

# PERCEPTION OF GAME-BASED LEARNING AND ITS IMPACT ON MOTIVATION AND ENGAGEMENT AMONG RADIOLOGIC TECHNOLOGY STUDENTS



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# Perception of Game-Based Learning and its Impact on Motivation and Engagement among Radiologic Technology Students

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## Abstract

The study investigates the perception of game-based learning (GBL) and its impact on motivation and engagement among third-year radiologic technology students. Utilizing a descriptive-correlational research design, the study surveyed 100 students from Our Lady of Mercy Pulilan in Bulacan. Results indicated a very positive perception of GBL, a high level of motivation, and significant engagement. The findings further revealed strong correlations between perception and motivation ( $r = .759$ ), perception and engagement ( $r = .712$ ), and motivation and engagement ( $r = .862$ ). Based on the findings, an action plan was proposed to sustain the perception, motivation, and engagement in GBL.

**Keywords:** *game-based learning, radiologic technology students, perception, motivation and engagement*

## Introduction

In recent years, students have faced challenges in maintaining motivation and engagement in traditional education settings. Game-based learning (GBL) has emerged as an innovative approach to enhance students' learning experiences. Studies have indicated that GBL can effectively foster motivation and engagement, leading to improved academic outcomes. However, limited research has explored these effects specifically within radiologic technology education, particularly in Bulacan. This study seeks to address this gap by investigating the perception of GBL among radiologic technology students and its impact on motivation and engagement.

## Research Questions

The study aimed to answer the following research questions:

1. What are the radiologic technology students' perceptions of GBL?
2. What is the level of motivation of radiologic technology students in GBL?
3. What is the level of engagement of radiologic technology students in GBL?
4. Is there a significant relationship between students' perception and their level of motivation in GBL?
5. Is there a significant relationship between students' perception and their level of engagement in GBL?
6. Is there a significant relationship between students' level of motivation and level of engagement in GBL?
7. Based on the findings, what action plan can be proposed to enhance perception, motivation, and engagement in GBL?

## Literature Review

### *Game-based learning*

Game-based learning (GBL) is an innovative approach to delivering knowledge to students, enhancing motivation and engagement. In the past years, the digital games industry has grown and transformed society into a whole new level, and it has become the most influential aspect in the entertainment stream (Cheah et al., 2021).

The study conducted by Cheah et al. (2021) reviewed 91 peer-reviewed journal articles which state that there are six motivational themes, such as immersion and flow, gratification and affect, escapism, social interaction, identification, and goal orientation, which are considered as the primary drivers why games are so engaging and why people love them. This idea has been integrated into teaching strategies, specifically during THE COVID-19 pandemic, which led to the utilization of game-based learning.

Toquero et al. (2021) showed that the utilization of game-based learning (GBL) during and after the pandemic is effective not only in meeting the learning objectives but also engaging and motivating students in their studies. This approach benefits digital learners by making virtual education more engaging and effective, particularly in the situation of the COVID-19 pandemic and beyond. They encouraged higher education institutions to integrate GBL strategies into virtual classes to provide meaningful learning experiences while ensuring student safety. Ultimately, this method may inspire a shift from traditional teaching to a more learner-centered online environment in the post-pandemic era.

Satrio et al. (2021) examines the impact of game-based learning, specifically using the E-CrowdWar educational game, on high school students' academic performance. Conducted with 200 students from Blitar and Kediri, the research aimed to assess the effectiveness of integrating games into learning. Results indicated a significant improvement in student outcomes, with pre-test average scores of 65 points increasing to 90.74 in Kediri and 86.95 in Blitar after the intervention. Overall, the findings highlight the positive effects of game-based learning on students' creativity, critical thinking, and cognitive skills, suggesting it should be implemented more widely, particularly in economics education.

Many individuals would say that GBL is only applicable for digital games, but there are other ways to utilize this apart from its virtual application. This can also be applied in in-class activities using traditional games, such as game cards or game boards. Santos (2023) discussed the effectiveness of games as educational tools, emphasizing that further research should focus on how to integrate them into teaching rather than on their effectiveness. It explores the use of board games as cost-effective instructional materials through a method called LuDu, designed to help teachers create a game-based learning experience. This iterative approach encourages teachers to start with their learning objectives, develop their own board games, and integrate them into their teaching practices. Similarly, gamification of GBL activities adapts game-like elements such as points, rewards, levels, and challenges into education settings to capture students' attention and participation, which constitutes deeper learning. Studies have shown that instilling knowledge in students can be delivered in many ways, and GBL is particularly well-suited for designing educational approaches (Nadeem et al., 2023).

