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Gamification in Education: Enhancing the Students Engagement and Learning Achievements through the Integration use of Game based Learning

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Abstract

The aim of this study is to determine the impact of gamification in encouraging learners' involvement, achievement and learning activities within learning institutions. Here, game characteristics include the issuance of points, competition, incentives, and feedback mechanisms to be used in game force. The goal of integrating these elements into the conventional contexts of teaching and learning approach is, therefore, to determine whether the application of gamified features can increase students' engagement and consequently improve their academic performance. Consequently, this research employs a quantitative research paradigm to capture and explain the effects of gamification on learning behaviors and performance. The study will compare two distinct groups: The first class will be introduced to learning through games, whereas the second class will be taught in a normal, conventional manner. Questionnaires will be used as data collection tools so that both groups will complete questionnaires about their learning experiences, interests and perceived learning achievements. Through the analyses of these surveys, the present research aims to establish whether gamification can help enhance engagement and learning achievements over traditional stimuli. This research aims to provide enlightening results that help to answer the question of whether it is possible to make use of the means of games to enhance the learning activities and students' activity and results, thus enriching the field of educational technology. Besides, the study may also provide recommendations to instructors in terms of creating bespoke and relevant teaching and learning environments that can enhance learning outcomes for learners of different profiles.

Key Words

Learning Games, Educational Games, Interactive Student Participation, Teaching Success, Numerical Evaluation

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Introduction

Background

Current formal educational structures have numerous difficulties in enhancing student attention and enhancing their learning. Most students express their disconnection from conventional classroom learning through professors' lectures, textbooks, and tests. These methods do not take into consideration the variation in learning abilities, which leads to low levels of motivation, participation, and memory retention. Research has indicated that when

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students are passive in their learning, they are poor in their performance. Thus, they give low scores on their tests, and they lose interest in what they are learning.

Another major problem in traditional learning system is that learning is mostly induced. In such environments students cram and repeat what is in the exams but they do not even absorb or apply what they are taught in real life situations. In addition, the absence of interaction and feedback during learning kills a student's interest in the topic, which reduces the chances of success in the future.

As a result of these difficulties, educational researchers and practitioners have started to look at novel strategies that would help boost students' interest and improve learning achievements. One such approach is gamification where by normal learning environment is augmented by elements such as points, badges, leader boards and levels.

Game-based learning (GBL) goes one step further and applies actual games – be they computer or board – to teach particular content. Educationally, games are by themselves, and they involve problem-solving, critical thinking, and collaboration skills that are relevant in school and in life. When developed properly, game-based learning environments provide students with instant feedback, incentives, and the feeling of advancement as learning is made fun and meaningful.

Research Problem

Despite the vast popularity of gamification and game-based learning in school, knowledge about their impact on students' engagement and learning outcomes is surprisingly scarce. However, research in social media and education is still limited, and most existing studies are based on narrative evaluations of students and educators. The question, however, is whether a game-based instructing indeed offers superior interest and achievement as opposed to conventional instructing. Although the use of gamification has been found to enhance motivation, studies in this area are still inconclusive with regards to the effective use of gamification across different disciplines or within different age groups, especially because many existing experiments lack power, generalisability and methodological rigour. This research intends to meet this need by improving the understanding of the benefits of gamification in learning engagement and student outcomes.

Research Objective

1. To measure the effectiveness of game-based learning based on students' learning activities and performance gains.
2. To assess the effectiveness of using game elements in the traditional learning environment to increase students' engagement, motivation and performance.
3. In order to compare the test scores, the participation rates and the engagement levels of students learning in Gamified and Non-Gamified environments.
4. To support the research with facts and figures and to prove the efficiency of the use of gamification in education.
5. To raise awareness of educators, policymakers and educational software developers about the opportunities and challenges of using gamification in educational environments.

Research Questions

To achieve the research objectives, the following key questions will guide the study:

1. How does the use of games affect students' learning and academic performance?
2. To what extent does the application of game elements to traditional classrooms improve students' engagement, motivation, and performance?
3. In what ways does the use of gamification impact the differences in test scores, participation rates and engagement levels?

4. What conclusions can be made from the analysis that can help to understand whether or not the use of gamification enhances learners' educational outcomes?
5. In what way can the results help educators, policymakers, and developers of educational software to learn about the advantages and disadvantages of using gamification in learning?

Literature Review
Gamification in Education: Present Main Works that Describe what Gamification is and how it has been implemented in Learning Environment

Gamification is, therefore, a process of using aspects such as points, badges, levels, and leaders in non-game contexts to enhance the user's engagement and motivation. In the context of education, gamification is an attempt to make usual, often monotonous and passive learning activities into vivid and lively processes that attract students. If educators incorporate game elements into their design of instruction, they will be able to present learning tasks in a manner that resembles games and, therefore, make students more inclined to participate in the tasks. That is not only entertainment for the students but also to increase the desire and attentiveness of students to the course so that they can be willing to contribute and progress in their learning experience. For instance, if students are given points for submitting an assignment or badges for completing an activity, they receive some items that are related to the rewards in the game.

