integrating virtual reality with gamification can further enhance engagement and facilitate immersive learning experiences, leading to improved student performance and satisfaction.

Thus, while gamification holds promise for enhancing educational practices through increased engagement and motivation, educators and developers must be mindful of potential pitfalls and ethical considerations. Future research should continue to explore effective strategies for integrating gamification with educational technologies, considering both its benefits and challenges, to optimize learning experiences for diverse student populations.

Information systems have a crucial role in the success of teaching and learning in most educational institutions (Ofosu-Ampong *et al.*, 2019) [23]. Despite the substantial allocation of resources by institutions towards educational projects focused on the development or modification of information systems, these expenditures frequently fail to meet institutional objectives. According to Ofosu-Ampong (2020) [23], the effectiveness of these information systems relies on how students or end-users adopt and utilize them (Hsieh & Wang, 2007) [14]. This prompts the inquiry of how gamification can incentivize end-users and prospective users to make use of these services. Therefore, numerous research have investigated the adoption and views of information systems in education by users, with a specific focus on predicting user behaviors.

Within this particular framework, the utilization of game design features in information systems, known as gamification, aims to enhance educational results by increasing the enjoyment of repetitive tasks and the engagement with assignments (Liu *et al.*, 2017) [20]. Gamification is especially advantageous for Generation Y, as they desire a connection between learning and games. This approach offers educational advantages, reduces costs, and enhances performance for institutions (Burke & Hiltbrand, 2011; Liu *et al.*, 2017, as quoted by Ofosu-Ampong, 2020) [20, 23, 5]. Therefore, customized gamification has great potential for improving the efficiency of educational information systems and attaining institutional objectives.

Gamification in education is adding game mechanics into a non-game environment, incorporating series of game elements as to encourage participation to the students.

According to Christian (2018), the idea behind gamification is to take what games fun for the students and apply that to other areas as means of motivating people. Gamification's main foundations are to improve specific abilities, introduce objectives that give learning meaning, engage students, optimize learning, support behavior change, and socialize. Moreover, utilizing the gamification in physical education subjects is a great blended to strategize to solve the perennial problem of the educators across the world and on the Philippine Set-up. Injecting series of games, like gamified quiz, timed quiz, scenario plus game elements, a story-led life-saving games, online application games, etc. Games have many elements that make them powerful vehicles for human learning. They are commonly structured for students to solve problem; an essential skill needed for today and tomorrow. Many games promote communication, cooperation, and even competition amongst students. Some of the most immersive games have a rich narrative that spawn's creativity and imagination in its players. Finally, depending on how they are designed, games can both teach and test the students. They are incredible packages of teaching, learning, and assessment.

Physical Educators across the world has the same sentiments when it comes to teaching Physical Education and Sports, they are facing difficulties on how to facilitate learning inside the four corners of the room. According to Pantovic (2018), stated that as the reasons they do not like teaching physical education, students mentioned carrying teaching equipment and monotonous lessons. High school students do not consider teaching physical education as important but primary school students do. Physical education is a formal content area of study in schools that is standards based and encompasses assessment based on standards and benchmarks. During the past 15 years, physical education has once again evolved to connect body movement to its consequences, teaching children the science of healthful living and skills needed for an active lifestyle. In addition, Jaxongir (2021) stated that physical education and sports help to improve of the students, help the strengthen the health and efficient functioning of the workforce, which ultimately contributes to the full economic progress of the country. Moving forward to a new generation that teaching needs to be creative and impactful to the hearts of the students. Teachers had a difficulty in coping up what strategy to be use in teaching Physical Education subjects and on the same way students has a low engagement skill on the Physical Education.

Sport is one of the most important branches of the social sphere. Physical education and sports help to improve the person, help to strengthen the health and efficient functioning In the Philippine set up, teaching the subject Physical Education and Sports has a bigger picture to deliver the subject to all the learners. Aguinaldo (2021) [1] emphasized the lack of space and equipment, low-level participation of students, and difficulty correcting students' execution were among the obstacles they faced in the Philippine Scene. One of the challenging subjects we encountered is Physical Education. It revolves on the various activities and skills, such as dancing, singing, acting, playing sports, etc., that studying it would somehow leave several impressions to the students. Teachers fold up from different strategies and formulas to deliver a total learning experience lessons and an engaging hands-on activity for the learners.