Rahim et al. (2020) explored students' perceptions of gamified online quizzes in a Medicinal Chemistry course. Using a mixed-method approach, the research analyzed descriptive data, informal chats, and observations. Three Quizizz-based quizzes were implemented outside class, allowing multiple attempts, with post-quiz discussions held during class. Among 63 respondents, over 96% found the quizzes beneficial, citing instant feedback, mistake-based learning, and discussions as key factors. Performance improved over time, and qualitative feedback reinforced these findings. Overall, students viewed the quizzes as engaging and effective for peer learning, while instructors found them valuable for formative assessment in large classes, making them a viable alternative to traditional quizzes.

Studies have shown that GBL is effective and has helped students develop personal skills. The study by Kim and Lee (2021) examined the effectiveness of the Neuro-World game-based cognitive training program in enhancing cognitive abilities in children with intellectual disabilities. A total of 60 children were assessed using pre- and post-intelligence tests (K-WISC-IV). Half of the students underwent training using traditional cognitive training while the other half used Neuro-World. Although there was no significant improvement in the students who underwent the traditional cognitive training, the Neuro-World group demonstrated significant improvement, particularly in working memory and processing speed. These improvements were attributed to the program's focus on memory, attention, visual perception, and performance ability. Given its effectiveness within three months, the Neuro-World program presents a promising alternative for cognitive and learning interventions, with potential applications in remote training for children with intellectual disabilities.

Lu et al. (2023) performed a meta-analysis that examined the impact of game-based learning (GBL) on students' computational thinking (CT) by analyzing 28 effect sizes from 24 studies involving 2,134 participants. The findings revealed a significant positive effect of GBL on CT with considerable variation among studies. Among different game types, role-playing games had the greatest impact, followed by action, puzzle, and adventure games. Additionally, the effectiveness of GBL on CT was lower in more individualistic countries. In terms of duration, interventions lasting between four hours and one week had the strongest effect, followed by those lasting over four weeks, up to four hours, and between one week and four weeks.

Another study by Ahmed et al. (2022) found that incorporating games into teaching a new language is an effective strategy that lessens stress and improves students' learning prowess and retention. These studies prove that GBL can be incorporated into different fields and could make a promising result with proper structure and implementation.

In summary, the strategy of game-based learning is to deviate from conventional teaching methods, taking advantage of the nature of games that make teaching pedagogy motivating and engaging (SunStar New, 2024)

### ***Perception of game-based learning***

Students' perception of GBL is viewed to be effective and enjoyable. Consequently, this makes students' perception positive towards GBL as a pedagogical approach in education.

In the study of Asniza et al. (2021), they investigated pre-university students' perceptions of using Kahoot! to improve engagement and active learning in Biology classes. A quantitative survey was conducted with 100 students from colleges in northern Malaysia, and data were analyzed. Results showed that students believed Kahoot! effectively encouraged their participation and enhanced active learning. Key motivating factors included strong interaction and communication between students and teachers. The study suggests that teachers at the pre-university level should consider integrating online games like Kahoot! into their teaching to boost student engagement.

Hartt et al. (2020) proved that game-based learning to be an effective educational approach that enhances student motivation, emotional engagement, and enjoyment. The study focused on planning education explored the effects of gamification on students' perceptions of learning, engagement, and teamwork. The research involved two lectures in an undergraduate planning course, contrasting a traditional lecture format with a game-based approach. Feedback was collected through an online questionnaire and semi-structured interviews. The findings indicated a clear preference among students for the game-based lecture, highlighting increased and engagement levels. The study concludes that gamification is particularly advantageous for planning education, suggesting its potential to enrich the learning experience in this field.