The studies by Deterding et al. (2011) have given the initial step in defining gamification as the process of integrating game design elements in non-game contexts, with emphasis on the elements that make learning fun and productive. It is such a definition that has informed most of the subsequent research on gamification in education. University students who went through a gamified course, as described in Domínguez et al. (2013), not only reported a higher level of engagement but slightly improved their academic performance, showing the difference between engagement and performance. In addition, Hamari et al. (2014) discussed the empirical research on gamification and mentioned that environments with the high adoption of game elements like-leaderboard and rewards enhance the engagement level to a great extent if the game elements are more connected with the learning goals.

While the term gamification refers to the application of the game design to other contexts, GBL is the application of the game context to learning. This is why GBL aims to capture the students' attention and ensure that they are willing to engage with content in an adventurous way. This approach uses the game's basic characteristic of interaction and conflict solving as the learner can learn and practice in a safe environment where he or she might make wrong decisions. To be precise, the principles of GBL are fun, play, feedback, and challenge, and the latter is the feature that changes with the development of the learner. Thus, students are more interested because they can apply the given concepts and observe the consequences in the game environment.

The chief learning approaches of GBL are playing, risk-taking, and learning without the pressure of getting it wrong because games provide the actors with an opportunity to try out strategies. The other one is feedback, or most educational games provide feedback in real-time, hence giving children a chance to change their behaviour. Scaffolding is related to the concept of educational development, whereby the tasks become complex as the students advance to other levels, which aids learning at a certain/progressive level. Last, there is a positive affect of the approach; games can be teamwork or competition, and it provides students with the opportunity to interact and learn skills while having fun with challenges.

Other research carried out on GBL also gives evidence that GBL improves a student's performance outcomes. (Gee, 2003) defines good games as being already based on learning principles to let the learner be active and learn in context, and learning is the key to education. Epistemic games were developed by Shaffer (2006) as the kind of activities that are supposed to help students get acquainted with the given profession and its reasoning patterns. Moreover, (Clark et al., 2016) concluded the meta-analysis, and it was found that the outcomes were positive and significant for learning with the help of digital games, especially in STEM areas, where it was also mentioned that they contribute not only to the formation of academic knowledge but soft competencies, including teamwork and perseverance.

According to the findings, the use of gamification has a positive implication on the behaviour of the students since it makes the learning process more meaningful and more engaging. Engagement may be described as a student's attention, interest and willingness to learn, which are key aspects of learning. Nonetheless, some incentives like points, badges, and leaderboards encourage achievement as well as competition that keeps the students occupied. However, the study also showed that the extent of the effect of gamification on engagement is based on the manner in which the game features were integrated. If the gamification strategies were well integrated, then it would enhance the learning procedure, but if it is overdone or incorporates competitiveness-related game elements, it may lead to a decrease in the interest level of the students.

Hanus and Fox (2015), in their study on university classrooms, observed that with the use of gamification, students were more engaged in the first week and if points, badges and competitions persisted, their engagement reduced in subsequent weeks. Sailer et al. (2017) took this line further by examining the level of interaction that different game mechanics elicited among the learners. Specifically, they found that elements that enhance competence, such as feedback and progress indicators and elements that enhance relatedness, such as leader boards and team-based missions, offered the most value to the students. Furthermore, Hakulinen, Auvinen, & Korhonen (2013) pointed out that from the game perspective, the students realized the goal of the game and established personal goals for themselves, and they were on time with the assignments as well as group activities.

It was also found that gamification increases students' learning performance in terms of recall, mastery, and performance. If game elements are introduced in the learning environment, then not only are learners more motivated, but they also learn faster and get better results on tests. According to the findings of other scholars, it has been known that gamification has a positive impact on students' intrinsic motivation and efforts, as well as the time spent on learning activities.

In the study conducted by Barata et al. (2013) regarding the university course, it was realized that students who were in the gamified section were more participative and performed better than students who were in the non-gaming classes. While conducting a mathematics study, Su & Cheng (2015) discovered that there were benefits of gamification aspects because they enhanced feedback and accomplishment, which enhanced learning retention and comprehension of the learned concepts. According to Zainuddin et al. (2020), the use of gamification in language learning highlighted the changes identified where students' vocabulary and language skills improved most when using collaboration. In addition, (Wang, 2011) also noted that students who underwent the gamified courses had higher intrinsic motivation because the systems such as levels and badges motivated the students to engage in details study of the contents of the course to gain more levels and badges hence, would perform well in test and assessment.

It has also been recognized as a method of enhancing the acquisition of the 21st-century skills such as analysis, synthesis and evaluation, and collaboration. This paper will also demonstrate how learning environments are transformed into games in order to enhance skill acquisition to be more fun and challenging.

Game-Based Learning (GBL): Outlining the Principles of GBLand Proving how it Enhances Learning Outcomes.

