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The Impact of Gamification on Enhancing Student Engagement and Science Achievement

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ABSTRACT

This quasi-experimental study investigates the impact of Gamification on student engagement and academic achievement in science among Grade 6 students at Moria Elementary School, Monkayo West District, Division of Davao de Oro, during the school year 2024–2025. Using a one-group pretest-posttest design, the study aims to determine the effect of gamified instructional strategies on students' achievement and engagement levels. The pre-test results indicated that students had an average mastery level in science and satisfactory engagement, particularly in the cognitive and affective domains. After a month of gamified science instruction, the post-test results showed a marked improvement in both academic achievement and engagement levels, with students progressing from average mastery to a higher proficiency level in science. Engagement scores also improved, indicating a "very satisfactory" level of student involvement. Statistical analyses using a paired t-test revealed significant differences in both academic performance and engagement before and after the intervention. These findings suggest that Gamification significantly enhances both student achievement in science and their overall engagement in learning. The study recommends further implementation and exploration of Gamification as an effective pedagogical tool in science.

Keywords: education, teaching, gamification

INTRODUCTION

Gamification, one of the approaches in teaching various disciplines, is believed to affect students' engagement and academic achievement. According to Surendeleg et al. (2014), Gamification is a concept designed to improve user experience and engagement with a system, making it highly applicable to education. Recently, interest in educational Gamification has grown significantly, as educators explore innovative ways to apply game-based elements in the learning process. The potential of Gamification in education is substantial, as humans have an innate desire to learn, regardless of age. The researcher believes Gamification can significantly boost students' motivation, participation, and performance. However, its success largely depends on the teacher's knowledge, creativity, and ability to implement gamified classroom strategies effectively.

Further, the study by Öztürk and Korkmaz (2020) in Turkey revealed that Gamification contributes significantly more to students ' attitudes towards the social studies course than the traditional method. Educational games contribute substantially more to students' cooperative learning skills than the conventional method. Social studies education, which is reinforced by educational games, contributes significantly more to students' academic achievement in the social studies course than the traditional method. Furthermore, the researcher suggested that

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gamification elements positively influence student success. Teachers are recommended to use the gamification method since the results revealed that Gamification improved students' participation, especially those not interested in the subject.

Furthermore, the study of Tolentino and Roleda (2019) in De La Sale University, Philippines, revealed the effects of gamified instruction on the motivation and achievement of high school students in Science. Both the quantitative and qualitative data collected substantiate the conclusion that gamified instruction brought about a significant increase in both student motivation and achievement in Science. It is recommended that gamified instruction be tried out in more Science classrooms with utmost caution to prevent students from developing wrong attitude towards assessment and Science as well.

Likewise, Monkayo West District Elementary teachers in Davao de Oro, where the researcher is teaching, experienced major problems in increasing learning engagement and achievement. Yet, taking actions to supply solutions has not been established and emphasized. With this scenario, the researcher is motivated to study using games in teaching science to determine if the students will be more engaged in the teaching-learning process.

Literature Review

Gamification as Learning Strategy Utilizing Advance Technology. Kapp et al. (2012) defined Gamification as using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems. The first practice of Gamification came in 1896 when stamps were sold to retailers and then used to reward loyal customers. This was all put into motion by marketers who claimed great success, reinforcing buying behavior and company engagement. While Gamification has been present ever since, it was not until an IT expert, Nick Pelling, coined the official term in 2003 when he started his consulting company that tried to gamify hardware solutions.

However, it was not a common term until 2010 (Werbach & Hunter, 2012). This does not mean that gamification principles were not utilized before 2002, but there was no common name for it before its coinage. Gamification has three main elements (Werbach & Hunter, 2012): points, badges, and leaderboards, but Marczewski (2013) adds two more: rules and levels. A classroom that contains any or all of these elements can be considered a gamified classroom. Points are a numeric value that are increased if a player does something meritorious. Points can motivate people who like to collect things and show off to their peers with their accomplishments. In typical games and gamification systems, points tell how much effort a player has put in. Larger differences in points show which players have exerted more effort and which ones have laxed up.

Additionally, points can determine player ranks or levels. Points also connect player progression in the game with extrinsic rewards; players' points can be converted into real-life rewards, providing a good way to give instant feedback. Clear and frequent feedback is an essential element of good game design. This feedback tells the user they are progressing well in the game. Points can be an external display of progress in the system where fellow players can see each other's scores, and points can be a significant marker of status. While points appear appealing to players, they do not reflect the user's actions to get those points. That is why points should be used with badges (Werbach & Hunter, 2012).

Equally important is the implementation of game levels. A player starts at Level 1 and progresses through increasingly challenging stages. Reaching a new level is known as "leveling up". Leveling up signifies the process and allows for giving positive feedback. Gamification in Science Education Several studies have looked into the influence of Gamification in science education and revealed interesting findings. Iosup and Epema (2014) found that Gamification correlates with an increase in the percentage of passing students and participation in voluntary activities and challenging assignments. A small-scale study (Bjælde, Pedersen, & Sherson, 2014) demonstrated how a gamified teaching setup can effectively support student learning in a quantum mechanics course. Rojas and Fraser (2013) discovered in their study that Gamification could assist educators in delivering complex mutation testing concepts and making the learning experience more enjoyable and fruitful for students. Gamification of learning content is seen as a successful approach to enhance learning in helping students understand the microscopic laboratory processes (Fleischmann & Ariel, 2016).

The research done by Rose (2015) made Life Science students taking an introductory physics course undergo tests using gamified multiple-choice quizzes against a control group. Strong evidence supported the hypothesis that students taking gamified quizzes are more motivated than those taking more traditional quizzes. Another

study (Rose et. al, 2016) examined student attitudes and performance among those using the gamified quizzes and compared to non-gamified control groups within the same course. The study showed similar results: gaming techniques significantly correlate with increased engagement with course material outside of the classroom.

Comparably, Rasool et. al (2014) found Gamification of web-based learning environment particularly helpful in problem-solving. Contrarily, some gamification features appear to elicit opposing outcomes in individual studies. Hanus and Fox (2015) suggest that encouraging competition harms motivation, and Koivisto and Hamari (2014) note that some studies also report increased competition between students as a negative outcome. Social comparison naturally leads to competition, as comparison often makes individuals aware of their lack of skill, status, or position relative to others (Garcia et. al, 2006). Further, competition emerges when social comparison is made on a mutually relevant dimension and made with another of equal status. Competition is often used in the classroom to increase motivation, but research suggests that competition can adversely affect the school. Competition can diminish overall performance, cooperation, and problem-solving, and has a positive relationship with cheating (Orosz et al., 2013).