The study conducted by Arcagök (2021) focused on assessing how game-based teaching methods influence academic performance across various curricula. By performing a meta-analysis, the study reviewed 412 studies conducted from 2000 to 2020, ultimately narrowing it down to 54 experimental studies that specifically examined game-based practices. Using the Comprehensive Meta-

Analysis Program (CMA) and MetaWin for data analysis, the findings indicated that game-based teaching methods generally lead to improved academic outcomes compared to traditional teaching approaches. Additionally, the effectiveness of these game-based curricula varied significantly based on factors such as education levels, duration of treatment, sample sizes, and types of publication.

Sun et al. (2021) investigates teacher scaffolding strategies in digital game-based learning within primary mathematics classrooms and their impact on students' perceptions of learning. Involving 141 students and four teachers, the research gathered qualitative data from classroom observations and student interviews. Findings revealed that both whole-class and one-to-one scaffolding significantly influenced students' engagement and attitudes towards mathematics when integrated with digital games. The study concludes that effective scaffolding can enhance students' knowledge, arithmetic skills, and interest in mathematics, with whole-class scaffolding particularly beneficial during the initial practice phase of learning integer-arithmetic problems. This shows that the perception of students plays a significant role in designing a teaching strategy.

Teachers viewed GBL positively as it provides significant differences between their students' performance from pre- and post-application. To prepare students for real-world scenarios, it is imperative to expose them to different situations where creativity, problem solving, critical thinking, and collaborating are the primary consideration of teachers when practicing the learner-centric approach (Hussaini et al., 2021).

According to Purba & Katemba (2022), Game-based learning (GBL) is increasingly utilized by educators to enhance English vocabulary acquisition, which is essential for effective communication and mastering the language's four skills: listening, speaking, reading, and writing. A significant vocabulary deficit can hinder students' motivation to learn. Throughout the pandemic, various educational technologies, particularly games, have been employed to engage students and alleviate boredom during lessons. A study involving 40 high school teachers from Sumatra and Java evaluated their perceptions of GBL. The results indicated a positive outlook among teachers regarding its effectiveness, with many agreeing that GBL not only improves vocabulary but also makes learning more enjoyable for students.

Likewise, Lampropoulos (2023) investigates K-12 teachers' views on the advantages of integrating digital game-based learning (DGBL) in the classroom, involving 158 primary and secondary educators who complete a 37-question survey. The results indicated a generally positive attitude among teachers toward DGBL, with variations in responses linked to factors such as educational background, gender, and teaching experience, rather than age or the level of education they taught. Most have background with the application of DGBL. However, they identified challenges such as insufficient equipment, limited digital skills, and a lack of training. For academic faculties, they see DGBL enhances communication and digital competencies, fosters engaging virtual learning environments, and encourages student participation and collaboration. For students, DGBL supports cognitive and social-emotional growth, boosts digital skills, enhances motivation and engagement, and fosters critical thinking, creativity, and autonomy. Ultimately, the evidence suggests that DGBL is a valuable educational method that can be applied across all levels of education, whether in-person or online, helping to elevate teaching quality and meet contemporary educational demands.

Low et al. (2023) investigates physics teachers' perceptions of GBL, the extent to which they apply it in their teaching, and their participation in designing educational games. A survey involving 211 secondary school physics teachers revealed that only 29.9% had created educational games for their classes. Overall, the use of GBL in teaching physics remains low, despite a strong interest among teachers in game design. Key barriers to adopting GBL include insufficient technical resources in schools, lack of knowledge and skills, and time limitations. The study's findings serve as a foundation for stakeholders aiming to enhance the integration of GBL into physics education. Overall, even though GBL is an effective tool for teaching, the lack of understanding and skill to make one could hinder its purpose to promote an effective educational strategy.

In conclusion, knowing students' and teachers' perceptions of game-based learning plays a vital role in structuring teaching methods that could become a catalyst in transforming education in a whole new level. With proper skills and tools, this method can provide a significant impact in the education sector.

### **Motivation**

Motivation could become a catalyst to improve productivity (Acquah et al., 2021). However, it was found that motivation from online learning during and post-pandemic situations has been negatively affected (Chiu et al., 2021). Motivation plays a vital role in influencing students' success in their academic career, whereas considering the application of GBL will help learners not only to enhance motivation but also attain learning objectives. The integration of GBL has consistently demonstrated a beneficial effect on students' motivation.

