Developing Gamified Educational Technologies to Enhance Learning and Motivate Student Engagement in Education: A Quantitative Study Using Human-Computer Interaction (HCI)

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Abstract: Nowadays, the rapidly evolving educational landscape is keeping the students engaged and motivated is more important. This study seeks into how gamified educational technologies— and the tools that are used in game-like elements such as the points, the rewards, and the challenges—that can help make learning more effective and can be more enjoyable. In addition, by familiarizing and adding the principles from the Human-Computer Interaction (HCI), our aim is to make a design educational experiences that are not only responsive and also will make students more intuitive and user-friendly. Through the interviews, the focus groups, and the classroom observations, we gathered data and insights from both the students and the educators to be able to understand on how these things influence the motivations and student's learning behavior. To sum it up, the results showed that when the gamification is thoughtfully combined with solid learning goals, it can make a greater interest, sustain attentions, and to foster a deeper connection to the learning process. All in all, this research will highlight the importance of designing educational tools with the user in mind, ensuring they are not only functional and but also engaging and also can be accessible for all the learners.

Keywords: Gamification, Educational Technology, Human-Computer Interaction, Student Engagement, Motivation, User-Centered Design, Interactive Learning, Quantitative Study.

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I. INTRODUCTION

A. Background and Context

With the advancement of technology over the decade, there has been a rising increase in Human-Computer Interaction (HCI) systems. From the computer to mobile, every device used is based on the foundation of the same interaction that offers pillars for simple yet friendly conversation. While the concept seems simple, this is a multidisciplinary approach that moves a step ahead of the communication quality between the user and computer and focuses on computer design. A system that is designed to enrich the customer experience and reach larger connectivity of design, research, and product development is Human-Computer Interaction. HCI has always been a part of technology and design, but it is on the rise as technology becomes more integrated with our daily lives [1]. This research aims to explore on how gamification can be integrated through education to improve student participations, motivations and learning capabilities. The study aims to design and assessment gamified system can make learning entertaining and more collaborative by giving a game elements like challenges, competitions and rewards. Therefore, adding a learning with a game-based approach can be an effective, it makes a means of harmonizing teachers' and students' likings. In short, gamebased learning helps by improving students' engagement, coordination, and creativity [2].

Gamification in education is developing how students tackle with training materials, transforming traditional learning into self-motivated, collaborative formats. By adding the aspects of gaming into the training process, learners are interested to invests more effort, time, and focus, making education an appealing trip rather than a tedious task. This combination of entertainment and education has confirmed to be a powerful instrument in enhancing student engagement and facilitating deeper understanding [3].

B. Research Problem

Gamification is the combination of game-like elements into education platform; it is widely used to improve the student engagement and motivation. However, the gamification effectiveness depends in the alignment with the learning objectives. This research aims to explore the integration of gamification into education to address these issues and identify effective strategy on how can improve student participation in learning.

In HCI research, it identifies the gaps due to student satisfaction that plays a vital role on determining how effectively the student engage and participate with the use of gamified technology. Addressing this problem is a crucial context in advanced HCI due to the design that prioritizing the user needs to more intuitive, user-friendly, engaging and effective learning experience. By focusing on how BSIT students interact with and respond to gamified technologies, this research can contribute to the development of more user-

friendly platforms that meet both the educational and experiential needs of students [4].

C. Research Questions and Objectives

- Research Questions
- How does the gamified system based on a specific elements design like points, leaderboards and levels impact the student engagement on learning environments?
- In what ways does the gamified elements features affect the student motivation in Ho participating academic performance.
- How effective does the gamification strategy and their design elements in improving students learning outcomes and academic performance?
- To what extend does the gamified elements design contribute to the student satisfaction compared to the traditional learning method.

Objectives

- To assess how the gamification elements like levels, leaderboards and points can improve student engagement in learning.
- To explore the effect of gamified design on student motivation to learn and complete academic performance.
- To evaluate the effectiveness of gamified system based in the elements design to improve student performance and ability to remember the lessons and tasks.
- To assess student satisfaction with gamified learning experiences, focusing on the role of interactive and rewarding design features.

D. Justification and Significance

Gamification is defined as an integration of a game-like features into education to promotes an interactive and engage experience into learners is highly implemented in some educational platforms. It enhances the student engagement and motivation in the academic activity and learnings [3]. Gamification in education is use of a game design like elements to improve nongame context to improving the learner's engagement, motivation and learning. It's being increasingly implemented in learning settings to treat issues of student motivation, persistence, attention, and participation [4]. Thus, this study aims to explore the gamified educational technology as a relevant and a necessary solution on the ongoing challenges in student active participation and motivation in learning. By assessing how the gamified elements affect the engagement, motivation, effectiveness and satisfaction. This research aims to improve the development of gamified system design to a user-friendly and more interactive systems that provides a solution or meeting the needs in education.

II. LITERATURE REVIEW

A. Overview of HCI Theories and Models

In the Constructivist Learning Theory, it's put the learner on the centre of educational experience, highlighting the active engagement in learning experience. Rather than inactively getting the information, individuals tend to build their own knowledge through hands on exploration and experimentation. This theory had a significant impact on designing an interactive learning environment, to foster critical thinking and reflection. In the HCI, the constructivist principles play a vital role in shaping the digital learning tool provides an engagement learning environment and adapting the individual new learning styles, making the education more effective and interactive [5]. Furthermore, in Cognitive Constructivism, made by John Dewey and Jean Piaget, it shows that the learning is dynamic where the individuals make and obtaining knowledge through the experience and reflection. In Dewey's concept of focused living encourages a real-world learning that fosters criticalthinking and the problem-solving across varied context. Meanwhile in the Piaget's theory, it emphasizes the developments of the nature of learnings, where the knowledge is built with time by uniting the simpler ideas into complex ones. Altogether, their models form a basis in the designing of educational experience, that are experimental and learnerfocused and encourages the students to actively engaged.