Additionally, rewarding a task one finds interesting harms motivation to do that task (Deci et al., 2001). A longitudinal study (Hanus & Fox, 2015) found that students in the gamified course showed less motivation, satisfaction, and empowerment over time than those in the non-gamified class. Some assert that the benefits of Gamification are short-lived, even for tedious tasks (Koivisto & Hamari, 2014). Koivisto and Hamari (2014) found that engagement and interest decrease over time for individuals participating in a gamified system. Moreover, it was mentioned in the article, "Gamification: Designing for Motivation in Interactions" (Deterding, 2012), that Elizabeth Lawley noted that although Gamification has good intentions, its reduction of game design to its surface characteristics is detrimental to the successful Gamification of a classroom.

Beardsley (2009) claims that the methods of gaming tests may result in spurious test score gains unrelated to actual gains in student learning. She explained that many educators "teach to the test" with Gamification, making students experts in answering test questions without understanding the concepts and justifying their answers. Thus, although Gamification may benefit, examining potential drawbacks is essential, as it may hamper the motivation educators are trying to cultivate. Moreover, De-Marcos et. al (2016) suggest that more research is needed to reject or support claims that Gamification leads to shallow learning. Several conferences have discussed the potential gains of incorporating Gamification in education in the Philippines since September 2013. However, a substantial amount of published research has not supported or contested the claims of using Gamification in science education.

Tomaro and Mutiarin (2018) emphasized the Philippine government's initiative to enhance education by integrating Information and Communication Technology (ICT) into the basic education curriculum. However, the study also pointed out that technology becomes effective only when properly adopted and utilized. Achieving this requires strong collaboration among teachers and school systems, as well as the use of innovative teaching approaches to ensure meaningful technology integration.

Despite the inclusion of ICT in school curricula, several challenges continue to hinder the quality of technological training among Filipino students. Recent findings highlight the benefits and difficulties of using technology in the classroom. Teachers reported more positive than negative impacts, particularly noting increased student motivation and engagement. However, they also expressed the need for more targeted support and personalized training to confidently and effectively implement technological tools. Furthermore, students themselves were found to need additional training and support to use these tools independently and efficiently. These insights suggest that while technology is promising for enhancing teaching and learning, its success depends on sustained professional development and capacity-building for teachers and students. This underscores the importance of a strategic and well-supported approach to EdTech integration within the Philippine educational system (Carstens et al., 2021).

Ultimately, by embedding digital literacy across the curriculum and adopting innovative teaching strategies, educators can equip learners with the skills and knowledge they need to succeed in the future workforce and contribute meaningfully to society (Jacqueline, 2024).

The study by Brasileño and Bidad (2021) assessed the status and Level of ICT integration in Junior High Schools under the Department of Education in General Santos City for the 2019-2020 school year, using a convergent

parallel mixed-methods approach. Results showed that ICT teachers played key roles in encouraging student participation and enhancing teaching-learning. However, limited computer access, outdated software, and poor internet connectivity hindered effective implementation. Although guided by the curriculum, teachers lacked standardized modules and primarily depended on online resources.

Moreover, the study revealed that gamified learning led to notable improvements in students' academic performance compared to online and traditional education. It resulted in higher success and excellence rates, improved average grades, and better retention. Gamification enhanced student motivation, engagement, and satisfaction, contributing to a more enjoyable and meaningful learning experience. Overall, it proved to be the most effective instructional among the three (Lampropoulos and Sidiropoulos, 2024)

However, the study of Pajarito et al. (2024) emphasized the need for educators to adapt their teaching approaches to meet the educational needs of the 21st century. While Gamification can enhance student interest, engagement, and social interaction, its impact on academic performance is inconsistent. Thus, the results showed no significant difference in pre-test scores between groups, but Gamification led to a decline in student performance, suggesting potential drawbacks when not correctly implemented. The findings highlight that while student-centered approaches like Gamification promote active learning, teacher-centered strategies are essential to ensure instructional clarity and cognitive development. Educators should be trained in balanced, well-informed instructional strategies to maximize effectiveness. Schools and curriculum developers are encouraged to support professional development and design inclusive curricula that promote the integration of diverse teaching methods

Muntean (2011) highlights that learners generally exhibit a positive attitude toward Gamification, as it enhances motivation and provides encouraging feedback throughout the learning process. Similarly, studies by Polat (2014) and Gibson et al. (2015) affirm that game-based activities promote positive learner attitudes and contribute significantly to academic success. Sarı and Altun (2016) further emphasize that games naturally capture attention and engagement, making them a powerful educational tool. Additionally, Jones (2001) notes that game-based activities support communication skills and aid in developing muscle coordination, demonstrating their holistic benefits in education.

As cited by Öztürk and Korkmaz (2020), Prensky (2002) underscores the importance of addressing factors hindering learning and advocating for creating enjoyable learning environments. In this context, incorporating educational games or learning through entertainment can significantly enhance students' learning experiences. According to Bayat et al. (2014), educational games encourage active student participation, particularly among shy learners, positively influencing their interest and attitude toward the subject. This active engagement not only fosters involvement but also provides students with opportunities to express their thoughts and emotions, ultimately enhancing their creativity (Uberman, 1998), cited by Öztürk and Korkmaz (2020),

Several studies have supported the positive impact of game-enriched learning environments. For instance, Karamustafaoğlu and Kaya (2013) found that incorporating games into instruction enhances the learning experience. Similarly, Saracaloğlu and Karademir (2009) demonstrated that games promote academic success and make achieving course objectives more enjoyable and accessible. In educational literature, the term gamification frequently appears alongside the concept of educational games. Gamification refers to using game-like elements in non-game contexts, offering an engaging and enjoyable instructional approach that supports repetition and reinforces learning in a fun and motivating environment (Bayat et al., 2011).

Moreover, one of the most notable advantages of Gamification is its ability to transform abstract concepts into concrete experiences, thereby bridging the gap between theoretical knowledge and practical application (Öztemiz & Önal, 2013). Similarly, Canbay (2012) highlighted that Gamification fosters opportunities for collaboration, healthy competition, and active participation in the learning process. However, like any instructional approach, Gamification also has its limitations. Research indicates that competitive environments may negatively impact slow learners, potentially discouraging participation and performance (Coşkun, 2012). Additionally, when games are not aligned with specific learning objectives, they may fail to support meaningful learning outcomes (Ülküdür, 2016). Considering these factors, gamified learning experiences must be carefully designed—considering student needs, learning goals, and classroom dynamics—to ensure they are both practical and inclusive.

Effects of Gamification on Academic Achievement. It is debatable if Gamification is an ordered system that helps students succeed, a simple pontification process, or complete foolishness. As a result, this study was

undertaken to provide a scientific explanation while demonstrating the gamification effect on achievements among students using the meta-analysis approach, which is based on experimental research that examines the influence of Gamification on student achievement between 2010 and 2016. The complete meta-analysis revealed a standard effect size value of 0.557, which was determined by combining experimental research. This number indicates that Gamification has a relatively beneficial impact on student achievement. It is demonstrated that there is no publication bias when judging the effect's validity (Yıldırım & Şen, 2021).