Game-based learning refers to a learning method that employs actual games, whether computer or board, as the primary means of course content transmission. Unlike gamification, in which elements from the game, for example, point scoring, leader boards or rewards, are incorporated into conventional learning paradigms, GBL relies on full-fledged games separately designed to impart knowledge, skills or competencies. GBL allows learners to participate in learning processes in which they interact with the learning information in a firsthand manner, and in the process, learning is more effective. The special strength that is available and inherent in GBL is the fact that the overall inherent characteristics of games are convergent with aspects of problem-solving and engender a deeper understanding of the material. In this way, GBL makes learners participate actively in their educational process, turning learning from a passive process into an experience in which learners are active actors in their learning process.

Several principles define GBL and explain why it is effective in learning. GBL is grounded in the principle of learning through play, in which students apply what they are learning through experimentation and exposure to failure without consequences. It fosters points of view, analysis, and innovation because learners are allowed to experiment with different approaches to a problem without suffering consequences for failure. Another component of GBL is "Immediate Feedback" Feedback is the process through which information is passed from the tutor to the learner or from one learner to other learners after a learning activity. It is well known that educational games contain immediate feedback, so students are able to comprehend their errors as soon as possible, modify their plans and improve their skills gradually. The architecture of many games can readily be seen to map to the educational concept of 'gradual increase in difficulty,' often referred to as the 'scaffolding' in educational processes where the levels of difficulty are gradually built up from the initial level up to the highest one that the learner can handle. Also, there is the 'collaboration and competition feature of GBL, where learners are made to either cooperate to achieve some objectives or to excel against each other. It includes elements that will develop both individual and interpersonal skills, such as teamwork and communication.

As can be seen from the literature, there is ample evidence that shows that GBL can facilitate learning outcomes. According to Gee, 2003, games are good at education because they form learning principles that are in line with conventional learning practices. Good games are interactive, place the problem-solving context, and enable the learner to progress at his/her own pace. Shaffer (2006) also described the other types of games that are useful for students, such as the epistemic games, which assist the students in embracing professional knowledge, Reasoning and critical thinking skills. According to Clark, Tanner-Smith, and Killingsworth's meta-analysis done in 2016, learning outcomes were enhanced by games, especially in the science, technology, engineering, and mathematics (STEM) niche. This paper, in its conclusion, underscores how viable GBL is not only in enhancing performance outcomes but also in developing key interpersonal values inter alia, communication and collaboration, and tenacity. Since GBL is free from high pressure, it allows learners to experiment and develop a growth mindset to tackle any issues that come their way with tenacity.

Impact on Student Engagement: Review Prior Studies Regarding the Impact of Gamification on Motivators, Learning Engagement, and Learners' Interaction in Classroom.

Students' attendance is an important factor in learning processes because it indicates students' attention, interest and interaction with learning contents and processes. There is a significant positive correlation between academic success, personal growth and a high level of engagement in learning. In simple terms, gamification is the application of game design in a learning context and has become one of the most effective strategies to boost motivation for learning intervention. To this end, elements like points, badges, leaderboards, and rewards are introduced in the process of gamification to make the regular academic chores look like engaging problems in front of a student.

Previous literature helps to understand the impact of gamification in relation to students' engagement. In another study by Hanus and Fox (2015), the effectiveness of gamification was assessed in a university classroom context, and the results showed that, at the beginning of the classes, students perceived higher levels of engagement in a gamified context. Nonetheless, students' interest in the use of points and badges started decreasing over time due to the decrease in the attractiveness of game elements as well as when game elements promoted repetition and competitiveness. The current research also emphasizes the need to properly integrate elements of game design that will facilitate extended play without making the user either bored or stressed.

More information is provided by Sailer et al. (2017), who looked at the particular features that make games enjoyable. In their study, the authors established that features leading to perceived competence, including feedback and progress indicators, as well as those that foster social relatedness, including leaderboards and team challenges, increased student engagement. This way, the elements of gamification would be linked with the major motivational factors for students, including achievement and social relatedness, which would make learning more engaging and, therefore, long-term.

Hakulinen, Auvinen, and Korhonen (2013) continued with similar findings by pointing out that in gamified environments, students are motivated to submit their assignments on time and engage in discussions and group

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activities. They also pointed to the positive changes in the self-organization of students as many of them started to monitor their work more actively and set individual learning objectives. This implies that gamification not only enhances learner participation but also enhances learner participation. For effective learning, academic, and personal development, learners need not only motivation but also time management skills and achievable goals.

In this, research affirms the use of gamification for increased students' engagement through the promotion of a more engaging, fun and even, a more rewarding learning environment. However, a great deal of attention must be paid to the balance of such elements in order to avoid both boring and repelling the students, especially in competitive games. Perhaps the greatest strength is elaborating on an effective design cycle for gamification by establishing appropriate long-term incentives that support individual accomplishment as well as social interaction.

Impact on Learning Achievements: A Review on How Gamification Enhances Learning Retention, Academic Achievement and Skill Acquisition from Previous Research.