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Moreover, in the Self-Determination Theory (SDT) provides a comprehensive framework to understand human motivation and personality. It determined between the intrinsic motivation determined by the personal interest and enjoyment and extrinsic motivation that influenced by external pressure and rewards. It emphasizes the effect on cognitive and social development. In HCI, SDT serves as a foundation for designing a user interface and system that improves the user competence and social connection. By addressing these psychological needs, building a well design HCI systems that can make the user engagement improved and provide overall satisfaction [7]. The Basic Psychological Needs Theory (BPNT) illustrates that frustration and satisfaction of three codes needs autonomy, competence and relatedness that impacts motivation. In autonomy, it involves acting in the sense of choice and reality, when individual is feeling frustrated it leading to pressure and inner struggle. While competence is a sense of growth in one's ability, with frustration that leads to feeling of failure and weakness. Lastly. Relatedness is a feeling of connection and valued by others, while its frustration can result in social disconnection and loneliness. On this model, when these needs adapt in the educational tools, surely the students are more likely to be engaged and motivated education that improves their learning experience [8].

In addition, the Flow Theory that developed by Mihaly Csikszentmihalyi in 1990, illustrates the state of deep focus and engagement of the learners is when it is fully immersed on the activity. In HCI, achieving the state of flow is difficult when designing an interface that maximize the user experience, performance and motivation. Gamified and interactive technology usually adapt the flow principle to make the learning environments engaging and enjoyable. When users feel challenged yet in control, they are more likely to remain engaged, enjoy the experience, and achieve better learning outcomes [9]. In the Flow Channel Models it describes that the good learning happens when there is balance in task challenges and the levels of the individual skills. If the challenge is too high, sometimes it leads to anxiety and depression, while if it's too low it will cause boredom in learners. Flow occurs in the middle where tasks are engaging yet achievable. This state can be fostered through clear goals, immediate feedback, and gradually increasing difficulty [10].

B. Review Recent Studies, Papers, And Advancements in HCI Gamification in Education: Enhancing Student Engagement and Learning Outcomes Recent research in Human Computer Interaction (HCI) is increasingly focus on the role of gamification in education, emphasizes the ability to improve the student engagement, motivation, effectiveness and satisfaction. According to Sylvester (2024), adding some game elements into the learning environments can make the learning more interactive and effective in educational experience. Moreover, gamification become a key trend in HCI, due to aligning in the advancement in adaptive learning, personalize education and using digital tools.

However, some challenges remain like maintaining the long-term engagement, meeting the needs of the learners and balancing the competition and collaboration. While many existing solutions have proposed, many educational platforms are still struggling to implement gamification in learning effectively, that reveals the gaps in user experience design and adaptive learning technology. By reviewing the recent advancement in HCI, this study aims to determine the current trends and limitations to provide an innovative solution that improve the impact of gamification in education [11].

C. Analyse Existing Solutions Related to the Research Problem Gamifications involve integrating game elements into education, have been a popular strategy to boost the student engagement and motivation in learning. Some tools like Kahoot, Duolingo and CodeCombat have shown that adding game features in teaching can make the learning of the students more enjoyable and interactive. These platforms use a gamified elements such as points, leaderboards and challenges that making the students involved on learning. However, to make the gamification to be truly effective, it should be aligned with the learning objectives that provides solutions to the needs of the students [12]. This study highlights the significance of a meaningful game like features in keeping the students participative and engaged on the learning. While the gamification enhances the motivation of the students, its effectiveness depends on the rewards and on the familiarity of the students with the game. Additionally, human computer interaction (HCI) research emphasizes the need for userfriendly design in the gamified platforms to ensure that the students would remain participative and engaged, also satisfied with their learning experience.

III. METHODOLOGY

A. Research Design

This study uses a descriptive research design to analytically collect, analyse, and use data on how gamifiededucational technologies enhances the learning and how it motivates student engagement. By guiding the student interactions to the gamified-learning system, this study objectives will identify the factors that improves the engagement of the students, motivates and effectiveness of the system. This study uses surveys to gather the thoughts of the students with the gamified system. Additionally, it also analyses the effects of this on how it will improve the students learning experience. The descriptive approach allows for a detailed understanding to the user engagement, their learning behaviours, and the design challenges, ultimately giving evidence base on the recommendations for enhancing gamifiededucational technologies [13].

B. Participants

The respondents of this study are BSIT (Bachelor of Science in Information Technology) students from 4th year level with the population of 300 students. The selection criteria include BSIT 4th years students who are purposely using the gamified learning system. To qualify, students must be enrolled in the BSIT program and demonstrate a sufficient level of engagement and interaction with the gamified system. The sampling method used is purposive sampling, where students are intentionally selected from each block based on their experience with gamified learning environments. At least 15 students are chosen per block to ensure balanced representation across the year level [14]. The recruitment process will be conducted within the institution through in-person recruitment to effectively reach BSIT students for the survey. This approach ensures that the students understand the given information thoroughly and participate meaningfully in the study [15].

C. Data Collection

This study will be conducted using interview process on the students on BSIT. Semi-structured interview is used to gather their insights, experience, and challenges with using the gamified learning systems. It enables to understand their personal opinion on how effective the system to the students to gain motivation in learning in an enjoyable moment, give motivation and improve the system for better experience [16]. In addition, survey and questionnaires interpret and analyse data such student feedbacks including student level of engagement, satisfaction and motivation within the system, utilizing 4-Likert-scale questions for statistical analysis. The finding provides deeper understanding in the gamified learning systems improvements and context related in the effectiveness of this in education learning process of the students [17].