According to Dikmen (2021), Gamification makes learning more enjoyable and motivates pupils by capturing their attention. In the literature, investigations conducted to establish the influence of Gamification of learning on academic attainment have yielded inconsistent findings. While some research shows that Gamification improves academic achievement, others show no effect. In this direction, the study's goal is to use meta-analysis to investigate the influence of gamified learning on educational attainment. Some moderator analyses were also performed to determine the exact efficiency of Gamification in terms of game types (digital and non-digital games), publishing year, school subjects for which games were employed, class sizes, and student levels.

Moreover, according to the study's findings by Arufe Giráldez et al. (2021), Gamification and various other active approaches are being implemented in university classrooms because of their potential benefits for student learning. Results revealed that the intervention group outperformed the control group regarding final average grade ($p < 0.001$). In voluntary learning activities, students in the intervention group earned more Health Points ($p = 0.006$), Experience Points ($p = 0.005$), a higher Total Score ($p = 0.002$), and a higher Level Achieved. These findings suggest that a multimodal gamified learning environment can improve students' academic achievement.

Aljraiwi (2019) adds that Gamification is one of educational technology's most important current developments. The study aimed to determine the impact of Gamification of web-based learning on academic achievement and creative thinking in primary children, in which a learning environment was created using Gamification of web-based learning. The results demonstrated a statistically significant difference between the means of scores of the experimental and control groups in the post-test academic achievement exam and the Torrance test of creative thinking, favoring the experimental group. This shows that Gamification resulted in high academic accomplishment and creative thinking levels.

On the other hand, Uz Bilgin and Gul (2020) evaluated the influence of Gamification (both online and in-person) on students' views toward group learning environments, their course, group cohesion, and academic performance. Gamification, or game components and tactics in non-gaming settings, can be a novel strategy to improve group cohesion and performance in collaborative learning situations. Although no significant differences were found between the gamified and traditional groups regarding students' attitudes toward group learning environments and the course, the gamified group outperformed the traditional group regarding group cohesion and team member evaluation scores.

In addition, mobile applications (apps) are widely employed as learning and teaching tools in higher education (Pechenkina, 2017). However, academics, lecturers, learning designers, and other education stakeholders continue to be interested in what makes an educational mobile helpful app. This article contributes to this goal by presenting the results of a study that looked at whether using a gamified mobile learning app improved students' academic performance and involvement in the subject. The app in question was designed expressly to increase student engagement in lecture content by distributing multiple-choice tests straight to students' mobile devices following the lecture and before the tutorial.

Furthermore, Korkmaz and Öztürk (2020) conducted a semi-experimental study to assess how educational games affect students' academic progress, attitudes towards the course, and cooperative learning skills. Gamified Social Studies Education greatly improves students' perceptions regarding social studies courses compared to traditional methods. However, it was discovered that it made no meaningful contribution to the benefit factor. Social studies education, enhanced by educational games, considerably improves students' cooperative learning skills compared to the traditional way. Social studies education enhanced by educational games considerably improves students' academic progress in social studies courses compared to the traditional technique.

Despite the growing interest in Gamification in learning contexts, challenge-based gamification applications have rarely been tested in education. In response to this need, we created Educhall, a web-based tool based on gamification concepts. Drawing on self-determination theory and flow theory, the current study seeks to

investigate how incorporating this challenge-based gamified software into students' learning process can boost students' motivation, flow, and academic performance through the produced competition and challenge. According to self-determination theory, statistical evidence suggests that a challenge-based gamified learning strategy improves academic achievement and motivation. Among the motivational subfactors, the experimental group reported significantly better confidence and pleasure with the course (Kaya & Ercag, 2023).

In contrast to conventional lecture-based teaching techniques, Gamification is defined as the incorporation of game design features into non-gaming contexts and has grown in favor in classrooms because it has the potential to boost student engagement and enjoyment. Although most students have positive opinions about Gamification, its effect on academic performance is still up for dispute. According to Zeng et al. (2024) gamification somewhat impacts students' academic achievement. Additionally, the results of several moderator studies offer insightful information on the choice and use of game design components and factors unique to distinct educational stages.

The significant increase in research has linked gamified learning to increased motivation, better performance, and more engagement. Personalized learning analytics dashboards can improve student engagement like Gamification. Pupils who had access to the dashboard reported largely favorable experiences with it, and on average, their final grades were 13% higher than those of their peers who did not have dashboard access. With minimal time and expense, gamified dashboards could significantly improve student performance in large STEM lecture courses (Alam et.al, 2023).

Most students in a class participated more when Cronk (2012) used game principles to create a reward-based system as an incentive for them. Similarly, Denny (2018) found that using an online badge-based achievement system positively impacted students' participation in activities in a large-scale controlled trial. Regarding the design of gamification mechanics and dynamics, the benefits of gamification implementations have also been linked to students' academic success. Including game features in a self-testing platform may improve exam achievement by increasing engagement. They found that Gamification can affect academic performance in learning contexts and may cause women to make social comparisons.

Similarly, by examining the effects of both intrinsic and extrinsic incentives, Buckley and Doyle (2016) investigated how Gamification affected participation and performance. More than 100 undergraduate students participated in an online gamified learning program, and using pre- and post-intervention surveys, they found that gamification apps improved learning.

Gamification has been shown to boost learning motivation and result in positive learning behaviors or results. A Malaysian study examined whether academic attainment levels impacted the impacts of gamified learning on 118 students. Previous research has demonstrated that high, middle, and low performers do not all respond identically to Gamification. To investigate further, the current study assessed the effect of Gamification on motivational characteristics such as sense of competence, intrinsic motivation, valuation, and engagement among different levels of achievers. The study found that academic attainment levels attenuated Gamification's effect on valuation (Kam & Umar, 2022).

Effects of Gamification to Students' Engagement. Engagement refers to a student's actual conduct and attitude toward academic work. The use of gamification strategies, in contrast, according to Morgan, is what increases students' engagement in group projects and teacher-student interactions According to author analyses of the research findings, the researchers found that students who participated in gamified learning had higher levels of engagement, were more productive learners, and actively engaged with the content (Kapp, 2012).

Student engagement is widely recognized as an important factor influencing student accomplishment. Students' prior learning (readiness), desire for learning, and how input is presented are all elements that influence their ability to learn. Diverse learning styles among students influence how they engage in the activities led by educators. Sustaining students' attention and participation is a challenge that puts the educator in a conundrum. Gamification is the application of game design principles in non-game contexts to engage people and drive desirable behaviors. According to Parveen and Ramzam (2024), digital technologies can transform education and enhance learning opportunities across the globe. When used effectively, these tools enable educators to design interactive and customized learning experiences that address the unique needs of each learner.