Learning Achievement means the knowledge, skills and competencies that learners acquire both in school and out of school. These achievements are evidence not only of academic learning accomplishments but also of cognitive-practical competencies. There is evidence that gamification increases learning outcomes because it promotes learning retention, improved performance and acquisition of relevant skills. The application of points, levels, badges, and progress bars makes gamification foster an environment that will encourage the students to achieve learning milestones. The dynamic process of learning is, therefore, enhanced, and students are encouraged to be more involved, patient, and able to retain more of what they have learnt.

Research also explores the effects of gamification with an emphasis on learning outcomes in different learning environments. Barata et al. (2013) used gamification in a university course, and the results were analyzed for students' performance in several semesters. The result showed that students in the game environment were more active and performed better than students in the non-game environment. In this study, it is all our contention that using these elements of gamification will enhance students' stake in their academic processes, hence the desired results. In their study, Su and Cheng (2015) selected gamification as the means of enhancing the learning of a mathematics course and found that learners' understanding and memory of the course material improved greatly. The study links these improvements to the feedback and achievement that games offer in order to enhance students' retention of knowledge over time.

Zainuddin et al. (2020) looked into the effects of gamification on language acquisition, specifically in the areas of vocabulary and language proficiency. Their study revealed that the integration of game-based learning with cooperative strategy was effective and hence supported the hypothesis that gamification improves learning outcomes in both individual and collaborative learning environments. Likewise, Sanchez (2020) revealed that gamification enhanced the level of student's motivation from an intrinsic perspective, accompanied by improved test and assessment results. Through the use of levels and badges, the theory of gamification helped the students spend extra time and effort mastering the course and material.

Apart from improving academic achievement, the use of games has been attributed to building 21st-century competencies such as innovation, analysis and interpersonal skills. These skills are very relevant in the current learning environment, where learners are supposed to address various issues in real life and solve them collaboratively. By using gamification, the mentioned competencies can be practised in an engaging manner, and thus, students get an opportunity to develop important skills in a motivating context. As a tool for content learning, mastering techniques and knowledge, gamification is a perfect example of a powerful solution for achieving comprehensive learning.

Research Methodology
Study Design
To investigate the effects of gamification, this study was a quantitative, experimental design and focused on motivation within game-based tools. Two groups were involved: A set of quantitative pre and post-test results that

compared a class using normal coursework (lectures, readings, homework) with a class using gamified elements such as points, badges, levels, rewards, and leaderboards for motivation. As such, the experimental design was to assess the impact of the intervention- namely, the use of gamification- on student engagement and performance. In order to do this, the study was designed to operate on a group basis, and systematic data collection and statistical testing were carried out to evaluate the effectiveness of the learning intervention.

Sample Population

This study targeted one hundred undergraduate students from two classes of the same level of study and the same course but different sections that were used as the control and experimental groups, respectively, in order to reduce variability in ability. With a mean age of 19.5 years (range: All the participants reported their age within 18–22 years, so it can be assumed that they had comparable previous knowledge. Both online and f2f learning contributed to the fact that there were no differences in the usage of technologies such as laptops and the internet for all the students. Gender and gaming experience were covaried in order to moderate the effects of these variables on results, based on which the comparison of engagement and performance in the two groups was made.

Data Collection Tools

The means of data gathering were questionnaires and achievement tests to obtain quantitative information on student's participation and performance. A Likert scale in the survey focused on the extent of engagement levels, motivation, interest and level of enjoyment that statements such as "I wish to be involved in this class" and "The activities in this course are enjoyable", among others. Controlled pre and post-questionnaires allowed measuring changes after the application of the game-based learning tools in the experimental group. This paper compared normal teaching methods to gamified ones to determine if there are some notable differences in students' participation and performance that could show the advantages of using the technique.

Data Collection Tools

Data for this research was collected quantitatively through questionnaires and standardized achievement tests. A self-developed, five-point Likert scale questionnaire measured motivation, interest, participation and enjoyment pre and post-intervention with sample statements such as "I feel motivated to participate in this class". Moreover, pre and post-quizzes, which assessed the level of retention of the course content, were administered in order to compare the results of the control and the experimental groups. Altogether, these tools offered accurate, numeric data on how the use of gamification affects students' participation and performance.

Traditional Classroom Learning

Teaching Approach

In the control group, conventional methods of teaching and learning in the classroom were used. Lectures, reading from textbooks, discussions, and conventional assignments were the main strategies used in this approach to present the course content. The instructor was most involved in the presentation of information, and students were required to listen, write, and learn what the instructor was presenting. This traditional approach focused on a more individual teacher's perspective where the task of teaching was to share with students.

Learning Activities

The learning activities in this group consisted of learning through lectures and memorization. Quizzes and homework were designed with a focus on what was delivered in class and what was provided in the textbooks, many of which asked questions that would be best answered through rote memorization. Students usually adopt a receiving mode of learning, which means that they receive knowledge without interacting with course material. This method comprised tests, quizzes, essays, and exams that tested their capacity to reproduce information and not enhance their critical thinking skills.