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D. Data Analysis

This study uses both quantitative and qualitative approaches to better understand how gamified-educational technologies affects the student engagement, student satisfaction, and the gamification learnings' effectiveness. The participants are thoroughly selected using purposive sampling, focusing on those who use the gamified-learning system to make sure that the result is relevant and meaningful data. The quantitative data is collected through Likert-scale surveys, and will be analysed using the tools like mean, median, and standard deviation to show results according to student responses. Inferential statistics such as Pearson correlation analysis will also be used to understand more the patterns and relationships between different variables [18]. In contrast, the qualitative data, students' open-ended responses will be analysed through thematic analysis to discover common ideas in their experiences. By mixing the two methods used, the study offers both numbers and real student insights to entirely understand the impact of gamification in education. [19].

E. Ethical Considerations

In this study, confidentiality and privacy are required to ensure that the participants' identities and responses will be kept and secure and will be anonymous. Protecting the personal information from unauthorized access and maintaining trust throughout the study [20]. The data that are collected will be anonymously, obtaining informed consent from respondent regarding on how their data will be used. It is also essential that minimizing the data collection to what is strictly necessary for the research.

IV. ADVANCED HCI DESIGN

A. System Architecture

The advanced HCI library system architecture is designed to enhance usability, efficiency, and user satisfaction, built around a client-server model that integrates a user-friendly interface with backend data handling.

- ➤ Key Components Include:
- User Interface (UI) Layer: Provides an accessible, intuitive platform with simplified navigation and responsive design.
- Application Logic Layer: Manages user input, ensuring efficient interaction between the UI and backend while adapting based on user roles.
- Database Management System (DBMS): Manages data storage and retrieval, optimizing response times and data accuracy.
- Feedback and Error Handling Module: Captures user feedback and displays error messages to maintain smooth operations and reliability.

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Fig 1: The Diagram Outlines a Enhancing SEAIT's School Fund Management Through a Transparent and User-Friendly Donation System: A Qualitative Study Using Human-Computer Interaction (HCI) Principles.

B. Features and Functionalities

- \geq The features and functionalities of SEAIT's School Fund Management System are the following:
- Dashboard: Provide overall overview of the student, there performance and their overall activity to the game that results to views the performance progress of the user.
- Courses: In this Page views and record the course added by the admin viewing also it can add new course or quiz also can updated the course if their any changes into it.
- Questions: In this area Provides the record of questions added by the admin base on the course also the admin can update, delete and view the questions base on the preference of the admin
- Students: It provides record of students viewing the students accounts viewing their performance in the activity or courses they have been played, also the admin can update and delete the student profiles base on the admin decision.
- Badges: In this Function the admin can add badges names for the student trophies the admin can also updated or delete the badges depends on the admin preferences.

- Analytics: It provides report analytics of the overall performance of the student in their activity participated in the game.
- Settings: Provides record of user's admin wanted to add also see profile list of a user.
- Students Dashboard: The system shows students learning journey how many points earned, your status and level and how many achievements you have.
- Courses: It Provide Courses or activity that the student wants to play or category or course that the students want to play.
- Quest: Provides Questions to be answer of the student if the student want to play base on the courses they want to play if it's easy, normal, hard based on the level of the students.
- Performance: Provide overall activity that tracks students that if the user or student wants to find they can easily view it.
- Achievements: In this area that the student or user can see their achievements.
- Leaderboards: The students can see the rankings based on their performance and level earned.

C. User Interface Design

8		🞓 EduQuest
	⊠	Begin Your Learning Adventure Username Linter your username
√×		Password Enter your secret code
		Create Account Forgot Password?

Fig 2: In this Figure, It Shows the Login Section of the System

😭 EdoQuest	Admin Dashboard			Admin Logout
🕒 Dashboard	Overview			
 Courses Questions Students Badges 	Total Students 250 12% this month	Total Courses 12 12 new this month	Total Questions 480 1 24 new this week	Active Today 36 1986 vs.yesterday
✓ Analytics ★ Settings	3 Recent Activity			
	John Doe answered 5 minutes ago Jane Smith reached 1 hour ago	"What is a function?" correctly (any)		

Fig 3: In this Figure, it Shows the Admin Dashboard Section of the System

😭 EdoQuest	Manage Co		Admin Logout		
🚱 Dashboard	Manage C	+ Add New Course			
 Courses Questions 	COURSE ID	COURSE NAME	DESCRIPTION	DATE CREATED	ACTIONS
Students	COURSE001	Introduction to Programming	Basic concepts of programming using Python.	April 1, 2025	• •
8 Badges	COURSE002	Web Development	Learn to build websites using HTML, CSS, and JavaScript.	April 5, 2025	• 🕑 🔳
 Analytics Settings 	COURSE003	Data Structures	Understanding fundamental data structures and algorithms.	April 10, 2025	• •
	COURSE004	Mobile App Development	Build cross-platform mobile applications using React Native.	April 15, 2025	• • •

Fig 4: In this Figure, It Shows the Courses Section of the System

V. SAO FUNDRAISING ASSISTANCE AND DONATION ALLOCATION SYSTEM MANAGE DONORS - REPORTS



Fig 5: In This Figure, It Shows the Manage Question Section of the System.

😭 EdoQuest	Student Progress						(A)	dmin Logout
Dashboard Courses Ouestions	C Student Progr	ress						Filer
Students	Student	Level	EXP	Badges	Questions Answered	Correct Answers	Accuracy	Actions
Analytics	JS Jane Smith	15 15	2,300		120	98	82%	e 9 g
Settings	JD John Doe	28	5,420	IS MASTER	200	172	(85%)	© 12
	Maria Rodriguez	21 21	3,750	CSS MASTER JS NOVACE	165	132	605	6 C
111	AK Alex Kim	32 32	6,840	(HTML MASTER) (CSS MASTER) (JS PRO)	240	216	6	© ℃

Fig 6: In This Figure, It Shows the Manage Student Section of the System.