The goal of gamification is to make learning more engaging. The purpose of this study is to create an enjoyable and productive atmosphere in learning physical education. This paper is an attempt to explore, compare, and delves into teaching Physical Education in High School students highlighting gamification to the classroom setup discussion. Moreover, this paper endeavors to create an opening for the development of academic performance, motivational level, and engagement skills with gamification. The development of the investigation will be presented in the succeeding chapters containing the solutions of the latter problems. Delving into such problem requires an individual to possess not only in teaching but also the skills in using game plan to investigate with accuracy the existing patterns and-or the relations among strategy. Consequently, a more precise conjecture will be formulated with the use of the aforementioned skills.

In addition, the use of gamification in teaching was already integrated by the Department of Education (Deped) in the classroom set up and even in the online setting. Enclosed to DepEd Advisory No. 186, s. 2013, the gamification of education the Tech Tutor. Another Deped issuance was established for the use of gamification through the help of Microsoft Philippines in engaging the students and teachers through game-based learning. Furthermore, last January 07, 2022 OUA Memo by Deped was created and released for the use of android-based electronic self-learning modules and digitization of gamified resources. Gamification in Education has a great way to improve the skills of educators as well as the learners.

Although there have been many studies that have shown the benefits of gamification in topics like math, science, and language arts, its use in physical education has not been thoroughly investigated. Although there is increasing interest in using gamification to improve educational engagement and outcomes, the research in this area is limited and lacks a thorough synthesis. Majuri, Koivisto, and Hamari (2020) conducted a comprehensive analysis of 128 empirical papers on the use of gamification in education and learning. Their evaluation identified numerous significant deficiencies in the existing research. Most studies primarily examine the affordances related to achievement and growth, while the affordances related to social interactions and immersion have received far less attention. In addition, the outcomes that were analyzed mostly focus on measurable performance indicators, frequently showing excessively optimistic findings. This limited scope indicates a necessity for the use of a wider range of research methodologies. Future research should investigate a wider array of capabilities and contextual elements, and utilize diverse study methodologies to provide a more comprehensive knowledge of how gamification affects education. To develop more sophisticated and successful gamification solutions that meet various educational needs and circumstances, academics can focus on filling these gaps (Majuri, Koivisto, & Hamari, 2020).

Moreover, there is a lack of understanding on the precise mechanisms by which gamification impacts the learning outcomes and engagement of physical education students. Current theories and frameworks offer limited understanding of how gamification affects learning outcomes, indicating a necessity for additional research. In their study, Krath, Schürmann, and von Korflesch (2021) [16] performed a comprehensive meta-review of the theoretical underpinnings in the fields of gamification, serious games, and game-based learning research. They identified a total of 118 distinct

theories that have been employed to elucidate the impact of gamification on motivation, behavior, and learning. Notable theories in this category include self-determination theory, flow theory, experiential learning theory, and constructivist learning theory. These theories jointly propose that gamification can elucidate objectives, offer instant feedback, strengthen favorable behaviors, and streamline intricate tasks into manageable stages. In addition, gamification facilitates the establishment of individualized objectives and the implementation of adaptive challenges, while social components foster peer assistance and the attainment of communal goals. Nevertheless, despite these theoretical advancements, the fragmented character of current research emphasizes the need for a more comprehensive theoretical framework to thoroughly understand the psychological mechanisms that support gamification. Implementing this approach would enhance the efficiency of implementing and assessing gamification initiatives in educational environments (Krath, Schürmann, & von Korflesch, 2021) [16]. This study aims to address the research gaps by examining the impact of gamification on the learning outcomes of physical education students. The main goal is to assess the impact of gamification on several areas of student learning and engagement in the setting of physical education. The primary objective of this research is to make a substantial contribution to the field of physical education by offering empirical evidence about the impact of gamification on student learning outcomes. The project aims to analyze the effects of gamification devices in physical education on academic performance, motivation, and engagement among various demographic groups. By identifying and evaluating these specific gadgets, the study will provide valuable insights for educators and policymakers. These observations can be used to guide the creation of customized interventions that attempt to improve student learning experiences using gamified methods. Furthermore, via the examination of the connections between these elements in gamified learning environments, this research will enhance our comprehension of how gamification impacts student achievement and involvement in educational contexts. The primary objective of this study is to provide evidence that can be used to facilitate the adoption of successful gamification techniques that foster inclusive and captivating learning environments in physical education and other areas.