Assessment

In order to maintain comparability of the results, the control group also underwent the same pre- and post-tests as

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the experimental group was given. The pre-test assessed the learners' knowledge before the study was conducted, while the post-test was used to assess the level of learning after the intervention. To do this, the research sought to use parallel measurements in the experimental and control groups where only traditional teaching was employed in order to compare the result of the game-based learning with the traditional teaching methods.

Experimental Group: Game-Based Learning Approach

As for the control group, the experimental group underwent a game-based learning environment that aimed at capturing their interest and improving their learning. This approach involved the use of several mechanics of games that were used to encourage the students to learn in the class.

In the learning environment designed as a game, the students were rewarded for their work, to be more precise, for the completion of assignments and tests, as well as for participation in the discussion. This point system was aimed at giving the students some sort of feedback so that they could see the results of their work. The more points students earned, the more satisfaction that motivated them to participate in learning activities. This kind of immediate reward for efforts made boosted the level of participation among students and positively rewarded good behaviour towards learning. That is why the opportunity to track their points stimulated interest in courses as students were more engaged in their learning process and tried to gain more points for different activities and interactions.

The inclusion of the badges and the rewards analyze another motivating factor within the overall equation of the game. Students received badges for reaching certain goals, for instance, for finishing difficult assignments or passing tests. This began in order to validate the students' work and achievements, which in turn produces pride for the students. Furthermore, earning badges forced students to have their own objectives, which they had to achieve to get the badges that they wanted. Apart from badges, many kinds of rewards were proposed, such as material benefits or other rights that could encourage students to perform better performance. These rewards serve as a positive feedback loop that encourages the students to regard learning as something they would like to pursue and know that their struggles will be rewarded.

The curriculum had a clear sequential design in terms of the difficulty of tasks and quizzes included throughout the course. This levelling system was supposed to encourage the students, as they had to pass a certain level to be able to progress to the next level. This approach was good because it made students feel that they were accomplishing something when they got to the level the teacher wanted them to get before allowing them to proceed to the next lesson. The structured progression for the tasks ensured that students had a growth mindset where they saw the problems as steps up the learning curve. This mindset could translate to better and more focused study efforts since the students changed their mindset to go for more challenging efforts and capabilities of growth.

In the adopted game environment, leaderboards were utilized to provide competitiveness in the learning environment so that the performance of the students was measured and accomplishment was fostered. With points earned as the basis of the rankings, the leaderboard produced a form of competition among the students who wanted better places on the list. This competitive aspect added a lot to the effectiveness of the engagement because students were doing things in order to better their counterparts. The idea of having a leaderboard was that students could see each other succeed but at the same time push each other to do better. Such visibility of achievements not only motivated the students to work harder but also fostered cooperation and friendly relations among them because the students were solving collective objectives and participating in other students' learning processes.

Learning Activities

The learning activities for the experimental group were fun-based and game-like in order to enhance their learning. Students were encouraged to participate in activities such as solving puzzles, doing quiz for incentives and participating in group challenges. These activities were intended to encourage teamwork, analysis, and problem solving endeavors while students were solving tasks as a team.

Assessment

Similar to the control group, the experimental group completed the same pre- and post-tests in order to measure learning accomplishment. However, the progress and the level of participation of the students were closely tracked through the gamified system. This continuous evaluation gave a perception of how gamification impacted not only the students' experience but also their achievement towards the learning goals and made it possible to make changes in the course of learning by using this information.

In conclusion, the learning by playing games in the experimental group is totally different from the conventional method used in the control group. The incorporation of game techniques into the learning environment was the primary goal of the study, with the view of improving student involvement and performance. The results of the comparison of the two groups helped to gain insights into the possible advantages of the use of gamification in teaching.

Variables

Independent Variable

The variable used in this study was points, badges, levels, and leaderboards that were used exclusively on the experimental group to enhance student motivation, participation and performance. Outcomes such as course activities like assignments and discussions are rewarded to encourage motivation and progress. The badges were used to reward specific accomplishments that improved the levels of self-esteem, self-confidence, and work commitment. Hierarchical task assignments broke down tasks into levels of easy, medium, and hard so that each task could be mastered and attempted at an appropriate rate. Individual score boards, on the other hand, fostered rivalry by displaying one's performance. These gamification elements changed normal teaching to measure the effectiveness of engagement and academic performance in order to provide insight into the effectiveness of gamification in the classroom.

Dependent Variables

The study focused on two main dependent variables, student participation and learning outcomes, in order to measure the effectiveness of gamification. To understand the level of engagement, motivation, participation and enjoyment, a Likert-scale questionnaire was used, and pre and post-tests were taken if possible. The extent of learning achievement was measured by pre- and post-tests, where content knowledge retention between the two groups, taught through gamification and the traditional methods, was compared. Quantitative results were used to understand the significance of the impact of gamification on engagement and performance, which may be useful for educators and policymakers who can see the potential of gamification in the educational environment.