Fig 7: In This Figure, It Shows the Manage Badges Section of the System.

篖 EdoQuest	Analytics Dashboard			Admin Logout
 Dashboard Courses 	Analytics Comprehensive overview of studer usage statistics.	nt performance, engagement metrics, and pl	atform	
 Questions Students Badges Analytics 	Total Students 1,250 ↑ 15% this month	Total Courses 25 ↑ 3 new this month	Questions Answered 30,000 T 8% this week	Badges Earned 825 12% this month
Settings	Performance Analytics	^r Course		Monthly Quarterly Yearly

Fig 8: In This Figure, It Shows the Analytics Section of the System

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😭 EdoQuest	Authentication and Security Admin Logout								
 Dashboard Courses Questions 	Authentication and Security Manage administrators and moderator accounts with appropriate access levels. Current Admins & Moderators								
Students	Username	Role	Actions						
8 Badges	admin_master	Admin	ef Edt						
Analytics	moderator1	Moderator	E Edt						
	+ Add New Admin/Modera	tor							
	Username Enter username								

Fig 9: In This Figure, it Shows the Settings Section of the System.

😭 EdoQuest			12	● € 245/500 (770) (Logout)
n Dashboard	Adventure Dashboa	rd		
 Courses Quests Performance Achievements 	Current Level	X Achievements 8 8/20 Badges Unlocked	 Questions Answered 25 83% Accuracy Rate 	Course Progress 3/5 3 Courses In Progress
 Leaderboard Settings 	Active Quests		2	

Fig 10: In This Figure, it Shows the Student Dashboard Section of the System.



Fig 11: In This Figure, It Shows the Student Courses Section of the System.

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Fig 12: In This Figure, It Shows the Student Quests Section of the System.



Fig 13: In This Figure, It Shows the Student Performance Section of the System.



Fig 14: In this Figure, It Shows the Student Achievements Section of the System.

😭 EdoQuest		12 3 245/500 3 10 Logout
n Dashboard	Leaderboard	
 Courses Quests 	Global Rankings	All Time This Month This Week
Le Performance	Rank 1 Player 1 EXP 1 Badges	1 Last Active
✗ Achievements𝕎 Leaderboard	Jane Dela Cruz 7,800 & 8 Badges	Today, 2:30 PM
Settings	2 John Lim Level 14 7,200 8 7 Badges	Yesterday, 8:15 PM
	3 Ana Reyes 6,900 & 6 Badges	Today, 10:45 AM
	Michael Santos 6,450 8 5 Badges	Yesterday, 3:20 PM
	5 Lisa Tan Level 12 5,980 & 6 Badges	Today. 9:10 AM

Fig 15: In This Figure, It Shows the Student Leaderboard Section of the System.

😭 EdoQuest		★12 🗲 245500 (770) 🕡 Logout
n Dashboard	Account Settings	
CoursesQuests	Profile Settings	
 Performance 장 Achievements 또 Leaderboard Settings 	JDe Jane Dela Cruz Member since April 2023	
	Full Name Jane Dela Cruz Email Address Jane.delacruz@example.com	
	Usemame jane_adventurer	

Fig 16: In This Figure, It Shows the Student Account Settings Section of the System.

VI. **EVALUATION AND RESULTS**

A. Usability Testing

To assess the usability of the gamified educational technology that is used in this study, the research provides a structured usability procedure and was conducted on the Bachelor of Science in Information Technology (BSIT) 4th year students from SEAIT. The main objectives of this study are to understand how the students will interact with the gamified key elements and how those features give impact with their learning experience.

The participant will ask to engage with the gamified system. After that, the respondents will answer the 4-point Likert Scale questionnaire that the researcher provided to understand and know their experience on the system. The survey given focus on the four main areas, the student engagement, motivation, effectiveness and user satisfaction. Each participant will rate their experience in the system usability features in the scale from 4 (Strongly Agree) to 1 (Strongly Disagree). To ensure honesty and unbiased on the feedback, the responses were anonymously collected. A total of 100 BSIT students took part in this survey, providing a valuable insight on how effective the gamified technology to enhance and motivate student in their learning experience.

The researchers collect and analyzed data using the descriptive statistical method, such as mean, standard deviation and frequency distribution. The higher mean means more

positive responses on how the gamified technology influenced the students learning and engagement. The researchers also use a Pearson Correlation analysis to explore how the usability features of the system were aligned on enhancing the student motivation, learning outcomes and academic performance.

B. Performance Metrics

To assess the performance metric of gamified educational technology, the study employed a key metrics such us engagement score, motivation score, learning outcome score and satisfaction score to measure the effectiveness of the gamified system. Engagement score, this measures the average rate on how the students actively participate and interact with the system. Motivation Score, this assessed the motivation of the student and willingness to complete the task within the gamified system. While the learning outcome score, also assess on how well the students to remembered knowledge and performed academically as a result of using the system. Lastly, satisfaction score, this will measure the overall satisfaction and contentment of the students had with their experience in gamified system.

These provided performance metrics is directly aligned with the research objectives by helping the students to understand how the design of the gamified system affect the student engagement, how the gamified tools boost student motivation and whether it help to improvement their academic performance. Additionally, it allows the researchers to assess the overall user satisfaction and compare the gamified

experience with the traditional learning methods to provide a valuable insight of the effectiveness of gamified system into enhancing learning experience.