A study of Pando Cerra et al. (2022) explores the combination of traditional teaching methods and game mechanics through a specialized web platform and mobile devices to evaluate their effects on student performance and motivation. They conducted a comparative research design and implemented it with 96 first-year engineering students, who were divided into two groups: a Control Group (CG) that used conventional teaching methods, and an Experimental Group (EG) that incorporated GBL and Information and Communication Technologies (ICT). The findings revealed that students in the EG significantly outperformed their peers in the CG, demonstrating higher motivation and interest in the subject matter. Thus, integrating GBL into engineering education can enhance learning outcomes and facilitate the educational process.

Balaskas et al. (2023) conducted a study in a Greek elementary school involving 27 sixth graders, focusing on the use of a Kahoot! quiz to assess its effectiveness as a supplemental educational tool. The study included a post-activity questionnaire aimed at gauging students' interest and motivation. It showed that students positively viewed Kahoot! as an alternative teaching method. It highlighted improvements in motivation, enjoyment, autonomy, creativity and overall interest in learning. Furthermore, the findings suggested a moderate enhancement in students' comprehension of the material and a slight preference for this tech-driven approach over conventional methods. Overall, the research indicates that fostering a supportive and imaginative learning environment can boost student motivation and promote independent learning through gamified experiences.

Similarly, Chang and Yeh (2021) use a blended design for game-based learning, bingo games, and a mobile application. They conducted an 18-week experimental instruction under information management and 86 undergraduate students participated in the study. They found that the use of Bingo and Socrative, an online tool to give students quizzes and activities, enhanced student's motivation, knowledge sharing, and critical thinking, thus improved the students' thinking prowess. This proves that GBL motivates students to partake in activities that they will benefit from.

A study by López-Fernández et al. (2024) analyzes the impact of educational video games on students' learning and motivation in computer science education. They compared the effectiveness of their self-made educational games in two different settings, face-to-face and online approaches. They found that teacher-authored educational video games are effective despite its face-to-face or online application, and some students favored positively in face-to-face application. Likewise, a study found that teacher-authored education games are proven effective as traditional teaching pedagogy in terms of gaining knowledge.

Moreover, López-Fernández et al. (2021) explore the effects of teacher-created educational video games on computer science learning and motivation, comparing their effectiveness in both classroom and online settings. The research involved 321 students—217 in a traditional face-to-face environment and 104 in an online format. The researcher utilized a quasi-experimental design featuring pre-tests, post-tests, and questionnaires to assess learning outcomes and motivational levels associated with game-based education focused on software design. The findings indicate that teacher-authored video games promote significant knowledge gains and motivation in students, regardless of the format. Additionally, student feedback suggested that many perceived a more positive experience in face-to-face settings.

Camacho-Sánchez (2022) explores the impact of Digital Game-Based Learning (DGBL) and Gamification on university students' academic performance and motivation. A total of 126 students participated, with 38 in the experimental group. Researchers utilized an evaluative test for academic performance, the Cooperative Playful Learning Strategies (CMELAC) questionnaire for motivation, and additional open-ended questions to gather more insights on motivation. Findings indicate that the experimental group outperformed the control group academically, with high motivation levels across all participants. Overall, the study suggests that the gamified DGBL approach is an effective teaching tool that enhances active learning, provides immediate feedback, and boosts both academic performance and motivation among students.

In conclusion, game-based learning motivates students to learn whether it be face-to-face or in in-classroom settings. This indicates that motivated students engage more in this setup, benefiting their academic performance.

### ***Student engagement***

Engagement pertains to the degree of active involvement and emotional commitment one has in the learning experience. It is linked with improvement and growth as it is essential to learning (Surattana et al., 2021).

Nadeem et al. (2023) investigates how digital game-based learning (GBL) influences engagement and motivation among students, while also considering gender differences in online learning environments. 2 phases were conducted which involved undergraduate students, participating in game-based or traditional online quizzes. In the first phase, 276 students, were initially recruited in the Sophomore seminar classes, with 101 students (83 male and 18 female) participated in the survey. In the second phase, 126 participants of which only 107 participated (63 females and 44 males). They found that GBL enhances student engagement and motivation compared to traditional methods. The study noted that the presence of a leaderboard positively affected some students' academic performance, though it might be demotivating for others. Additionally, female students expressed a greater enjoyment for the games but preferred not to compete directly with peers as much as their male counterparts. Overall, the positive feedback indicates that integrating game-based elements into education can make learning more enjoyable and improve student engagement.