Results

Descriptive Statistics

Descriptive statistics give a broad picture of the degree of participation and learning achievement of both the control and the experimental groups. These measures are the main indicators that show general tendencies and regularities in the data observed.

Engagement Scores

The level of engagement was determined by a Likert scale that captured different aspects of the engagement of the students before and after the intervention. The results are summarized below:

Table 1

Group	Mean Engagement Score (Pre-test)	Mean Engagement Score (Post-test)	Standard Deviation (Post-test)
Control Group	3.2	3.4	0.45
Experimental Group	3.1	4.5	0.30

The results of mean engagement scores are discussed in detail because they shed light on the effectiveness of teaching methodologies that facilitate engagement levels of students. The control group's mean engagement score rose by just 0.2 from 3.2 to 3.4 due to the use of traditional teaching practices. This increase indicates that though traditional methods of teaching and learning may bring about some level of learning engagement, the enhancements are not very encouraging and may not effectively compel students to be active participants in the learning process. On the other hand, the experimental group had a significant improvement in their mean engagement score from 3.1 to 4.5 after using gamification techniques. This rise is dramatic, which points to the highly positive effect of the use of the gamification approach in learning, suggesting that the elements of the game introduced into the educational process successfully stimulated students to increase their interest in the learning process and become more active in the learning process.

Additional information on the standard deviation is needed to elaborate on the spread of the engagement scores within groups. The control group's standard deviation of 0.45 indicates moderate variation in the level of engagement in the students; that is, some students were more engaged than others, and some were less engaged. Such fluctuations may suggest that students have different degrees of desire to learn the material, which is typical for traditional teaching contexts in which students' interests can vary greatly. The experimental group, on the other hand, had a standard deviation of 0.30, which means that the engagement scores were much more aligned among participants. Such similarity indicates that the techniques of gamification enhanced the general coherency of the increase in interest, which implies that all students were equally motivated and engaged in the learning process. The lower variability in the experimental group even more, underlines the positive impact of introducing a game element to enhance the educational process for all children, not only for some selected by the teacher.

Learning Outcomes

Knowledge gains were determined using pre and post-knowledge tests that established the students' mastery of course content. The descriptive statistics for test scores are presented in the table below:

Table 2

Group	Mean Test Score (Pre-test)	Mean Test Score (Post-test)	Standard Deviation (Post-test)
Control Group	65%	70%	5%
Experimental Group	64%	85%	4%

The comparison of the mean test scores provides an understanding of the effectiveness of the instructional methods delivered by both groups to their students. The two groups also raised their scores from the pre-test to the post-test, which reflected a gradual general learning trend among the participants. In the control group where conventional methods of teaching were used, the mean score on the test actually increased from 65 per cent to only 70 per cent. This is an improvement of 5% in their understanding and absorption of the lessons taught in the class. Although this change is positive, it points out that generic approaches to instruction can, at best, offer small gains in student learning.

On a brighter note, the experimental group, which was exposed to the gamification strategies, had a staggering improvement in their mean test scores from 64% to 85%. This 21% improvement is quite impressive and shows that the academic performance has improved by a notch, as expected since gamification was all about making learning better. The significant improvement of the experimental group shows that not only motivation but also knowledge is improved in gamified learning environments, and thus, more significant educational advantages.

The results of the test scores are supplemented with the standard deviation that characterizes the dispersion of performance in each of the groups. In the control group, the 5 per cent standard deviation indicates below-average or moderate volatility of test scores. This means that although some of the students were able to find a better understanding of the lessons through the traditional teaching strategies, the others were not as successful. Such variability may be due to a lack of interest or motivation among the students in a conventional

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classroom environment where the instruction delivery effectiveness or ineffectiveness depends more on the student's needs and interests.

On the other hand, the experimental group had a small standard deviation of 4%, meaning that there was little variation in the learners' test scores. This is an indication that most of the students in the gamified learning environment received a similar and improved performance. The consistency of outcome may be explained by the intrinsic nature of gamification, which motivates students through an appealing and more effective educational process. Students who were engaged with this type of gamification and given the possibility to share their knowledge and get immediate feedback were also able to score the same level of improvement as the rest of the class, proving that everyone benefited from such an approach to learning. Thus, the lower variability in the experimental group supports the use of gamification to foster an environment for learning in which all students can succeed.

Inferential Statistics
Inferential statistics were used to explain the meaning of the differences obtained between the two groups.

T-test
The engagement scores and learning achievements were compared between the experimental and control groups using an independent samples t-test. The results are summarized below: The comparison of the engagement levels between the experimental and control groups is a significant difference, as confirmed by the t-test ($t(98) = 5.67$, $p < 0.01$). This result brings to light the increased effectiveness of gamification strategies in improving learner engagement. It can be concluded that the experiment group has different and higher mean engagement scores compared to the control group, $t = 5.67$, $p < .05$. The p-value of less than 0.01 means that any such difference could not have occurred by chance, yet again backing up these findings. Such a difference holds credibility to the idea that the specific gamification strategies adopted for the experimental group not only attracted the learners but also ensured that they increased the level of participation in their learning activities and, therefore, promoted an effective educational environment.