C. Comparative Analysis

The gamified educational technology developed in this study includes an advanced HCI principles such as userfriendly design, personalized development process and direct feedback mechanism example points, levels and leaderboards. Compared to the traditional education methods, this gamified system creates a more engaging and interactive experience to the learners that can boost their motivation to join the class. As shown by the high mean score of 3.79 -3.87, it describes that the gamified system enhanced the motivation and satisfaction of the students in completing the task and engage more in the teaching. The integration of gamified element features showed a strong correlation between the students with better retention and understanding, it shows on the mean score of 3.59 - 3.85illustrates the improved learning process of the students on the learning environments. Additionally, with the mean of 3.74 it shows that the gamified elements design such us leaderboards and levels and points significantly contribute to the engagements of the students in learning rather than on the traditional method. Therefore, the gamified educational technology offers an innovative and a user-friendly design to keep the student more engage and participative towards the education.

D. Results and Findings

The results on the survey evaluation reveals the high level of consistent on the student engagement, motivation across all category and satisfaction. In terms of engagement, the results revealed a mean score ranged from 3.48-3.74, indicating a high high percentage of the student that strongly agreed that the gamified elements helped the students to stay engage and focused on their academic task. Moreover, in motivation it also showed a similar pattern with the mean score between 3.51 and 3.79 signifying that the game like design features of the gamified system helps to boost the student motivation to completing the academic task and activities. On the other hand, in learning outcome, based on the survey results with the mean scores reaching up to 3.85, emphasizes the gamification effectiveness towards the learning environment of the students. It also enables a deeper and more meaningful experience among the students in their learning experience.

Additionally, satisfaction also receive a high percentage agreement with the mean score that ranging from 3.66 up to 3.87, especially in terms of enjoying the use of system and a willingness to recommend it to others. Aside of that the achievement of new levels or rewards is considered as one of the most satisfying aspects for the students where they are motivated to do more and boost their confident to in the class. However, if there a positive also theirs a negative impact, the results shows that some aspect slightly had a lower score, it observed and it related to peer recommendation and competitiveness, highlighting that the student may have a varied response towards the social comparison features such as leaderboards that some students find it more frustrating due to the ranking.

VII. DISCUSSION

A. Interpretation of Findings

The findings in this study offers significant evidence in response to the research questions emphasizing the positive effect of gamified elements like points, leaderboards and levels on the different aspects of the learning experience.

Research Question 1. How does the gamified system based on a specific elements design like points, leaderboards and levels impact the student engagement on learning environments?

The results show a strong agreement from students regarding the role of gamified elements in improving the student engagements. The mean score ranging from 3.38 to

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3.74, indicates that a game like features such as points, progress tracking through level and leaderboards is effective in keeping the students to be participative and focus on the learning activities. Students stated that with these gamified elements make the activities and task more interesting and enjoyable, also encourage students to be actively participate and motivate on the task. Thus, this promotes that the gamification in education successfully make the traditional academic task into more engaging learning experience.

Research Question 2. In what ways does the gamified elements features affect the student motivation in participating academic performance.

The survey results illustrate that the gamification is strongly affect the student motivation in participating on the lesson. With the mean score ranging from 3.51 to 3.79 with the standard deviation of 0.45 indicating a strong agreement of the respondents towards motivation. Results shows that the student is feeling more motivated to complete their task, perform better and remain engage to the task or lesson in the presence of rewards, challenges and even the chance to level up. Through badges, rankings and progress also serves as motivation for the students to complete the task in an enjoyable way. Thus, these finding suggest that gamified features also support the mental development of the student making the effort of learning more focused and rewarding.

Research Question 3. How effective does the gamification strategy and their design elements in improving students learning outcomes and academic performance?

Results shows that in the effectivity of gamified system to the learning outcome of the students indicating a strong agreement with a mean value that reaching up to 3.85 with a standard deviation of 0.52. Most of the students agreed that gamified elements enhance their understanding towards the lesson, also in recalling the information effectively. Moreover, students states that they more likely to put more efforts into academic task and performance while using the gamified system, it improves their performance and maintaining engage towards the lesson. Thus, these finding offers that a gamified system can serve as a valuable educational method to promotes a better learning effects and deep learning.

Research Question 4. To what extend does the gamified elements design contribute to the student satisfaction compared to the traditional learning method.

The survey results showed a high level of satisfaction with the gamified learning experience, with the mean scores ranging from 3.66 up to 3.87 with a standard deviation of 0.43. Students state that they found the system enjoyable to use, interaction and more convenient rather than the traditional learning methods. Students highly appreciate the achievement features like the ranking or even proceeding to the other levels. However, the results show a lower score satisfaction on the features that is related to social assessment like leaderboards or ranking receiving a mixed response. Overall, the students showed a clear preference of the gamified learning system over the traditional methods, highlighting the system effectiveness in offering satisfaction and more interactive and enjoyable experience on learning.

Overall, the analysis of the survey tally supports the conclusion that the gamified technologies enhance the student engagement, motivation, system effectiveness and satisfaction on the learning environments. These findings suggest that the integration of the gamified elements like rewards, badges and leaderboards helps to boost the student motivation to keep engage or participative and complete the task and performance easily with efforts and feeling happy.

 Table 1: Mean Range Interpretation (Likert Scale Guide)

Mean Scale		Description		
	4	Strongly Agree		
	3	Agree		
	2	Disagree		
	1	Strongly Disagree		

This table shows how mean scores from 1.00 to 4.00 are interpreted (e.g., Strongly Agree to Strongly Disagree) for

Likert-scale responses. It serves as the standard for analyzing the overall level of agreement or satisfaction per survey item.