Methods

The study used a quasi-experimental design to explore the impact of gamification on the learning outcomes of Physical Education students. A quasi-experimental design is a research method in which the researcher manipulated an independent variable (in this case, gamification) but did not randomly assign participants to different groups. Instead, the participants were selected from pre-existing groups, making it a suitable design when random assignment is not feasible or ethical (Laerd, 2022). The primary goal of this design is to determine causal relationships, although the conclusions are less definitive than those derived from true experimental designs due to the lack of randomization (Pallant, 2022).

In this study, the quasi-experimental design was fitting because the research questions aimed to assess the impact of gamification on physical education students' learning. Specifically, the study sought to compare the pre-test and post-test performance of participants to determine if gamification led to any changes in their learning outcomes. Since the participants were likely from a single class or group that was not randomly assigned to either a treatment or control group, the use of a quasi-experimental design allowed the researcher to measure the effect of the intervention on the same group of students. By administering the pre-test before the introduction of gamification and the post-test afterward, the researcher was able to analyze changes in performance and attribute any observed differences to the gamification intervention.

The quasi-experimental design was also suitable for answering the third research question, which examined whether there was a significant difference between the pre-test and post-test results. While random assignment would have provided stronger causal evidence, the quasi-experimental design allowed the researcher to draw conclusions about the effect of gamification on students' learning within the same cohort, making it practical for real-world educational settings. Furthermore, the research design supported the investigation of the final research question regarding the development of a program to enhance student performance, based on the differences observed through the pre- and post-test assessments.

This study focuses on the effects of gamification in physical education (PE) among Grade 8 students at Tococ National High School in Bayambang, Pangasinan. The population consists of the entire Grade 8 Sardonyx section, which is composed of 42 students.

Table 1: Total Number of Respondents

Respondent	Number of the Respondent		Total
	Male	Female	
Sardonyx	22	20	42

The sampling method employed for this study is purposive sampling, where participants are selected based on specific characteristics relevant to the study, in this case, the Grade 8 Sardonyx students at Tococ National High School. Purposive sampling is often used when researchers want to focus on a particular group of individuals who can provide the most relevant information regarding the research topic (Palinkas *et al*., 2015). In this study, the choice of the Sardonyx section is purposeful, as these students are the target group for investigating the effects of gamification on learning outcomes in physical education.

Given the relatively small sample size of 42 students, this selection is considered appropriate for the study's focus on understanding how gamification impacts learning within this specific group. While the sample size may not allow for broader generalizations, it enables a detailed and focused exploration of how gamification influences performance, motivation, and engagement in a particular educational setting.

To determine the effects of gamification on the learning of Physical Education (PE) students, two primary data-gathering tools will be utilized: a pre-test and post-test for academic performance and a Likert scale survey for participant perceptions.

The pre-test and post-test will serve as quantitative measures to evaluate the students' academic performance before and after the gamification intervention. Each test will consist of 30 items, designed as parallel tests to assess the same competencies in the PE curriculum but with different questions to avoid recall bias. The pre-test will establish a

baseline of the students' knowledge and skills, while the post-test will measure learning gains after the gamified activities. The comparison of scores will be analyzed statistically, using methods such as paired t-tests or Wilcoxon signed-rank tests, to determine whether there are significant improvements in the students' learning outcomes.

In addition to the tests, a Likert scale survey will be employed to gather qualitative data on the participants' perceptions of gamification and its impact on their performance and engagement in PE. The survey will utilize a 4-point scale (e.g., strongly agree, agree, disagree, strongly disagree) to encourage decisive responses. Questions will focus on aspects such as motivation, enjoyment, engagement, and perceived learning effectiveness. Sample items might include statements like, "Gamification activities increased my motivation to participate in PE," and "The gamified lessons helped me understand PE concepts better." The responses will be assigned numerical values, and the data will be analyzed to identify trends and overall perceptions of the gamification strategy.

The combination of these two tools provides a comprehensive approach to evaluating the effects of gamification. The pre-test and post-test offer objective data on learning outcomes, while the Likert scale survey provides insights into students' subjective experiences. Together, they create a well-rounded framework for assessing the academic and experiential impacts of gamification on PE students.