Besides the results connected with the level of engagement, the learning outcomes also confirm the positive effects of gamification on achievement. The post-test scores are also significantly different between the two groups, as shown by the t-test results ($t(98) = 6.84$, $p < 0.01$). This result shows that students in the experimental group, which received gamification techniques, had better scores on their assessments than the students in the control group, which received conventional teaching methods. The obtained t-value of 6.84 has confirmed a significant difference in the mean scores of the participants; therefore, it can be stated that gamification did not only increase interest and willingness to learn but also led to better academic results among students. Finally, they found a $p < 0.01$, which indicates they can exclude the possibility that the results have occurred by chance, which supports the claim that gamification improves learning. In sum, the results presented here are highly suggestive of the positive impact of games on enhancing learners' engagement and performance, supporting the call for the increased use of gamification as a learning approach in schools.

Correlation Analysis
In the present study, the use of a Pearson correlation analysis was used to establish the relationship between the application of gamification elements and enhanced academic performance. The results are as follows:

The results presented in Tables 3 and 4 show that there is a positive correlation between the number of points earned and academic performance, with $r(98) = 0.75$, $p < 0.01$. This explains a very strong positive relationship between the student's point score and their performance on the overall course since the more points they gain through their active involvement and completion of exercises, the better their performance is likely to be. The policy of students attaining a certain amount of points also encourages most students, as they are rewarded immediately, which in turn ensures they pay more attention to the content of their lessons. This relationship proves

that point is a successful gamification component that will help to create a desire in students to improve the current academic standards.

The Award of Badges and Academic Performance

Equally important is the relationship between the number of earned badges and students' performance, $r(98) = 0.68$, $p < 0.01$. This positive correlation shows that students who complete the specified goals and are awarded badges will show increased academic performance. They represent a type of reward which confirms students' work and achievements. The motivational influence of badges motivates students to set and achieve their goals, thus adding another level of engagement with the content of the course. This discovery shows that students are motivated to work harder academically when they are rewarded with a sense of accomplishment.

Class Levels and Academic Achievement

The relationship between moving through levels of increasing levels of difficulty and academic performance also emerged as positive, $r(98) = 70$, $p < 0.01$. Such a result indicates that learners who are able to progress through sequentially increasing levels of difficulty are likely to be academically performing well. The levelling system not only indicates to the students what they have to aim at but also challenges them to improve their skills gradually. When the students have mastered all the levels, they feel capable of tackling more challenging content, hence the motivation to develop at higher levels. This relationship suggests that the very structured nature of the challenges associated with gamification can improve student learning by promoting tenacity and interest.

Leaderboards and Grades

Finally, the relationship between leaderboards and academic performance results in a moderate positive correlation of $r(98) = 0.65$, $p < 0.01$. This indicates that the competitiveness of the leaderboards is central to the encouragement of excellence among students. Leaderboards, as a result, make students work harder and improve their rankings as they get a clear view of their position concerning other students. This competitive element could also create a culture of togetherness among students where everyone is working towards a common goal while at the same time making the students competitive to get better results. The way in which the increase in academic performance is enhanced by leaderboards serves as a strong pillar to the thought of gamification enhancing learning.

Altogether, these correlations make a suggestion that with the elements of gamification, including points, badges, levels, and the leaders, student engagement, as well as learning outcomes, are enhanced. The following is evidence for the application of the gamified approach in education, showing that well-designed gamification strategies help improve learners' academic performance and provide them with an entertaining learning environment.

Engagement Scores

The following bar chart shows the different engagement levels of the students before and after the integration of the game element. The chart presents average engagement scores for both groups:

The results of the pre-and post-tests comparing the experimental group and control group are summarized in the table below:

Table 3

Group	Pre-test Mean (%)	Post-test Mean (%)	Improvement Rate (%)
Control Group	65%	70%	5%
Experimental Group	64%	85%	21%

The Improvement Rate shows that the experimental group improved by 21 per cent while the control group only improved by 5 per cent in the test. This performance disparity explains the efficiency of gamification as a pedagogy.

Graphical Representation

To provide more contrasting data on the established learning effect, an added graphing method (like a line graph or a bar graph) could be used to view the improvement rates of each group. This representation would enhance the understanding of the teaching methodologies on the performance of the students and, hence, the importance of the findings.

Thus, the findings of the present research clearly support the hypothesis for the effectiveness of employing the principles of gamification and advancing the traditional approach to education. Such findings suggest that there is a possibility of using game elements to increase the motivation and effectiveness of learning to support the call for increased use of innovation strategies in learning. The data gathered and examined in the course of the study prove that gamification can be useful for increasing learners' interest and achieving positive learning outcomes.