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Table 2: Impact of Gamified Elements (Points, Levels, Leaderboard	ds) on Student Engagement
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Impact of Gamified Elements (Points, Levels, Leaderboards) on Student Engagement	Mean	Standard Deviation	Interpretation
The use of points in the system keeps me engaged in learning activities.	3.74	0.52	Strongly Agree
I feel motivated to participate in activities when I see my progress through levels.	3.53	0.65	Strongly Agree
Leaderboards encourage me to compete and stay engaged with learning tasks.	3.67	0.49	Strongly Agree
The gamified elements (points, levels, leaderboards) make learning activities more interesting.	3.70	0.53	Strongly Agree
I feel more involved in my studies due to the gamification features.	3.49	0.56	Strongly Agree
The feedback provided by gamified elements (such as points or rankings) is helpful in motivating me.	3.48	0.57	Strongly Agree
The progress-tracking system (points/levels) helps me stay focused on my academic goals.	3.51	0.52	Strongly Agree
I am more willing to participate in tasks because of the game-like features.	3.64	0.48	Strongly Agree
The visual representation of achievements (like badges or levels) increases	3.63	0.47	Strongly Agree
my motivation to engage.	5.05	0.47	
The competitive aspect of leaderboards enhances my willingness to participate.	3.52	0.50	Strongly Agree

This table shows how users rated the Impact of Gamified Elements (Points, Levels, Leaderboards) on Student

Engagement. The results indicate strong agreement that gamified element enhance the student engagement in learning.

Table 3: Influence of Gamified Features on Motivation					
Influence of Gamified Features on Motivation	Mean	Standard Deviation	Interpretation		
I feel more motivated to complete academic tasks because of the gamified features.	3.79	0.46	Strongly Agree		
Gamified design features make me excited to start new learning tasks.	3.70	0.47	Strongly Agree		
The reward system (points, badges) motivates me to perform better academically.	3.67	0.49	Strongly Agree		
The gamified system makes the learning process feel more rewarding.	3.77	0.44	Strongly Agree		
I feel motivated to study harder because I can earn rewards or level up.	3.67	0.43	Strongly Agree		
The game-like challenges in the system encourage me to push myself further in my studies.	3.57	0.45	Strongly Agree		
I enjoy learning more because of the points and rewards I can earn.	3.56	0.44	Strongly Agree		
The desire to reach the next level encourages me to complete academic tasks.	3.67	0.44	Strongly Agree		
The gamified design features help me stay motivated when tasks become difficult.	3.75	0.44	Strongly Agree		
I am more likely to finish tasks on time due to the gamified elements.	3.51	0.47	Strongly Agree		

This table shows how users rated **influence of gamified features on motivation**. The results indicate strong agreement that gamified element features motivate the student to complete the task and performance with efforts and motivated.

Table 4: Effectiveness of Gamification in Enhancing Learning Outcomes

Effectiveness of Gamification in Enhancing Learning	Mean	Standard	Interpretation
Outcomes		Deviation	
Gamified elements help me better retain the information learned.	3.59	0.576	Strongly Agree
The use of points and levels improves my ability to recall lessons and activities.	3.54	0.572	Strongly Agree
Gamification encourages me to put more effort into completing academic tasks.	3.79	0.536	Strongly Agree
The reward system enhances my understanding of the material.	3.85	0.446	Strongly Agree
I perform better academically when gamification features are involved.	3.72	0.524	Strongly Agree
Gamified activities are more effective for learning compared to traditional methods.	3.50	0.607	Strongly Agree
The interaction with the gamified system makes the learning process more effective.	3.64	0.492	Strongly Agree
I believe that using gamified features helps me learn more efficiently.	3.67	0.495	Strongly Agree
Gamified challenges improve my overall learning experience.	3.74	0.473	Strongly Agree
I have a better understanding of the subject matter due to the gamification of the lessons.	3.61	0.493	Strongly Agree

This table shows how users rated effectiveness of gamification in enhancing learning outcomes. The results indicate strong agreement that gamification in education can

enhance the student learning outcomes by making them enjoy and participative on the learning outcomes.

Table 5: Student Satisfaction with Gamified Learning Experiences					
Student Satisfaction with Gamified Learning Experiences	Mean	Standard	Interpretation		
		Deviation			
I am satisfied with the overall experience of using gamified learning tools.	3.76	0.49	Strongly Agree		
I enjoy using the gamified system for my learning.	3.84	0.38	Strongly Agree		
The game-like features (points, badges, levels) make learning enjoyable.	3.72	0.43	Strongly Agree		
I prefer using gamified tools over traditional learning methods.	3.79	0.43	Strongly Agree		
The gamified system meets my learning needs and expectations.	3.70	0.43	Strongly Agree		
I would recommend the gamified learning system to my peers.	3.66	0.48	Strongly Agree		
The design of the gamified system is engaging and user-friendly.	3.75	0.44	Strongly Agree		
I feel that the gamified system makes learning more fun and interactive.	3.75	0.43	Strongly Agree		
I feel satisfied when I achieve a new level or earn rewards in the system.	3.87	0.36	Strongly Agree		
Overall, I am happy with how gamification enhances my learning experience.	3.67	0.43	Strongly Agree		

This table shows how users rated student satisfaction with gamified learning experiences. The results indicate strong

agreement that gamified system provide a satisfaction on the learning experience of the students.

Table 6: Overall Tally of Responses and Means						
Statement	Mean	Standard	Level's Interpretation			
		Deviation				
Impact of Gamified Elements (Points, Levels, Leaderboards)	3.59	0.53	Strongly Agree			
on Student Engagement						
Influence of Gamified Features on Motivation	3.67	0.45	Strongly Agree			
Effectiveness of Gamification in Enhancing Learning	3.67	0.52	Strongly Agree			
Outcomes						
Student Satisfaction with Gamified Learning Experiences	3.75	0.43	Strongly Agree			
Overall:	3.67	0.48	Strongly Agree			

This table compiles all survey results, showing average scores and standard deviations for each item. It reveals that while most scores fall in the "Strongly Agree" or "High" range.