While the others focus on an online game-based platform, Yuratich (2020) developed a card game that helped his law students understand the role of a judge and how to build judgement based on the elements of common law reasoning from the drawn card. It is found that taking advantage of technology by making game-based learning materials has a significant impact in encouraging students to participate, collaborate with their peers, engage with content material, and be motivated to understand the concept of the discussions (Vaz de Carvalho and Coelho, 2022).

A study conducted by Martín-Hernández (2021) showed that 142 students who underwent GBL programs showed improvement in teamwork engagement, team building, teamwork competence, and innovation behaviors. It suggests that GBL can effectively promote personal and team skills. By understanding the use of gamification and game-based learning, stakeholders can design a game-based

instructional design that can be immersive and rewarding resulting to a positive learning experience (Erylmaz and Boicu, 2023). This demonstrates that GBL is an effective tool to engage students in the learning process.

In higher education, particularly in Radiology Education, some have conducted studies with the application of game-based learning on the program. They established that DiagRadQuiz, a game created by master's research health science teaching, is a method for teaching pathological patterns in CT SCAN that helped them diagnose diseases (Ribeiro et al, 2024). A study by Rudolphi-Solero et al., (2021) found that using GBL in Second Life, a virtual world featuring structured student's activity and team-based activities, that they are designing and developing are feasible and reproducible within medical education learning radiology. In another study conducted by Rudolphi-Solero et al. (2021), a multi-user game, Second Life, was conducted for a team competition among third-year medical students to learn radiologic anatomy and radiological signs, which was viewed positively because it promoted collaborative learning, thus helping them understand the topic even better than those non-participating students. Likewise, it is proven that Second Life can help students improve their oral communication skills in public and was described as interesting and useful (Pino-Postigo, 2023). Overall, online game-based platforms were engaging and relatable, promoting an immersive educational approach (Cheng, 2021).

In conclusion, the application of game-based learning is not limited to primary and secondary education, it is also applicable to tertiary or higher education.

## Methodology

The study utilized a descriptive-correlational research design. The target population consisted of 134 third-year radiologic technology students, with a sample size of 100 students determined through the Raosoft calculator at a 95% confidence level and a 5% margin of error.

A structured questionnaire was used to gather data on students' perceptions, levels of motivation, and engagement. The questionnaire was divided into three parts: Part I: determine the students' perceptions of GBL, Part II: determine the level of motivation on GBL, and Part III: determine the level of engagement using GBL. The instrument's reliability was confirmed using Cronbach's Alpha, with perception (.925), motivation (.938), and engagement (.900) all achieving acceptable reliability.

Data analysis was conducted using weighted means for descriptive analysis and Pearson's  $r$  for correlational analysis. Ethical considerations were observed by obtaining informed consent from participants and ensuring confidentiality.

## Results and Discussion

Findings revealed that students had a very positive perception of GBL, with an average weighted mean of 3.44. The level of motivation was also high (3.44), and engagement was similarly strong (3.39).

Table 1. *Third-year Radiologic Technology students' Perception of Game-Based Learning*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. The game-based activities are more fun than the traditional activities.	3.49	Very Positive	3
2. Game-based learning makes lessons more interesting.	3.54	Very Positive	2
3. The use of games in activities makes me understand the concepts of the topic better.	3.46	Very Positive	5
4. Game-based learning is a valuable teaching strategy.	3.48	Very Positive	4
5. Game-based promotes a healthy environment in in-class activities.	3.45	Very Positive	6
6. The use of game-based learning promotes collaboration among classmates.	3.55	Very Positive	1
7. Game-based learning helps me retain information for longer periods.	3.44	Very Positive	7
8. I feel that game-based learning is suitable for all courses.	3.32	Very Positive	10
9. Educators should incorporate game-based learning during discussions.	3.36	Very Positive	8
10. After game-based learning, I feel more confident with my academic abilities at school.	3.33	Very Positive	9
Overall Weighted Mean	3.44	Very Positive	

Table 1 presents students' perceptions of game-based learning. All indicators received a verbal interpretation as very positive. According to the third-year Radiologic Technology students, the use of game-based learning promoted collaboration among classmates, with a weighted mean of 3.55. Additionally, they found that game-based learning made lessons more interesting, with a weighted mean of 3.54. They also found that game-based activities are more fun than traditional activities, with a weighted mean of 3.49.