Discussion

Interpretation of Findings

The quantitative findings of this study offer overwhelming evidence to support the hypothesis that gamification improves students' engagement and learning performance. The large differences in both the engagement scores and test results between the experimental and control groups suggest that the use of gamification techniques made a positive difference in the student's educational processes. In particular, the experimental group raised the level of participation from 3.1 to 4.5, and the indicators of learning achievements, according to post-test results, increased from 64% to 85%. From these studies, it can be concluded that not only does gamification engage the students, but also increases their engagement in their work, resulting in better performance.

Engagement Impact

This paper discusses the findings that show that competition, rewards, and game dynamics are the most important determinants of students' engagement and activity in a learning context based on game principles. This is because features like points, badges, levels, and the leader board play a central role in the engagement that was noticed from the side of the experimental group. The mode based on leaderboards stimulated students to reach higher results due to competitiveness, and the point system stimulated students' activity and effort. Further, the material incentives linked with earning badges for achieving some goals helped students to receive clear references to their achievements. Competitive and reward-based activities went hand in hand in support of students' continuing 'buy-in' while also cultivating feelings of collectiveness and teamwork for the betterment of the whole learning environment.

Learning Achievement Impact

The fact that the test scores in the gamified group improved significantly prompts important questions about the underlying processes that led to those improvements. This is primarily due to the interaction aspect of game-based learning, where the experimental group's mean academic achievement improved from 64% on the pre-test to 85% on the post-test. In contrast with the conventional approaches to teaching and learning, which propagate receptiveness as a major learning strategy, the approach promoted by the games implies learning engagement. Such an active learning environment helps students put into practice what they have learnt in class and retain a lot of information as compared to the passive learning environment. The study conducted implies that the use of gamification is an ideal way of enhancing learning since it increases the interaction of the learners and leads to better performance.

The Findings of the Present Study are Compared with Related Literature

In light of the existing literature in the use of gamification in learning, the results of this study correspond with a multitude of studies that have reported positive gains as a result of gamification among learners. Previous studies have also postulated that using game elements in learning environments has positive effects on motivation, activity involvement and thus, better learning. For instance, research has shown that there are possibilities of making a student to be more self-directed using gamification. Nevertheless, certain literature is also concerned about some

issues that are associated with the method, including extraverted incentives, which can decrease intrinsically motivated behaviour in the long term. The findings of this study add to the literature, which indicates that gamification is an effective strategy, and at the same time, acknowledges the importance of moderation in the use of gamification in an educational context.

Limitations

However, there are some limitations of the present study that need to be mentioned here to make clear about the generalizability of the findings. First, the sample of 100 undergraduate students was recruited, and despite being sufficient for pilot analysis, it may not be sufficient to represent the general student population. Perhaps if a more extensive and varied population were surveyed, more generalized results would be obtained. Further, the length of the intervention may also be an issue; perhaps the longer exposure to the principles of gamification would lead to further enhancements to both engagement and learning. In addition, other method-related biases, including self-selection bias, could affect the study outcomes in that only students who had a special interest in gaming might be included in the experimental group. Future research should ensure that the limitations highlighted in the present study are eliminated as follows: A larger sample size should be used for the study, the intervention period should be longer, and random sampling methods should be used. Being aware of these limitations will be important for ensuring that the implications of the results for gamification in education are not misunderstood.

Conclusion
Summary of Findings
This study reveals that the use of gamification has positive effects in increasing students' learning interest and performance of the experimental group as compared to the control group. In the context of the current study, the use of points, badges, levels, and leaderboards was found to significantly enhance the experimental group's engagement levels as the scores increased from a mean of 3.1 to 4.5. Additionally, their academic learning significantly improved; by the way, the percentage of post-test results rose from 64% to 85%. From the above findings, it is clear that the use of gamification enhances the learning environment as well as assists in enhancing student's performance and comprehension of the content being taught in class.

Implications for Educators
The implication of the finding of this study is, therefore, useful for educators who may wish to improve their teaching strategies. What is more, the application of gamification elements to the study programs means that educators get the opportunity to make the process more interesting and attractive for the learners and make them more active participants in the process. The theoretical constructs of motivation and commitment are central to student success; therefore, gamification is a valuable set of tools. Teachers are encouraged to get familiar with a number of game-based mechanisms specific to the subject area as well as the students in order to create an educational environment that will engage students' interest and, at the same time, improve the quality of the educational process.

Suggested for Further Research
In order to extend the existing literature, the following directions should be explored in future research. First, evaluating concerns with bigger samples would contribute improved data, and the applicability of the results would be more versatile across different learning settings. Furthermore, research into the impact of gamification on learners of different ages would help to determine that the level of engagement and learning achievements differs across ages and thus identify the most suitable age-appropriate gamification approaches. Moreover, the use of other game-based methods extending the ones applied in this study, for example, the narrative approach to learning or collaborative games, can give more insights into the best practice of using gamification for different educational environments. In total, such research suggests that there exists the potential in this domain to continue strengthening and broadening the knowledge of how gamification can be employed properly to enhance educational practices and the results achieved by learners.

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