B. Contributions and Innovation

This study contributes to the advancement Human Computer Interaction field by providing an insight on how the gamified educational technology affects the user satisfaction and enhances educational learning outcomes. It illustrates how the gamification principles with an integrated usability design improves the user engagement and motivation in learning activities. Specifically, it examines the gamified system to offer an innovative solution that validates the practical benefits of implementing a gaming like design features in educational platforms. By focusing on the engagement, motivation, effectiveness and satisfaction, the study emphasizes the effectiveness of gamification in education to enhance the users learning experience. Also, it introduces a student tested framework for evaluating the gamified system through descriptive statistics and 4-point likert scale analysis, providing a well-structured approach to analyze the effect of gamification in educational platforms. Moreover, this study also gives an innovative solution like adding a reward on the gamification system to catch the users interest in learning, providing an actual feedback and visual tracking of achievements. These insights provide not only to validate the effectiveness of gamification in educational platforms also to contribute some applications of an interactive designs.

C. Limitations and Future Work

While this study presents a significant insight on how the gamified system is effective to the educational platform, there are some limitations on this study. This study is only conducted at the SEAIT institution, it will limit the general findings on the other educational institution. The result may vary due to the limited groups that is involved. Also, this study only uses a descriptive research design, although this design is effective it will not ensure that theirs a deep understanding on the gamified system. By this method, the study will give a confusion on the used gamified elements and on the learning outcomes. Additionally, the gamified system used in this study clearly not stated an accurate learning style to adapt in the user's needs.

To address these limitations, the future research would consider to expand the scope of the study and include more institutions. This will help to determine the effect of the gamification in education is a true and accurate due to have a larger scope to observed the patterns. Moreover, adapting a learning style on the gamified system is to be consider to enhance the effect of gamification on education. Additionally, adapting an artificial intelligence on the gamification to support to give a real time feedback and examine the long-term effect of gamification on the enhancement of the student engagement and motivation on learning.

VIII. CONCLUSION

A. Summary of Key Findings

This study was to develop a gamified technologies on education to enhance the student engagement and motivation in learning. Based on the survey data, the participants generally rated the system positively, especially on the aspect of student engagement, motivation, effectiveness and satisfaction of the system. Most of the responses illustrates a strong agreement (RQ1) of the gaming like features design on the system that it helps to keep the student focus and participative the learning task and performance. Moreover, these gamified elements make the learning more enjoyable and interested that makes the student boost their motivation to complete the task, perform better and remains engage to the task or lesson in the presence of rewards, challenges and even the chance to level up (RQ2). The results clearly stated that the students agreed that gamified elements enhance their understanding towards the lesson, also in recalling the information effectively and they more likely to put more efforts into academic task. performance while using the gamified system (RQ3) and provide satisfaction in using the system (RQ4).

B. Final Remarks

The research journey underscored the exploration of the gamification educational technologies on the enhance of the student's engagement, motivation, effectiveness and satisfaction on the learning. From the creation of the design of the system up to evaluating the 100 students on BSIT have been provided an significant insight towards the effectiveness of the

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gamified system on the educational platforms. The integration of game like elements design on the system like rewards, badges and ranking helps the student to motivate and keep participative on the lesson task and activities, also it showed strong positive feedback on all areas that being measure using the descriptive analysis and usability testing. The results confirm that to make the learning more interactive and enjoyable due to the rewards and leaderboards that make the students more actively participate and motivated on the learnings. Furthermore, continuous improvements based on the user feedback will be important to create a real time feedback and keep long term use of the gamification in educational platforms.

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APPENDICES

Appendix A: Interview Questions

- How would you describe your overall experience with the current donation system at SEAIT?
- In your opinion, what specific features or functionalities are missing or need improvement in the current system?
- What design or interface qualities do you believe would make the donation system more user-friendly and accessible?
- How important is transparency in a digital donation system, and how does it influence your trust in the process?
- How does the usability of the donation system affect your willingness to engage with or recommend it to others?

Appendix B: Survey Responses

QUESTIONNAIRE

Instructions

Thank you for taking the time to participate in this questionnaire. This study aims to gather your insights and experiences regarding the use of gamified educational technologies and how they impact your learning, motivation, engagement, and satisfaction. Please read each statement carefully and indicate the extent to which you agree or disagree by putting a check (\checkmark) in the box that best represents your opinion, based on the scale below:

Scale	Description
4	Strongly Agree
3	Agree
2	Disagree
1	Strongly Disagree

There are four (4) sections in this questionnaire. Each section focuses on a specific area related to gamified educational technologies. Kindly respond honestly based on your personal experience with the system.

Your responses will be kept strictly confidential and will only be used for research purposes.

Name:	C
Block & Year:	0

Impact of Gamified Elements (Points, Levels, Leaderboards) on Student Engagement

Questions	1	2	3	4
The use of points in the system keeps me engaged in learning activities.				
I feel motivated to participate in activities when I see my progress through levels.				
Leaderboards encourage me to compete and stay engaged with learning tasks.				
The gamified elements (points, levels, leaderboards) make learning activities more				
interesting.				
I feel more involved in my studies due to the gamification features.				
The feedback provided by gamified elements (such as points or rankings) is helpful				
in motivating me.				
The progress-tracking system (points/levels) helps me stay focused on my academic				
goals.				
I am more willing to participate in tasks because of the game-like features.				
The visual representation of achievements (like badges or levels) increases my				
motivation to engage.				
The competitive aspect of leaderboards enhances my willingness to participate.				

Influence of Gamified Features on Motivation

Questions	1	2	3	4
I feel more motivated to complete academic tasks because of the gamified features.				
Gamified design features make me excited to start new learning tasks.				
The reward system (points, badges) motivates me to perform better academically.				
The gamified system makes the learning process feel more rewarding.				
I feel motivated to study harder because I can earn rewards or level up.				
The game-like challenges in the system encourage me to push myself further in my				
studies.				
I enjoy learning more because of the points and rewards I can earn.				
The desire to reach the next level encourages me to complete academic tasks.				
The gamified design features help me stay motivated when tasks become difficult.				
I am more likely to finish tasks on time due to the gamified elements.				