The students considered game-based learning as a valuable teaching strategy, with a weighted mean of 3.48, and believed that the use of games in activities helped them understand the concepts of the topic better, with a weighted mean of 3.46. Moreover, they found that Game-based learning promotes a healthy environment in in-class activities, with a weighted mean of 3.45.

The students felt that Game-based learning helps them retain information for longer periods, with a mean of 3.44. They suggested that educators should incorporate game-based learning during discussions, with a weighted mean of 3.36. Furthermore, they felt more confident with their academic abilities at school after game-based learning, with a weighted mean of 3.3. Finally, the students believed

that game-based learning was suitable for all courses with a weighted mean of 3.32.

Overall, the students had a very positive perception of game-based learning, as reflected in the overall weighted mean of 3.44. The results imply that the use of game-based learning promoted collaboration among their classmates. Similarly, the respondents found that game-based learning made lessons more interesting.

The findings support the prior study of Hartt et al. (2020). They found that students have a clear preference for the game-based lecture, highlighting increased engagement levels. This calls for continuous incorporation of game-based learning in teaching strategies to achieve the learning objectives.

**Table 2. 3rd-year Radiologic Technology students' Level of Motivation on Game-Based Learning**

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Game-based learning motivates me to participate more in class.	3.39	Highly Motivated	8.5
2. The use of games makes learning more enjoyable.	3.52	Highly Motivated	2
3. I am thrilled when games are part of the activities.	3.44	Highly Motivated	5
4. The competitive nature of GBL encourages me to perform well.	3.40	Highly Motivated	7
5. Game-based learning brings out my ability to think under pressure.	3.53	Highly Motivated	1
6. I feel motivated to prepare when games will be included in our activities.	3.39	Highly Motivated	8.5
7. Game-based learning makes me want to explore more related topics to our lesson.	3.35	Highly Motivated	10
8. Game-based learning activities make me feel rewarded when I succeed.	3.48	Highly Motivated	4
9. Game-based learning motivates me to collaborate with my classmates.	3.49	Highly Motivated	3
10. Varieties of game-based learning activities keep me motivated throughout the course.	3.41	Highly Motivated	6
Overall Weighted Mean	3.44	Highly Motivated	

Table 2 presents the respondents' level of motivation in game-based learning. All indicators received a verbal interpretation of highly motivated. The third-year Radiologic Technology students found that game-based learning brought out their ability to think under pressure, with a weighted mean of 3.53. They also expressed that the use of games made learning more enjoyable, with a mean of 3.52. Game-based learning motivated them to collaborate with their classmates, with a weighted mean of 3.49. Additionally, they found that game-based learning activities made them feel rewarded when they succeeded, with a weighted mean of 3.48.

The students were thrilled when games were part of the activities, with a weighted mean of 3.44. They also noted that the variety of game-based learning activities kept them motivated throughout the course, with a weighted mean of 3.41. The competitive nature of game-based learning encouraged them to perform well, with a weighted mean of 3.40.

The students felt that game-based learning motivated them to participate more in class, and they were motivated to prepare when they knew games would be included in their activities, both with a weighted mean of 3.39. Finally, they expressed that game-based learning made them want to explore more related topics to the lesson, with a weighted mean of 3.35.

Overall, the respondents strongly agreed that game-based learning positively impacts their motivation, as reflected in the overall weighted mean of 3.44. The results imply that game-based learning brought out the ability of the respondents to think under pressure. Likewise, the respondents found that the use of game-based learning made learning more enjoyable.

The findings support the study made by Pando Cerra et al. (2022) stating that students who underwent game-based learning demonstrated higher motivation levels and interest in the subject matter. This reinforces the need to motivate students in their learning endeavors.