While some students focus on the overall effectiveness of Gamification in education, they often overlook the specific impact of individual game elements and how varying degrees of gamification influence. However, evidence from Smiderle et al. (2020) provides deeper insight into these nuances. Their study revealed that Gamification positively influenced students with certain personality traits, particularly those with low agreeableness, low openness, and introverted tendencies, by significantly improving their accuracy and engagement during the second half of the course. Notably, the study found that introverted students using the gamified system were more engaged than extroverted ones. Extroverts showed a lower interest in ranking elements, which proved more motivating for introverts.

These findings support the broader claim that Gamification can raise students' involvement and motivation in learning, leading to better learning outcomes. Surendeleg et al. (2014) emphasize that Gamification is reshaping educational expectations and driving a shift in learning design paradigms. Thus, understanding the specific elements influencing different learner types is crucial in harnessing Gamification's full potential in modern education.

In summary, Gamification can be very useful when we contribute by raising student involvement in the learning process. This student's motivation levels are raised through learning. The total improved learning quality and outcomes are the result. Since the achievement of Gamification is changing learning expectations in the general market. We must prepare for the design paradigm shift that will accompany the sphere. We should not disregard the new developments in educational technology (Surendeleg et al., 2014).

Numerous studies examine the factors that predict student engagement in the literature, such as those that discovered that a wide range of factors, such as educational institution culture and policies, student opinions, student individual competence, teacher or teacher qualities, and educational activities, impact student engagement. Facilitating learning activities that directly impact students' learning is one of the teacher's fundamental responsibilities (Hanaysha et al., 2023). It is a challenge for teachers to plan appropriate activities carefully. Since "serious" games are a powerful tool for engaging students, using them in education has great potential. As a result, many educators have considered including games in their teaching methods. Serious games, however, are typically complicated and expensive to create. A system may have equipment, software, and frequently related support or maintenance costs (Videnovik et al. 2023). Gamification is a recent trend described as applying game dynamics and mechanics in non-game contexts since 2010. It seeks to enhance students' experiences, engage, motivate, and foster a playful environment among students (Reiners & Wood, 2014; Schönbohm & Urban, 2014).

According to gamification research, it effectively motivates and entices people to take desired actions and change their behavior (Brigham, 2015). Gamification is becoming increasingly popular in education, and many teachers have tried to incorporate its idea into lesson plans. Further research has demonstrated the potential of Gamification in teaching and learning. However, more research is still required to document the effects of implementing Gamification in educational settings (Borges et. al, 2014).

A few notable examples of Gamification in educational activities have been used. Increasing students' interest in learning was one of the goals of those implementations. A good example is the study of Ibanez et al. (2014). They assessed how gamified learning activities affected students' engagement. They created the gamified learning platform by fusing game elements (such as points, leaderboards, and badges) with this platform, which they then used with students. Their study suggests a gamified learning environment can stimulate students to learn new things.

The application of game mechanics to education is known as Gamification. The main goal is to encourage students to participate in the learning process. The study conducted by Poondej and Lerdpornkulrat (2016) adds to the body of knowledge in the field of education by illuminating how using gamification techniques can boost students' interest in their studies. It further suggests that gamified learning activities boost students' interest in their studies. Their research findings imply that gamified learning activities ought to be taken seriously as a method of increasing student engagement. In addition, since points, badges, and leaderboards are the main variables influencing students' behavior, they ought to be incorporated into the current framework of engaged learning.

On the other hand, since educational games are group activities, they are believed to foster the students' ability to work cooperatively. Cooperative learning can be defined as students achieving the common objectives by helping each other in small groups to learn (Johnson & Johnson, 2018). In the literature, it is possible to encounter evidence suggesting that Gamification influences numerous psychometric variables such as academic success, attitude, and motivation (Bayat et. al, 2014). However, the literature does not include enough evidence of the effectiveness of games and Gamification, especially in social studies courses. On the other hand, this study put forward the effect of the gamification method on the attitude towards the course, cooperation, and over success. Within this framework, it is believed that the present study can contribute to the literature.

Engagement links to profound and significant learning in which teachers fulfill students' expectations. According to Lynch, Patten, and Hennessy (2013), the breadth of participation includes attending class, participating in discussions, listening to teachers or fellow students, completing assignments, and abiding by the rules. The concept of Gamification originates from the belief that certain conventional classroom activities are intrinsically dull and fail to capture students' interest. Games have become a part of the life of today's pupils, who are growing up with interactive media and video games. Kiryakova, Angelova, and Yordanova (2014) define Gamification as a powerful method to positively influence students' learning behavior and mindset. It boosts their motivation and participation, leading to a more engaging classroom experience. This approach yields twofold benefits—it enhances students' academic outcomes and understanding of the material while also supporting the development of a more efficient and productive learning environment.

Researchers largely agree on the relationship between engagement and academic accomplishment, and some have suggested that gamification applications have some potential for increasing engagement and achievement. However, while Gamification significantly enhances student engagement, learning outcomes, and attitudes towards the subject, its effectiveness depends on thoughtful design, alignment with learning goals, teacher training, and access to proper technology (Maryana, Halim & Rahmi, 2024). Hence, Rivera and Garden (2021) suggest that Gamification can be systematically and scientifically applied to enhance student engagement and improve learning outcomes by aligning specific game elements with targeted educational objectives across cognitive, affective, and psychomotor domains. It emphasizes that effective Gamification requires understanding the psychological aspects of engagement and carefully selecting game features that correspond to desired learning goals.

Moreover, Gamification, or the application of game features to non-game settings, has gained popularity in education to increase motivation and/or learning results. Although it is widely acknowledged that Gamification improves these dimensions of participation in business and education, there is inconclusive data. The preliminary Framework should, for the first time, allow practitioners to systematically build gamified learning experiences by purposefully selecting game elements based on the desired student experience and outcome of involvement. Although we focus on learning outcomes, the Framework can potentially improve other factors such as student happiness and wellness across various settings and disciplines (Rivera & Garden, 2021).

According to Aleksic-Maslac, Rašić, and Vranesic (2018), the rapid advancement of technology holds great potential for enhancing the educational process. As a modern and engaging instructional strategy, Gamification enables students to learn more effectively by incorporating elements of entertainment and competition, which sustains their motivation and attention during class. The core objective of this approach is to boost student engagement, foster healthy competition, and create a more enjoyable learning environment. Findings from the study indicated a positive attitude toward the use of Gamification in lectures, supporting its broader implementation across various courses. To reinforce this favorable trend at ZSEM, the researchers analyzed student participation in Kahoot activities for the Information and Communication Technologies course. They compared the data with students' final grades, revealing a promising correlation.