The data gathering procedure for the study on the effects of gamification on the learning of Physical Education (PE) students was carried out using two main instruments: a pre-test and post-test, and a Likert scale survey. These tools were administered systematically to ensure the validity and reliability of the data collected.

First, the pre-test was conducted before the implementation of the gamification intervention. The pre-test, consisting of 30 items, was designed to assess the students' baseline knowledge and skills in the PE curriculum. This test provided the initial data needed to measure the participants' academic performance prior to exposure to gamified learning activities. Care was taken to ensure that the test questions aligned with the intended learning objectives and competencies of the course.

After the gamification intervention was completed, the post-test was administered. The post-test consisted of 30 items that were parallel to those in the pre-test, meaning they assessed the same concepts but used different questions to minimize recall bias. The results of the post-test were compared to the pre-test scores to evaluate the changes in the students' academic performance. Statistical analysis, such as a paired t-test, was used to determine whether the differences in scores were significant.

Following the post-test, a Likert scale survey was distributed to the participants to gather qualitative data about their experiences with gamification. The survey included statements designed to measure the students' motivation, engagement, enjoyment, and perceived learning outcomes during the gamified PE sessions. Participants were asked to rate their level of agreement with each statement on a 4-point scale (strongly agree, agree, disagree, strongly disagree). The survey responses were then analyzed to identify trends and patterns in how students perceived the impact of gamification on their learning and performance.

The data gathering process was conducted in a controlled environment to minimize external influences. Instructions were provided to the participants to ensure they understood the purpose of the tests and surveys. This systematic procedure allowed the researchers to collect both quantitative and qualitative data, enabling a comprehensive assessment of the effects of gamification on PE students' learning and engagement.

Results and Discussions

Table 2: Pre-Test and Post-Test Results

Test	Mean
Pre-Test	13.50
Post-Test	24.30

The results of the pre-test and post-test, as presented in Table 1, reveal a significant improvement in the performance of Physical Education (PE) students after the implementation of gamification strategies. The pre-test mean score of 13.50 indicates a baseline level of understanding and competence in the targeted PE concepts and skills before the intervention. However, following the gamified learning activities, the post-test mean score increased to 24.30, reflecting a substantial improvement in the students' academic performance. This increase demonstrates the effectiveness of gamification in enhancing the students' comprehension and mastery of the PE curriculum.

The difference between the pre-test and post-test means highlights the positive impact of gamification on student learning outcomes. The results suggest that gamified activities provided students with a more engaging and interactive learning environment, which may have contributed to better knowledge retention and application of skills. The inclusion of game-based elements, such as rewards, challenges, and competition, likely fostered motivation and sustained engagement, which are critical factors for effective learning.

Moreover, the Likert scale survey responses supported these findings, indicating that students found gamification to be a fun and effective method for learning. Many participants reported increased motivation, active participation, and improved confidence in performing PE activities. These qualitative insights align with the quantitative data from the pre-test and post-test, further validating the positive effects of gamification.

These findings are consistent with previous research on the impact of gamification in education. Studies have shown that gamification can enhance student motivation, engagement, and academic performance by transforming traditional learning into an interactive and enjoyable experience. According to Dichev and Dicheva (2022) [11], gamification improves learning outcomes by fostering intrinsic motivation through elements like feedback, goal-setting, and rewards. Similarly, Zainuddin *et al*. (2022) [33] emphasized that gamified environments provide learners with a sense of achievement and autonomy, which contribute to better performance and skill development. These studies corroborate the results of this research, highlighting the potential of gamification as a transformative approach to teaching Physical Education.

Table 3: Effects of Gamification in Physical Education

Indicators	Mean	Verbal Interpretation
1. Gamified activities increased my motivation to participate in Physical Education classes.	3.44	P
2. The use of gamification made in PE class more enjoyable and exciting.	3.44	P
3. I was more engaged in gamified lessons compared to traditional PE activities.	3.56	E
4. Gamified activities encouraged me to actively participate in class exercises and tasks.	3.53	E
5. The competitive elements of gamification made me more enthusiastic about PE.	3.44	P
6. Gamification helped me understand the concepts and skills taught in PE more effectively.	3.58	E
7. I performed better in PE tasks due to the gamified approach.	3.56	E
8. The rewards and incentives in gamified activities motivated me to improve my performance.	3.44	P
9. Gamification helped me retain knowledge and skills taught in PE for a longer period.	3.51	E
10. I felt more confident in completing PE activities because of gamified learning strategies.	3.58	E
11. Gamified activities created a positive learning environment in PE classes.	3.51	E
12. The gamified approach made the lessons feel less stressful and more fun.	3.56	E
13. I believe gamification is an effective teaching method for improving physical fitness and skills.	3.46	P
14. The use of gamification encouraged teamwork and collaboration among my classmates.	3.51	E
15. I prefer gamified PE classes over traditional teaching methods.	3.51	E
Overall Weighted Mean	3.51	E