**Table 3. 3rd-year Radiologic Technology students' Level of Engagement in Game-Based Learning**

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Game-based learning keeps my attention throughout the discussion.	3.42	Highly Engaged	3.5
2. I often lose track of time during GBL activities.	3.29	Highly Engaged	10
3. I feel immersed in the discussions when games are part of it.	3.33	Highly Engaged	9
4. I feel encouraged to share my ideas during GB activities.	3.37	Highly Engaged	8
5. I am eager to learn new skills when games are included in our lessons.	3.42	Highly Engaged	3.5
6. I am more attentive when games are incorporated to our lessons.	3.45	Highly Engaged	2
7. I put effort into reviewing our lessons when we have GBL activities.	3.38	Highly Engaged	6.5
8. GBL helps me connect with my classmates.	3.48	Highly Engaged	1
9. GBL helps me stay focused on my academic objectives.	3.41	Highly Engaged	5
10. I enjoy solving challenges during game-based activities.	3.38	Highly Engaged	6.5
Overall Weighted Mean	3.39	Highly Engaged	

Table 3 presents the respondents' level of engagement in game-based learning. All indicators received a verbal interpretation as highly engaged. The third-year Radiologic Technology students found that game-based learning helped them connect with their classmates,

with a weighted mean of 3.48. They also expressed that they were more attentive when games were incorporated into their lessons, with a weighted mean of 3.45. The students noted that game-based learning kept their attention throughout the discussion, and they were eager to learn new skills when games were included in their lessons, both with a weighted mean of 3.42.

They felt that game-based learning helped them stay focused on their academic objectives, with a weighted mean of 3.41. Additionally, they put effort into reviewing lessons when game-based learning activities were part of the course, and they enjoyed solving challenges during game-based activities, both with a weighted mean of 3.38.

The students also felt encouraged to share their ideas during game-based activities, with a mean of 3.37. They felt immersed in the discussions when games were part of it, with a weighted mean of 3.33. Lastly, the students mentioned that they often lost track of time during game-based learning activities, with a weighted mean of 3.29.

Overall, the respondents were highly engaged in game-based learning, as reflected in the overall weighted mean of 3.39. The results imply that game-based learning helped respondents to connect with their classmates. Likewise, the respondents were more attentive when game-based learning was incorporated into their lessons.

The findings support previous research by Nadeem et al. (2023), which indicates that game-based learning increases student engagement. This highlights the importance of actively involving students in classroom activities, as game-based learning promotes greater participation.

Table 4. *Relationship Between the Respondents' Perception and Level of Motivation in Game-Based Learning*

<i>Variables</i>	<i>Statistical Treatment (Pearson's)</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Perception and motivation	$r=.759$ (strong correlation)	.000*	H0 rejected	Significant

\*Significant @ 0.01

For the relationship between the respondents' perception and level of motivation in game-based learning, a Pearson's  $r$  value of .759 was obtained indicating a strong correlation. Meanwhile, a probability value of .000 which was lower than the test of significance at .01 showed that there is a sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship between the variables.

This means that the more positive the respondents' perception of game-based learning, the higher their level of motivation.

The findings are consistent with earlier research by López-Fernández et al. (2021), which indicates that game-based educational games lead to significant knowledge gains and increased motivation among students. Students have perceived these games positively. Therefore, it is essential to integrate game-based learning into teaching strategies to enhance both perception and motivation

### **Relationship Between the 3rd-year Radiologic Technology students' Perception and Level of Engagement in Game-Based Learning**

Table 5. *Relationship Between the Respondents' Perception and Level of Engagement in Game-Based Learning*

<i>Variables</i>	<i>Statistical Treatment (Pearson's)</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Perception and engagement	$r=.712$ (strong correlation)	.000*	H0 rejected	Significant

\*Significant @ 0.01

For the relationship between the respondents' perception and level of engagement in game-based learning, a Pearson's  $r$  value of .712 was obtained indicating a strong correlation. Meanwhile, a probability value of .000 which was lower than the test of significance at .01 showed that there is a sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship between the variables.

This means that the more positive the respondents' perception of game-based learning, the higher their level of engagement. This aligns with the study conducted by Rahim et al. (2020), which found that students viewed game-based quizzes as engaging and effective for peer learning, positioning them as a viable alternative to traditional quizzes. Therefore, it is essential to utilize game-based learning to improve perceptions and foster greater engagement.

### **Relationship Between the 3rd-year Radiologic Technology students' Level of Motivation and Level of Engagement in Game-Based Learning**

For the relationship between the respondents' level of motivation and level of engagement in game-based learning, a Pearson's  $r$  value of .862 was obtained indicating a strong correlation. Meanwhile, a probability value of .000 which was lower than the test of significance at .01 showed that there is a sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship

between the variables.