Furthermore, despite the unprecedented popularity of using innovative gaming concepts in education to promote active learning, engage people, and solve motivational problems, an emerging body of research suggests that Gamification is ineffective in increasing student engagement or learning outcomes. A question board is devised and implemented to allow students to ask and answer questions on their taught modules, and academic staff can also contribute. Data is collected to study the long-term impact of Gamification. The findings indicate that Gamification can encourage users to adopt educational systems while increasing their interaction and engagement (Bouchrika et al., 2021).

According to the evidence, gamified learning interventions can boost student engagement and improve learning outcomes. Buckley and Boyle (2016) investigated the effects of intrinsic and extrinsic motivation on the participation and performance of more than 100 undergraduate students in an online gamified learning intervention. Gamified learning approaches have been shown to improve student learning outcomes. Third, our findings reveal that, while gamified interventions have a good influence on student involvement, it varies depending on whether the student is intrinsically or extrinsically motivated. These findings will be helpful in teaching and learning practitioners working in various educational situations and at all levels of education who want to improve student engagement and learning.

Consequently, Poondej and Lerdpornkulrat (2016) investigate the influence of implementing gamification strategies to promote student engagement in learning. The quasi-experimental nonequivalent-control group design was applied to 577 undergraduate students from six classes. Students in three classes were assigned to the treatment group, while students in the remaining classes were assigned to the control group. The treatment group took a gamification-themed course, whereas the control group took a standard course. The results showed that student engagement in learning was much higher in the treatment group than in the control group.

According to Khaleel et al. (2020), student learning engagement increases by implementing gamification techniques, particularly in tough disciplines such as programming language classes. As a result, students prefer to continue until they reach the goal of the gamification application. On the other hand, according to student opinion, all students check their results online in real time, increasing student engagement and motivation to learn. Also included is the perception of students' acceptance of all game components employed in the gamification website and the percentage of students who accept game elements in interaction.

In Thailand, 104 undergraduate students were surveyed to determine their Level of satisfaction and participation with an e-learning course. Furthermore, student interaction data from Moodle was used to see whether there were any differences in the frequency of online contact with the course between students who fared above average and those who were below average. The data revealed that students were very pleased with the gamification technologies in Moodle and were actively participating in the gamified e-learning course. The scientists discovered a substantial difference in the frequency of online involvement with the course between the groups that performed above and below average (Poondej & Lerdpornkulrat, 2020).

According to Smiderle et.al (2020), Gamification of education, like games, can increase student engagement and help them develop their specific abilities and learn more effectively. Scientific investigations, on the other hand, have found that user preferences have negative consequences. The relationship between the user's traits, executed actions, and game elements remains unanswered. More precisely, research sought to determine if different gamification aspects influence students' learning, programming attitudes (trial and error behavior while submitting programming tasks for correction), and engagement based on their personality factors. The findings revealed that Gamification affects users differently depending on their personality attributes. Our findings show that Gamification is effective, depends on users' features.

Theoretical Framework

This quasi-experimental study was anchored on the Landers' Theory of Gamified Learning (2014), which explains that Gamification, or the application of game elements in non-game contexts, can enhance learning and engagement. This means that Gamification in facilitating learning could increase the students' interest in engaging with the discussion and activities set by the teacher. This theory is limited in not considering the social, cognitive, and affective aspects of student involvement crucial to higher education and the broader repercussions of engagement, such as satisfaction or well-being.

Statement of the Problem

This quasi-experimental research aimed to determine the impact of the use of Gamification on the engagement of the students and their academic achievement of the Grade 6 students who are enrolled in Moria Elementary School, Monkayo West District, Division of Davao de Oro, for school year 2024-2025. Specifically, it sought to answer the following questions:

1. What is the pretest score of students in science?
2. What is the Level of engagement before the intervention?
3. What is the post-test score of students in science?
4. What is the Level of engagement after the intervention?

5. Is there a significant difference in the pretest and post-test scores of students in science before and after the intervention?
6. Is there a significant difference in the Level of engagement of students before and after the intervention?

Null Hypotheses

The hypotheses below was tested at 0.05 level of significance:
There is no significant difference on the Level of academic achievement before and after the intervention.
There is no significant difference on the Level of students' engagement before and after the intervention.

Scope and Delimitation of the study

This quasi-experimental study focused on the Grade 6 students enrolled in Moria Elementary School, Monkayo West District division of Davao de Oro, for the school year 2024-2025. All students in this Grade 6 section were part of the study. The use of a pretest and post-test were administered to these students. Using Gamification as the intervention, the students' engagement and academic achievement were measured through a pretest and post-test. The students' academic achievement was measured through their score in Science, for which the questions were prepared by the researcher and validated by identified experts. Using the Student Engagement Questionnaire, the Level of the students' engagement was assessed.

MATERIALS AND METHODS

Locale

The research was conducted at Moria Elementary School, Banlag Monkayo, Davao de Oro. Monkayo, officially the Municipality of Monkayo, is a 1st class municipality in the province of Davao de Oro, Philippines. According to the 2020 census, it has a population of 93,937, making it the most populous town in the province. The school offers complete Kindergarten and Elementary Basic Education in accordance to the K-12 Basic Education Curriculum pursuant to the guidelines and implementations of Republic Act 10533. The school has a population of 100 pupils for the school year 2024-2025. The school has five teachers handling classes, specifically one kinder teacher, one grade 1 teacher, one grade 2 teacher, one teacher handling multigrade classes in Grades 3 and 4, one grade 5 teacher, and one grade 6 teacher who is Teacher-In-Charge. It occupies five (5) classrooms, a conventional-type building constructed by the Department of Education.

Design

This study utilized the Quasi-Experimental one-group pretest-posttest research design. The research design is often described as a nonrandomized, pre-post intervention study. This design is frequently used when conducting a randomized controlled trial, which is not logically feasible or ethical (Harris et al., 2006). The design is appropriate for this study, where the subjects are naturally collected in a classroom setting. This design investigates whether there is a significant difference when an intervention technique is applied to a specific group of students at Moria Elementary School in Monkayo West District in the Division of Davao de Oro. After the administration of the gamification approach in teaching Science, a post-test will be administered.

Subjects of the study

The subjects of this quasi-experimental one-group pretest-posttest study were the 20 Grade 6 students who were officially enrolled at Moria Elementary School in Monkayo West District, Division of Davao de Oro during the school year 2024-2025.