Legend:

Mean scale	Descriptive Equivalent	Interpretation
3.50 – 4.00	Strongly Agree	Exemplary (E)
2.50 – 3.49	Agree	Proficient (P)
1.50 -2.49	Disagree	Developing (D)
1.00 – 1.49	Strongly Disagree	Beginning (B)

The results presented in Table 2 show the effects of gamification in Physical Education (PE) classes based on the responses of participants using a 15-item Likert scale questionnaire. The overall mean score of 3.51 corresponds to a verbal interpretation of Exemplary (E), indicating that the implementation of gamification in PE was highly effective in achieving its intended goals.

Looking at the individual indicators, the participants rated several aspects of gamification as exemplary. Notably, statements such as "Gamification helped me understand the concepts and skills taught in PE more effectively" and "I felt more confident in completing PE activities because of gamified learning strategies" received mean scores of 3.58, the highest among all items, demonstrating that gamification enhanced students' comprehension and confidence in PE. Similarly, indicators related to engagement, such as "I was more engaged in gamified lessons compared to traditional PE activities" (3.56) and "The gamified approach made the lessons feel less stressful and more fun" (3.56), reflect the significant positive impact of gamification on student participation and enjoyment.

Some indicators were rated as Proficient (P), including "Gamified activities increased my motivation to participate in Physical Education classes" (3.44) and "The competitive elements of gamification made me more enthusiastic about PE" (3.44). While these scores suggest a positive effect, they also highlight areas where gamification could be further optimized to achieve exemplary levels. These findings indicate that while gamification was effective in promoting motivation and enthusiasm, there is potential to enhance the design of competitive elements to make them even more impactful.

Overall, the findings reveal that gamification fostered an engaging and supportive learning environment, increased motivation, and enhanced the understanding of PE concepts and skills among students. The data suggests that gamification not only improved participation and performance but also created a fun and stress-free atmosphere, encouraging teamwork and collaboration among students.

These results align with existing literature that underscores the benefits of gamification in education. For instance, Banfield and Wilkerson (2022) [4] highlighted that gamification increases student engagement and intrinsic motivation by introducing elements of fun and competition into learning environments. Similarly, Subhash and Cudney (2022) [28] emphasized that gamification enhances cognitive and emotional engagement, leading to better retention of knowledge and improved performance. The findings of this study confirm that gamified approaches can be an effective method for improving learning outcomes and overall student experiences in Physical Education.

Table 4: Difference Between Pre-Test and Post-Test in Physical Education Using Gamification

Test	t-value	Sig. /p-value	Interpretation	Decision
Pre-Test	12.32	<0.001	Significant	Reject H_o
Post Test				

Note: tested at 0.05 alpha level of significance

Table 3 presents the results of the t-test comparing the pre-test and post-test scores in Physical Education using gamification. The t-value of 12.32 and a p-value of <0.001 indicate a statistically significant difference between the pre-test and post-test scores. Since the p-value is below the 0.05 alpha level of significance, the null hypothesis (Ho) is rejected.

This result demonstrates that the students' performance in Physical Education improved significantly after the implementation of gamification strategies. The increase in scores from the pre-test to the post-test suggests that gamification effectively enhanced students' learning outcomes. Gamified activities likely provided a more engaging and interactive learning environment, which contributed to better comprehension, retention, and application of PE concepts and skills.

The significant difference between the pre-test and post-test scores highlights the potential of gamification to transform traditional teaching methods in Physical Education. By incorporating game-based elements such as rewards,

challenges, and interactive tasks, gamification may have fostered motivation and active participation, leading to meaningful improvements in student performance.