Effectiveness of Gamification in Enhancing Learning Outcomes

Questions	1	2	3	4
Gamified elements help me better retain the information learned.				
The use of points and levels improves my ability to recall lessons and activities.				
Gamification encourages me to put more effort into completing academic tasks.				
The reward system enhances my understanding of the material.				
I perform better academically when gamification features are involved.				

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Gamified activities are more effective for learning compared to traditional methods.		
The interaction with the gamified system makes the learning process more effective.		
I believe that using gamified features helps me learn more efficiently.		
Gamified challenges improve my overall learning experience.		
I have a better understanding of the subject matter due to the gamification of the lessons.		

Student Satisfaction with Gamified Learning Experiences

Questions	1	2	3	4
I am satisfied with the overall experience of using gamified learning tools.				
I enjoy using the gamified system for my learning.				
The game-like features (points, badges, levels) make learning enjoyable.				
I prefer using gamified tools over traditional learning methods.				
The gamified system meets my learning needs and expectations.				
I would recommend the gamified learning system to my peers.				
The design of the gamified system is engaging and user-friendly.				
I feel that the gamified system makes learning more fun and interactive.				
I feel satisfied when I achieve a new level or earn rewards in the system.				
Overall, I am happy with how gamification enhances my learning experience.				

RESULTS

Impact of Gamified Elements (Points, Levels, Leaderboards) on Student Engagement	Mean	Standard Deviation	Interpretation
The use of points in the system keeps me engaged in learning activities.	3.74	0.52	Strongly Agree
I feel motivated to participate in activities when I see my progress through levels.	3.53	0.65	Strongly Agree
Leaderboards encourage me to compete and stay engaged with learning tasks.	3.67	0.49	Strongly Agree
The gamified elements (points, levels, leaderboards) make learning activities more interesting.	3.70	0.53	Strongly Agree
I feel more involved in my studies due to the gamification features.	3.49	0.56	Strongly Agree
The feedback provided by gamified elements (such as points or rankings) is helpful in motivating me.	3.48	0.57	Strongly Agree
The progress-tracking system (points/levels) helps me stay focused on my academic goals.	3.51	0.52	Strongly Agree
I am more willing to participate in tasks because of the game-like features.	3.64	0.48	Strongly Agree
The visual representation of achievements (like badges or levels) increases my motivation to engage.	3.63	0.47	Strongly Agree
The competitive aspect of leaderboards enhances my willingness to participate.	3.52	0.50	Strongly Agree

Influence of Gamified Features on Motivation	Mean	Standard Deviation	Interpretation
I feel more motivated to complete academic tasks because of the gamified features.	3.79	0.46	Strongly Agree
Gamified design features make me excited to start new learning tasks.	3.70	0.47	Strongly Agree
The reward system (points, badges) motivates me to perform better academically.	3.67	0.49	Strongly Agree
The gamified system makes the learning process feel more rewarding.	3.77	0.44	Strongly Agree
I feel motivated to study harder because I can earn rewards or level up.	3.67	0.43	Strongly Agree
The game-like challenges in the system encourage me to push myself further in my studies.	3.57	0.45	Strongly Agree
I enjoy learning more because of the points and rewards I can earn.	3.56	0.44	Strongly Agree
The desire to reach the next level encourages me to complete academic tasks.	3.67	0.44	Strongly Agree
The gamified design features help me stay motivated when tasks become difficult.	3.75	0.44	Strongly Agree
I am more likely to finish tasks on time due to the gamified elements.	3.51	0.47	Strongly Agree
Effectiveness of Gamification in Enhancing Learning Outcomes	Mean	Standard	Interpretation
		Deviation	
Gamified elements help me better retain the information learned.	3.59	0.576	Strongly Agree
The use of points and levels improves my ability to recall lessons and activities.	3.54	0.572	Strongly Agree
Gamification encourages me to put more effort into completing academic tasks.	3.79	0.536	Strongly Agree
The reward system enhances my understanding of the material.	3.85	0.446	Strongly Agree
I perform better academically when gamification features are involved.	3.72	0.524	Strongly Agree
Gamified activities are more effective for learning compared to traditional methods.	3.50	0.607	Strongly Agree
The interaction with the gamified system makes the learning process more effective.	3.64	0.492	Strongly Agree
I believe that using gamified features helps me learn more efficiently.	3.67	0.495	Strongly Agree
Gamified challenges improve my overall learning experience.	3.74	0.473	Strongly Agree

I have a better understanding of the subject matter due to the gamification of the lessons.	3.61	0.493	Strongly Agree
Student Satisfaction with Gamified Learning Experiences	Mean	Standard Deviation	Interpretation

		Deviation	
I am satisfied with the overall experience of using gamified learning tools.	3.76	0.49	Strongly Agree
I enjoy using the gamified system for my learning.	3.84	0.38	Strongly Agree
The game-like features (points, badges, levels) make learning enjoyable.	3.72	0.43	Strongly Agree
I prefer using gamified tools over traditional learning methods.	3.79	0.43	Strongly Agree
The gamified system meets my learning needs and expectations.	3.70	0.43	Strongly Agree
I would recommend the gamified learning system to my peers.	3.66	0.48	Strongly Agree
The design of the gamified system is engaging and user-friendly.	3.75	0.44	Strongly Agree
I feel that the gamified system makes learning more fun and interactive.	3.75	0.43	Strongly Agree
I feel satisfied when I achieve a new level or earn rewards in the system.	3.87	0.36	Strongly Agree
Overall, I am happy with how gamification enhances my learning	3.67	0.43	Strongly Agree
experience.	5.07		