Research Instrument

In this study, the researcher used a researcher-made test questionnaire for pretest and post-test in Science, as well as an adapted instrument with student engagement. This adapted instrument is from "The Student Engagement in Schools Questionnaire (SESQ) and the Teacher Engagement Report Form-New (TERF-N): Examining the Preliminary Evidence" of Hart et.al (2011). This is composed of three indicators: Affective Engagement, Behavioral Engagement, and Cognitive Engagement. For each item, the respondents rated themselves the Level of engagement using the four-point Likert Scale anchored at (4) Strongly Agree, (3) Agree, (2) Disagree and (1) Strongly Disagree. Before the study was conducted, the validated quantitative instruments were pilot-tested on students who were not included as the subjects of this study. After the pilot testing of the instrument, it was analyzed to determine its reliability index. The result of the reliability index on the instrument was 0.87, which was described as good.

Validation of Instrument

Panels of external and internal validators were assigned to check the instrument before administering it to the respondents. The pretest and post-test tool and an adapted instrument, with student engagement, were tested on a group of 10 students not included in the study. Since there was only a limited number of grade students in Moria Elementary School, the researcher had her pilot test of the instrument on students in the nearby elementary school for validation. Should any problems arise, the researcher reviewed it and revised the instrument. In order to have a guide for the whole duration of the study, the researcher used the course outline and lesson plans were written. The pretest-posttest was presented with a Table of Specifications (TOS) to ensure proper distribution of the test items.

Research Procedure

Before conducting the study, the researcher sought permission from the ethics committee for ethics review of this study. The researcher requested an endorsement letter from the graduate school, which was submitted to the Schools Division Superintendent with a personal letter from the researcher. Likewise, the researcher asked permission from the school head of Moria Elementary School to conduct a study where the researcher was teaching. The selection of the subjects was done purposively. At the beginning of the study, a pre-test and adapted instrument on student engagement were conducted with Grade 6 students selected as the study subjects. With the gamification approach in teaching Integrated Science for a month, a post-test was administered to the study subjects. The pre-test and post-test results were computed to determine if there was a difference between the mean gain scores of the students' pretest and post-test, and if there was a significant difference in the students' engagement level. During the teaching-learning process, regular assessment strategies were administered to the group, and the average scores they garnered were also used as additional data for comparison.

Statistical Tool

The following statistical tools were used to ensure the validity of the analysis and interpretations of the findings: A paired t-test was used to compare the groups' post-test and retention test scores and to test the significant difference between the pre-test and post-test results of students.

Ethical Considerations

According to Bhashin (2020), ethical consideration presents the beliefs and concepts that should be maintained throughout the study. With this, the researcher ensured that the moral standards are strictly followed throughout the study, addressing the areas that follow: The researcher ensured that the findings were shared in a way that directly benefits both students and the school involved, making them accessible to educators, policymakers, and other stakeholders. The study aimed to determine the impact of Gamification on the students' engagement and science achievement. Also, to guide teachers in conceptualizing teaching strategies for the learners to develop their effective styles in teaching science subjects, the students would help them evaluate their learning engagement and its effect on their academic achievement. The result of the study was shared with the school and published in the online journal so that other related research studies can use it as a reference.

The researcher distributed Informed Consent Forms (ICF) to the identified participants. The researcher disclosed essential information, such as the researcher's name and affiliation. It was also emphasized that participation is voluntary, and participants can withdraw anytime they feel discomfort. The purpose of the study was explained, along with the procedures carried out for the study. The researcher also ensured the participants' well-being and promptly addressed their questions about the research. By committing to this principle, the researcher prioritized the participants' safety and well-being, upholding ethical standards throughout the study. The researcher explained the entire process of the study, including the pretest-posttest, and the use of a gamification approach in teaching science to enhance student engagement and science achievement in the classroom setting. However, the researcher ensured that they were not forced to participate in the study but emphasized that the participation was voluntary and guaranteed complete understanding of their rights and the nature of the study. On the other hand, any decision to withdraw from participation did not affect their academic standing or relationship with their teacher.

The researcher explained the benefits of the participant's participation in the study. The researcher established a supportive and comfortable classroom environment for the researchers and set schedules during the most convenient time and course outline of the subject. By adhering to the principle of risk, benefits, and safety, the researcher can guarantee the safety of participants while ensuring that the study has a beneficial impact on student engagement and science achievement. The researcher made sure that the participant's personal information,

identity, and data gathered were kept confidential and secured to ensure that the Data Privacy Act of 2012 is being followed. To ensure the confidentiality of the research consent records immediately after collection, they were stored in a secure locked location, contact details were written on a separate form and kept secure immediately after completion. The results were manually recorded and secured in a locked storage area, and the questionnaire with answers was stored securely after completion. For the backup copies, the researcher keeps them on her laptop. The researcher will also provide a PIN or password so that no one can open it, and the files will be transferred to a Google Drive, which only the researcher can access. The data will be destroyed after the conduct of the study. The researchers guarantee the suitability of the study participants. They were treated equally and fairly regardless of their academic capabilities, gender, social and economic status, or ethnicity. The research participants were chosen based on the inclusion criteria: Grade 6 students officially enrolled at Moria Elementary School in Monkayo West District, Division of Davao de Oro, during the school year 2024-2025. The researcher assured that there were no biases or discrimination in the participants. After the study, the participants can still maintain a good name due to the contributions they made to the study. To address this aspect, the researcher practices an open and transparent disclosure of all relevant information about the study. The research participants were also given a copy of the transcript of their answers to verify the reliability and validity of the data gathered. The researcher provided comprehensive details about the research process. She transparently shared the result to enable others to confirm the result of the research, including the respondents and relevant stakeholders, on how the results were used to enhance student engagement and science achievement using a gamification approach in teaching science. On the other hand, the researcher must maintain open communication with the ACN Ethics Committee for the necessary updates and ensure compliance with ethical standards throughout the study. The researcher has enough experience conducting a study during college and graduate school.

RESULTS AND DISCUSSION

Level of the Educational Leadership Style of Academic Leaders

This section presents the results addressing the first statement of the problem, which examines the level of educational leadership style of academic leaders in terms of transformational, transactional, and instructional leadership, as well as the retention rate of instructors in the institution.

Achievement and Engagement Level of the Student's Pretest Scores in Science

This section presents the results of the first statement of the problem that examines the achievement level and engagement level of the students' pretest scores in Science. Table 2 and Table 3 present the pre-test results in science performance and engagement of the Grade 6 students, respectively.

Table 2. Pretest Scores in Science Achievement

Learning Area	No. of Students	Mean	Class Proficiency	Achievement Level
Science	20	10.5	35	Average Mastery

The pre-test performance data for Grade 6 students in Science indicates that the class, comprising 20 students, achieved a mean score of 10.5. Based on the Department Order No. 160, series of 2012 on the Mastery and Achievement Level, the class proficiency rate stands at 35%, corresponding to an Average achievement level. This suggests that, on average, students have a moderate understanding of the Science concepts assessed but may lack deeper comprehension and application skills.