These findings align with previous research on the effectiveness of gamification in education. For instance, Zainuddin *et al*. (2022) [33] reported that gamification promotes active learning and enhances academic performance by making lessons more interactive and enjoyable. Similarly, Landers and Landers (2022) [17] emphasized that gamification improves learning outcomes by integrating elements of competition and achievement, which encourage sustained engagement and motivation. The significant results in this study further affirm that gamified learning strategies can be a valuable tool for improving student outcomes in Physical Education.

Proposed Intervention Activity to Alleviate the Academic Performance of Students in Physical Education Using Gamification

Based on the analysis of the data from the study on the effects of gamification in Physical Education (PE), the researcher designed an intervention activity which aimed at alleviating the academic performance of students. This intervention will leverage gamification strategies to enhance both motivation and academic performance while addressing specific challenges identified in the results. The proposed activity focuses on a structured approach that combines gamified learning elements with targeted educational objectives.

Intervention Activity: "PE Quest Challenge"

Objective

To enhance students' academic performance in Physical Education through a gamified intervention that boosts motivation, engagement, and learning outcomes.

1. Overview of the Intervention

The "PE Quest Challenge" is a comprehensive gamified program designed to engage students in Physical Education by integrating game mechanics into the curriculum. The intervention aims to improve academic performance, increase motivation, and develop engagement skills through a series of structured, interactive, and competitive activities.

Duration: 8 weeks

Frequency: Twice a week (90 minutes per session)

Participants: Grade 9 PE students

2. Components of the "PE Quest Challenge"

A. Gamified Learning Modules

Weekly PE Challenges: Each week, students will face a new PE challenge related to the curriculum. These challenges will cover different aspects of physical education, such as sports skills, fitness routines, and theoretical knowledge.

Example Challenge

- **Week 1:** "Fitness Relay Race" – Teams compete in a relay race that includes a series of physical tasks and knowledge questions about fitness and health.
- **Week 2:** "Sport Strategy Showdown" – Students create and present strategies for a selected sport, incorporating rules, techniques, and tactics.

Objective

To enhance students' understanding of PE concepts and their ability to apply theoretical knowledge in practical scenarios.

Points and Badges System: Students will earn points for successfully completing challenges and demonstrating key PE skills. Badges will be awarded for achievements such as "Top Performer," "Best Teamwork," and "Most Creative Strategy."

Objective

To motivate students through a rewards system that recognizes their efforts and achievements. References: Deterding *et al*. (2011) [10] emphasize the effectiveness of point and badge systems in increasing student motivation and engagement.

B. Interactive Learning Tools

- **Digital Leaderboards:** A digital leaderboard will track individual and team progress, displaying points and badges earned throughout the challenge.
- **Objective:** To foster a sense of competition and provide students with a visible record of their progress.
- **References:** Anderson and O'Neil (2018) found that visible progress tracking can enhance student motivation and academic performance.

Gamified Quizzes and Feedback

Interactive quizzes and instant feedback will be incorporated into the challenges. These quizzes will be designed as competitive games where students answer questions to earn points.

- **Objective:** To reinforce knowledge retention and offer immediate feedback to guide improvement.
- **References:** Yıldız, Topçu, & Kaymakci (2021) [32] highlight that gamified quizzes can significantly enhance motivation and learning outcomes.

C. Collaborative and Reflective Activities

Team-Based PE Activities

Students will work in teams to complete challenges and achieve goals. Collaboration will be encouraged through team-based sports and group problem-solving tasks.

- **Objective:** To promote teamwork, peer collaboration, and communication skills.
- **References:** DeShon and Gillespie (2005) [9] support the idea that collaborative activities can enhance engagement and performance in academic settings.

Reflection Sessions

After each challenge, students will participate in reflection sessions where they discuss their experiences, successes, and areas for improvement.

- **Objective:** To encourage self-reflection and continuous improvement in PE skills and knowledge.
- **References:** Baiden *et al*. (2022) [3] demonstrated that reflection activities are beneficial for increasing student engagement and motivation.