Table 6. *Relationship Between the Respondents' Level of Motivation and Level of Engagement in Game-Based Learning*

Variables	Statistical Treatment (Pearson's)	p-value	Decision	Interpretation
Motivation and engagement	r=.862 (strong correlation)	.000*	H0 rejected	Significant

\*Significant @ .01

This means that the higher the level of motivation, the higher the level of engagement of the respondents in game-based learning. The findings support the study by Lampropoulos (2023), which states that game-based learning (GBL) enhances motivation and engagement. This suggests that GBL is a valuable educational method that can be applied at all levels of education. By utilizing game-based learning, students can achieve high levels of motivation and engagement.

### The Proposed Action Plan to Sustain Perception of Game-Based Learning and its Impact on Motivation and Engagement among 3rd-year Radiologic Technology students

Table 7. *Proposed Action Plan to Sustain Perception of Game-Based Learning and its Impact on Motivation and Engagement among 3rd-year Radiologic Technology Students*

Activities	Objective	Strategy	Time frame	Persons involved	Budget allocation	Success indicator
Radteach: Suitability of Game-Based Learning in all courses	To sustain awareness of how GBL can be adapted for various radiologic technology subjects	Conduct a seminar/workshop on integrating GBL in different subjects, showcasing successful case studies	2 months	Faculty, students, guest speakers	10,000	At least 80% of students acknowledge the applicability of GBL in different subjects
Motivational effects of game-based learning activities	To sustain student curiosity and engagement beyond GBL activities	Introduce post-GBL reflection activities, discussion forums, and gamified research tasks	1 semester	Faculty, students	6,000	At least 75% of students participate in post-GBL activities and research
Go, Go, Go, RT! Timer-based activities of GBL.	To help students sustain effective time management while engaging in GBL	Implement structured game sessions with time checkpoints and scheduled breaks	1 semester	Faculty, students	5,000	At least 85% of students report improved time management during GBL activities

#### Rationale:

This action plan is designed to sustain the perception of game-based learning and its impact on motivation and engagement among third-year radiologic technology students. This aims to ensure that GBL continues to be an effective tool as an educational pedagogy that will make students more motivated and engaged throughout their academic careers.

Correlation analysis showed a significant positive relationship between perception and motivation ( $r = .759, p < .01$ ), perception and engagement ( $r = .712, p < .01$ ), and motivation and engagement ( $r = .862, p < .01$ ). These results indicate that a more positive perception of GBL enhances motivation and engagement among students.

### Conclusions

The following conclusions were drawn based on the findings of the study.

The respondents had a very positive perception of game-based learning.

The respondents were highly motivated by the integration of game-based learning.

The respondents were highly engaged when game-based learning was applied.

The more positive the respondents' perceptions of game-based learning, the higher their level of motivation.

The more positive the respondents' perceptions of game-based learning, the higher their level of engagement.

The higher the level of motivation, the higher the level of engagement of the respondents.

An action plan was proposed to sustain the perception of game-based learning and its impact on motivation and engagement among radiologic technology students.

The study concludes that GBL positively influences students' motivation and engagement. Based on these findings, the following recommendations are proposed:

Radiologic Technology students should actively engage in game-based learning activities to enhance their perception and learning capacity to further understand radiologic technology topics.

Radiologic Technology faculty members should practice integrating game-based learning into their teaching method as it motivates and provides a beneficial impact not only to them but also to their students.

Radiologic Technology program head should consider integrating game-based learning into their instructional format of teaching because this can be used as a tool to engage students, fortify teaching strategies and meet learning objectives effectively.

Since a positive perception of GBL directly increases motivation, radiologic technology students should approach GBL activities with an open mind because cultivating positive attitude toward GBL will enhance perception and help maintain high levels of motivation.

Radiologic technology program head and faculty members should consider creating a supportive environment that encourages positive perception because the enjoyable nature of GBL may increase student engagement.

Radiologic technology faculty members should consider designing lessons and activities that not only motivate but also sustain that motivation throughout the course because motivated students tend to be more engaged which may lead to a favorable outcome.

Radiologic technology program head and faculty members should implement, monitor, and evaluate for continuous improvement.

Future researchers should explore more on the application of Game-Based Learning in different programs of higher education.

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