Table 3. Pretest Scores in Students Engagement

Type of Engagement	Mean	Engagement Level
Affective	**3.45**	**Satisfactory**
Behavioral	**3.4**	**Satisfactory**
Cognitive	**3.46**	**Satisfactory**
Overall Mean	**3.435**	**Satisfactory**

The data shown in Table 3 illustrate the pre-test engagement levels of Grade 6 students across three domains: affective, behavioral, and cognitive. The cognitive domain has the highest mean score at 3.46, indicating that students show the greatest engagement in mental and intellectual activities. The affective domain follows closely with a score of 3.45, suggesting that students have a positive emotional connection toward learning activities. The behavioral domain has the lowest score at 3.40, indicating relatively lower participation in observable learning behaviors such as class participation and task completion. The overall mean engagement score is 3.435, which

falls within the satisfactory Level. This suggests that while students are generally engaged, there is room for improvement, particularly in behavioral engagement.

Achievement and Engagement Level of the Student's Post-test Scores in Science

This section presents the results of the problem's second statement, which examines the achievement level and engagement level of the students' pre-test scores in science. Tables 4 and 5 present the results of the post-test science performance and engagement of the Grade 6 students, respectively.

Table 4. Post-test Scores in Science Achievement

Learning Area	No. of Students	Mean	Class Proficiency	Achievement Level
Science	20	17.5	58.3	Average Mastery

The data in Table 4 shows the post-test in the achievement of Grade 6 students in science. Out of 20 students, the class achieved a mean score of 17.5, corresponding to a class proficiency level of 58.3%. According to the same guidelines and standard DepEd and National Education Testing and Research Center, this performance level still falls within the average mastery category. However, the result indicates a positive improvement in class proficiency, increasing from 35% in the pretest to 58.3% in the post-test. Thus, the findings further suggest that Gamification can substantially support the development of foundational understanding and the application of scientific concepts among Grade 6 students.

Table 5. Post-test Scores in Students Engagement

Type of Engagement	Mean	Engagement Level
Affective	3.67	Very Satisfactory
Behavioral	3.61	Very Satisfactory
Cognitive	3.68	Very Satisfactory
Overall Mean	**3.655**	**Very Satisfactory**

Table 5 shows the post-test engagement levels of Grade 6 students after the implementation of Gamification in teaching science. The data indicate that the overall mean engagement score is 3.655, corresponding to a very satisfactory engagement level. Among the three types of engagement, cognitive engagement shows the highest mean score at 3.68. This suggests that the gamified approach effectively stimulated students' interest in understanding and processing scientific concepts. Affective engagement follows closely with a mean score of 3.67, indicating that students developed positive feelings and attitudes towards learning science through the gamified activities. While slightly lower at 3.61, behavioral engagement still reflects a high level of participation and involvement in science-related tasks. These results imply that Gamification significantly enhanced the overall engagement of Grade 6 students in science, particularly by fostering deeper cognitive involvement and positive emotional responses.

Difference of means in Pre-test and Post-test Performances of the Students

Table 5. Difference of means in Pretest and Post-test In Science Performance

	Mean	p-value	t-value	Remarks
Pre-test	10.5	0.001	11.293	Significant
Post-test	17.5			

The results presented in Table 5 show a comparison of the mean scores of Grade 6 students in the pre-test and post-test performances. The mean score increased from 10.5 in the pre-test to 17.5 in the post-test. The p-value of 0.001 is less than the commonly used significance level of 0.05, indicating that the difference in mean scores is statistically significant. Additionally, the t-value of 11.293 supports the presence of a significant difference between the two sets of scores. This result suggests that there has been a significant improvement in the achievement of Grade 6 students from the pre-test to the post-test. The Gamification as an instructional strategy applied between the two tests positively affects the students' performance in teaching science.

Table 6 presents the test of difference of means in Pretest and Post-test in student engagement of Grade 6 students.

Table 6. Difference of means in Pretest and Post-test in Student Engagement

	Mean	p-value	t-value	Remarks
Pre-test	3.435	0.001	5.482	Significant
Post-test	3.655			

The results presented in Table 6 show the comparison of Grade 6 students' engagement levels before and after the intervention, using a t-test for paired samples. The mean engagement score increased from 3.435 in the pre-test to 3.655 in the post-test. The p-value of 0.001 indicates that this difference is statistically significant at the 0.05 level. The computed t-value of 5.482 further supports this conclusion. Since the p-value is less than 0.05, it can be inferred that the increase in engagement scores from pre-test to post-test is not due to chance. Therefore, the Gamification as an intervention implemented between the pre-test and post-test likely has a significant positive effect on the engagement of the Grade 6 students.

Achievement and engagement level of the student's pre-test scores in science. Based on DepEd guidelines and standards, the achievement level of the students in the pretest is determined as average mastery, while the engagement level is described as satisfactory. The result implies that the Level of achievement and engagement in science highlights the need for targeted instructional interventions to improve student performance and engagement among Grade 6 students. Teachers should reinforce fundamental concepts and address learning constraints in teaching science in the elementary grades. Thus, incorporating hands-on activities, experimentation, assignments, and projects involving basic science can help students better learn and understand complex concepts in science. This approach will support students in advancing toward higher achievement levels, ensuring they are well-prepared for more complex scientific topics in future lessons (Tanwar, 2022). Hence, Michael et al (2023) posited that teachers must understand the importance of active learning to enhance student achievement in science. This requires targeted training that deepens their knowledge of active learning principles and supports their practical application in the classroom. By critically analyzing classroom practices and addressing challenges in implementation, teachers can refine strategies that promote active learning, ultimately leading to improved student outcomes in science. A study revealed that engaging students in active and hands-on activities can significantly boost achievement in science, proving to be more effective and efficient than traditional methods in enhancing academic performance. Similarly, it can help increase motivation, attitudes, and productivity through active learning, leading to improved grades and greater passion for education (Nurbavliyev, Kaymak & Sydykov, 2022).