1. Implementation Plan

Table 6: Implementation Plan of Proposed Activity

Week	Activity	Details	Learning Objectives	Resources Needed	Responsible Person	Success Indicators
1	Introduction & First Challenge	Introduce the "PE Quest Challenge" and conduct the first weekly challenge. Provide an overview of the points and badges system.	Understand the gamification framework and motivation strategies.	Presentation slides, challenge materials, leaderboard setup.	PE Instructor, IT Support	Students participate actively and understand the challenge structure.
2	Weekly Challenge & Digital Leaderboard	Continue with the second challenge and update the digital leaderboard. Engage students in discussing strategies and reviewing performance.	Develop critical thinking and strategic planning skills.	Challenge materials, leaderboard software.	PE Instructor	Increased student engagement and leaderboard updates reflect active participation.
3	Challenge & Gamified Quiz	Conduct the third challenge and administer a gamified quiz. Provide feedback on quiz results and discuss key concepts.	Reinforce learning through assessment and feedback.	Quiz platform, challenge materials.	PE Instructor, IT Support	High quiz participation rate and improved performance.
4	Team-Based Activity & Reflection Session	Host a team-based activity and a reflection session to review the past challenges and set new goals.	Foster teamwork, collaboration, and self-reflection.	Group activity materials, discussion guide.	PE Instructor	Students actively engage in discussions and demonstrate teamwork.
5	New Challenge & Leaderboard Update	Introduce the fifth challenge and update the leaderboard. Encourage students to reflect on their performance and plan for future challenges.	Encourage self-assessment and goal-setting.	Challenge materials, leaderboard software.	PE Instructor	Students show progress and adapt their strategies.
6	Challenge & Gamified Quiz	Implement the sixth challenge and conduct another gamified quiz. Discuss strategies for improvement based on quiz results.	Strengthen problem-solving skills and conceptual understanding.	Quiz platform, challenge materials.	PE Instructor, IT Support	Improvement in quiz scores and application of strategies.
7	Final Team Challenge & Reflection	Organize the final team challenge and hold a reflection session. Evaluate overall progress and celebrate achievements.	Assess cumulative learning and encourage self-improvement.	Team challenge materials, reflection forms.	PE Instructor	Students recognize their progress and share learning experiences.
8	Final Review & Awards Ceremony	Review the entire program, announce winners, and award badges. Provide certificates for outstanding performance and achievements.	Celebrate accomplishments and reinforce motivation.	Certificates, awards, leaderboard data.	PE Instructor, School Administrator	High student attendance and positive feedback on the program.

2. Expected Outcomes

- **Improved Academic Performance:** The intervention is designed to increase students' motivation and academic performance through engaging and challenging activities, supported by the findings of Anderson and O'Neil (2018) and Deterding *et al*. (2011) [10].
- **Increased Motivation:** By using a points and rewards system, the program aims to enhance students' enthusiasm and participation in PE, as supported by Yıldız, Topçu, and Kaymakci (2021) [32].
- **Enhanced Engagement Skills:** The focus on teamwork and reflection is intended to improve students' engagement skills, which is consistent with the results of Baiden *et al*. (2022) [3] and DeShon and Gillespie (2005) [9].

Conclusions

Based on the findings of the study, the following conclusions were derived:

1. The participants in the PE classes performed better in the post-test due to the implementation of gamification strategies.
2. The use of gamification resulted to an exemplary performance of the participants in their PE classes.
3. There is a significant difference between the performance of the participants in the pre-test and post-test which implies that the students performed better in the post-test where gamification strategies were implemented.

Recommendations

Based on the findings and conclusions drawn the following recommendations are offered.

1. Teachers are encouraged to implement a diverse range of gamification strategies, incorporating immersive, interactive, and motivational elements to accommodate different learning styles and preferences. The effectiveness of simulation activities, storytelling, and social collaboration highlights the importance of these methods in fostering engaging and dynamic learning experiences. To further enhance student participation and motivation in PE classes, educators should integrate a balanced mix of traditional and technology-based tools, ensuring lessons remain both stimulating and accessible. Additionally, continuous assessment and adaptation of these strategies will help optimize their impact, making learning more meaningful and enjoyable for students.
2. While gamification has been shown to enhance academic

performance and motivation, its long-term effectiveness relies on continuous improvement and adaptation. Educators should refine gamified activities to strengthen comprehension, retention, and real-world application of PE concepts.

3. The study also found that age plays a role in shaping students' perceptions of gamification's impact on academic performance and motivation. To maximize its effectiveness, gamification strategies should be tailored to meet the distinct needs of different age groups. Younger students may benefit from visually stimulating and simple gamified tasks, while older students might engage more with complex, thought-provoking activities that promote critical thinking and problem-solving. To address these differences and harness the advantages of gamification, the proposed "PE Quest Challenge" provides a structured approach.

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