Achievement and engagement level of the student's post-test scores in science. Based on the DepEd guidelines and standards, the achievement level of the students in the post-test is still determined as Average Mastery. In contrast, the engagement level is described as very satisfactory. The results imply that Gamification can be an effective strategy for improving science performance among Grade 6 students. According to Arufe Giráldez et al. (2021), gamification and other active approaches are increasingly used in classrooms due to their potential benefits for student learning. The results indicate a gamified learning environment can enhance students' academic achievement. To further increase achievement levels and support students in reaching full mastery, teachers may consider refining gamification techniques, such as incorporating adaptive challenges, providing immediate feedback, and promoting collaborative problem-solving. Continuous use and enhancement of gamified approaches could lead to higher proficiency rates and a deeper understanding of scientific concepts among learners, and it will also develop the creative skills among students (Aljraiwi, 2019). A longitudinal study conducted by Lampropoulos and Sidiropoulos (2024) to compare online learning, traditional learning, and gamified learning revealed that Gamification significantly enhances students' academic performance, engagement, and retention compared to conventional and online learning. By meeting students' psychological needs for autonomy, competence, and relatedness, gamified learning creates a more enjoyable and motivating educational experience. Another research study highlights the effectiveness of Gamification in enhancing student learning outcomes. Gamification proved especially effective for primary school students and in science education, suggesting it works best with younger learners and concept-heavy subjects. The most effective gamification designs combined mechanics, dynamics, and aesthetics, engaging students both intellectually and emotionally (Li et al., 2023). Moreover, Sappaile (2024) concluded that Gamification is a practical and innovative educational approach that significantly enhances student motivation, engagement, and learning outcomes. The integration of game elements such as points, rewards, challenges, achievements, competition, and collaboration creates a more engaging and enjoyable learning environment.

Difference of means in pre-test and post-test Performances of the Grade 6 Students. Students' Level of achievement in the pre-test had a mean of 10.5 and 17.5 as a mean for the post-test. The results gave a p-value of 0.001 and a t-value of 11.293, which means that the null hypothesis was rejected and accept the alternate hypothesis that there was a significant difference between the respondents' pre-test and post-test scores. These findings suggest that the intervention effectively enhanced students' academic performance. The significant improvement in test scores highlights the potential of Gamification to support student learning and achievement in educational settings by making learning more enjoyable. It motivates pupils by capturing their attention (Dikmen, 2021). Moreover, a meta-analysis conducted by Yildirim and Sen (2019) revealed that the use of gamified activities can positively impact student achievement, contributing a 7.2% increase in academic performance. This finding is based on 45 experimental studies involving 3,487 students from various countries. Moreover, Mediavilla et al. (2024) described Gamification as a valuable tool in the teaching-learning process, not only due to its positive effects on student motivation and engagement but also because it fosters collaboration, enhances knowledge retention, and develops critical problem-solving and decision-making skills. By promoting active learning, Gamification encourages students to engage directly with tasks and challenges related to course content, thereby consolidating their understanding. The repetitive nature of educational games reinforces comprehension and memory, while immediate feedback enables students to correct errors and adjust their learning strategies in real time. Active participation, practice, and timely feedback improve retention and provide a more meaningful, practical educational experience. Furthermore, findings of the study conducted by Alidas et. al. (2023) about the teachers' reflections on their experiences with game utilization reveal that they assess student performance using specific criteria and rubrics. Student outcomes and feedback serve as indicators of the effectiveness of Gamification in the classroom. Additionally, the teachers proposed several strategies to enhance Gamification, such as rewarding winning and losing teams, distributing prizes consistently, and incorporating diverse activities.

Difference of means in Pre-test and Post-test Engagement of the Grade 6 Students. There was a significant difference between the respondents' pre-test and post-test scores. Thus, the statistically significant increase in mean engagement scores suggests that the strategies or activities introduced effectively enhanced student engagement in teaching science. Sappaile (2024) argued that Gamification is a practical and innovative educational approach that enhances student motivation, engagement, and learning outcomes by incorporating game elements such as points, rewards, challenges, and collaboration. Also, Kapp (2012) predicted that those students who participated in gamified learning activities are more likely to be active and engaged with the learning content.

A similar study revealed that Gamification is useful in science education learning and development as it contributes to students' social interaction, engagement, motivation, and positive attitudes towards science courses. This is true for students in various levels of academia in science courses (Alahmari et. al., 2023). Another study revealed that learners were more motivated toward learning science when engaging with an adaptive gamification environment. Students strongly preferred this approach, with no participants expressing disagreement or strong disagreement. Additionally, the majority reported increased interest in learning through this method, with only a small percentage (5%) expressing disagreement. These findings indicate that incorporating an adaptive gamification environment effectively enhances students' motivation and interest in learning science (Zourmpakis et al., 2023). Thus, Poondej and Lerdpornkulrat (2016) asserted that gamified learning activities significantly enhance student engagement, suggesting that such activities should be considered a serious strategy for increasing student participation. Furthermore, Gamification positively influences students' learning outcomes, including their achievements, engagement, and motivation throughout the learning process. Based on these findings, Mohammed, Fatemah, and Hassan (2024) concluded that incorporating game-like elements into teaching and learning is highly beneficial for students and should be widely adopted by educators.

Conclusion and Recommendations

Given the foregoing findings, the achievement level of the Grade 6 students in science during the pre-test was at the average mastery level. In contrast, the engagement level was described as Satisfactory. After implementing Gamification as an instructional strategy, although it fell under the average Level of achievement, the pretest and post-test results increased by 23.3% and the engagement level increased to Very Satisfactory. Hence, there is a significant difference between the pre-test and post-test scores, which indicates that the students' academic performance in Science has substantially improved among Grade 6 students of Moria Elementary School. The difference in performance is statistically significant. Similarly, the engagement level showed a significant improvement, suggesting that the gamification strategy effectively enhanced student engagement. In addition, the positive increase in both performance and engagement levels clearly indicates that the use of Gamification

significantly contributes to the development of students' understanding and application of scientific concepts. The findings imply that incorporating gamified activities into science instruction, particularly in elementary, can make learning more enjoyable and engaging for students, thereby promoting better academic achievements.

Based on the foregoing findings and conclusions, the following recommendations are proposed:

1. Teachers are encouraged to continuously integrate gamification techniques into Science instruction, as these have proven effective in improving academic performance and student engagement. Activities such as educational games, interactive quizzes, and reward systems should be consistently applied to maintain students' interest and enhance mastery of scientific concepts.

2. To further improve students' achievement and engagement levels, teachers should explore and incorporate more advanced gamification elements, including adaptive challenges tailored to students' abilities, immediate feedback mechanisms, and collaborative tasks that foster teamwork and critical thinking.

3. School Heads should organize training sessions and workshops to equip teachers with the necessary skills and knowledge to effectively implement gamification strategies in the teaching-learning process. This will ensure educators are well-prepared to design engaging and meaningful learning experiences.

4. Given the positive outcomes in Science, it is recommended that gamification strategies be applied to other subject areas where student engagement and performance need improvement. This will provide a more holistic learning experience and promote academic growth across the curriculum.

5. Future studies should explore the long-term effects of Gamification on student performance and engagement. Researchers may also investigate the impact of different gamified activities to determine which are most effective in enhancing learning outcomes. Moreover, Researchers are encouraged to adopt a mixed-method approach that integrates classroom observations alongside quantitative data analysis. This comprehensive approach will yield a deeper understanding of how Gamification impacts students' cognitive processes and behavioral engagement, providing richer insights into its effectiveness in enhancing learning outcomes.

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