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The effect of online learning engagement improvement in a gamification environment using the Gamiplus application

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Abstract

The purpose of this research was to study the effect of learning engagement in a gamification environment and learner satisfaction using the Gamiplus application. The sample was a total of 33 students of the Faculty of Education, Thonburi Rajabhat University, Thailand. The tools used in the experiment were the: (1) Self-assessment form for learning engagement; (2) Learning engagement rubric; (3) Gamiplus application; and (4) Questionnaire for satisfaction towards learning with Gamiplus. The self-assessment form had a reliability of .960. The learning engagement rubric had a positive statistically significant Pearson correlation coefficient at .05 (r_{xy} = .982). Data were analyzed using the dependent *t*-test statistical analysis and one-way repeated measure ANOVA scores of the 1st, 3rd, and 5th trials. The results showed that: (1) the mean score of learning engagement from the self-assessment form after the experiment was statistically significantly higher than before the experiment at .05; and (2) the one-way repeated analysis of variance found that the mean score of learning engagement in each study was statistically significantly higher at .05, and the overall learners' satisfaction was at a high level (M = 4.45, SD = 0.71).

Introduction

Over the past 2 years, the coronavirus outbreak has affected all levels of education. Teaching and learning have shifted from traditional classroom learning to online learning, which challenges the transformation of teaching and learning processes as well as the adaptation of teachers and learners. Amid the coronavirus outbreak crisis, there are continuous challenges to modify strategies to motivate learners to focus and participate in online teaching and learning activities ranging from teaching and learning processes to adaptation to technology usage (Amnouychokanant et al., 2021; Toquero, 2020).

Most problems found in online learning are learners' lack of concentration, decreased learning efficiency, or boredom. This may be a result of learning with a lack of motivation and engagement. Learners' engagement is the result of in-class interactions by hands-on action (Barkley, 2010). To enhance learning engagement, creating a learning environment in which learners can participate in learning

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activities with challenges can mean the use of the game context in teaching and learning, known as gamification (Miller, 2013). Learning in a gamification environment contributes to the development of learning engagement, helping learners succeed in solving problems, and promoting challenges, curiosity, and imagination to learn. Learning in a gamification environment can be seen as a tool for engaging learners to increase their learning interaction and engagement (Bouchrika et al., 2021; Park et al., 2019; Zainuddin et al., 2020).

With online learning, interaction, and engagement while learning is crucial in terms of the learners' efficiency. To manage online learning using cloud technology, there are several platforms to help students organize learning, provide easy access to the content, and promote learning engagement (Albashtawi & Al Bataineh, 2020). In addition, Kumar and Sharma (2021) studied cloud-based learning systems that support learning and understanding, motivation, and online learning. They found that there are many outstanding cloud platforms, and Google Classroom is one of the platforms that support learning. According to Todorov (2022), there are more than 150 million users of Google Classroom worldwide because the platform is user-friendly for teachers and students and supports multiple collaboration presentations. Regarded as an interesting platform for learners, Google Classroom supports add-on development for a gamification environment that promotes leaners' engagement.

The researcher was interested in studying the learning engagement using a gamification environment in the Google Classroom learning platform. The aim was to promote engagement in the online learning environment using Gamiplus as an add-on to enhance Google Classroom's ability with the gamification environment to promote collaboration and learners' engagement in learning. This may be helpful as the application of the add-on can further develop other areas of a gamification environment.

Literature Review

Learning Engagement

Engagement in learning is a way to promote learning, reduce boredom, and allow learners to enjoy learning willingly and with interest (Finn & Zimmer, 2012; Kim et al., 2018). Learner involvement is the result of the interaction between active learning and motivation (Barkley, 2010). The learning engagement consists of 3 main components, namely: (1) behavioral; (2) emotional; and (3) cognitive learning engagement. For example, Lavoué et al. (2021) studied and analyzed the learners' interactions in a gamification learning environment. Likewise, research by Bouchrika et al. (2021) found that gamification can affect student learning, engagement, and level of interaction in e-learning, where gamification can be a valuable tool in attracting more users to the educational system and increases student interaction and engagement. Moreover, Zainuddin et al. (2020) conducted a study and found that the use of gamification promotes learning and attracts learners to engage and enjoy learning. From literature reviews, it can be observed that gamification helps promote learning and engagement.

Online Learning

Online learning is a teaching and learning method that uses technology to distribute content and teaching activities, thus, it offers more independent resources for learning (Zheng et al., 2019). To facilitate online learning for the students, the learning management platform is also important. Today, there are many interesting platforms. Among them, Google Classroom is a popular and widely used platform. The interesting features of Google Classroom are presented in Table 1. Based on the popularity and features, this research chose Google Classroom as the learning platform by developing a gamification environment add-on to enhance the

Table 1 Interesting features of Google Classroom

Interesting features	Free	Easy to use for teachers	Easy to use f or learners	Have tools to support student collaboration	Have a rubric scoring system	Have an easy-to-install add-on to optimize Google Classroom	Able to add many forms of teaching materials - for example, YouTube documents	Have a convenient communication channel	Easy to add students
Google Classroom	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: Sharda and Bajpai (2021); Google (2022)

effectiveness of promoting learners' engagement. However, the problems of online learning are the lack of concentration, decreased learning efficiency, and learners' boredom. This may come from learning that lacks motivation or lacks a suitable learning environment. A solution to the problems is using gamification techniques to encourage learners' learning engagement, create an environment for students to enjoy learning, reduce stress, attract learners, and encourage learners to willingly participate in the learning and activities organized online (Donath et al., 2020; Fajri et al., 2021; Handayani et al., 2021; Şahin & Yurdugül, 2022).

Gamification Learning Environment

Gamification refers to the learning environment management that stimulates learners' interest while promoting engagement via competitions. Gamification adapts the elements of games to the context of learning by addressing the responses learners' have towards games mechanisms. Gamification is categorized as a pedagogical innovation that enhances learners' engagement and promotes learning (Contreras-Espinosa & Gomez, 2020; Zichermann & Cunningham, 2011). This study applied a total of 7 mechanisms (Kuo & Chuang, 2016; Werbach & Hunter, 2012; Zichermann & Cunningham, 2011), including: (1) score, (2) success badge, (3) goal, (4) progress status, (5) rules, (6) feedback, and (7) difficulty level. Implementing gamification in teaching and learning can stimulate and encourage learners' engagement. This is consistent with research by Filippou et al. (2018); Rojas-López et al. (2019); and Zainuddin et al. (2020) who studied learning engagement by using a gamification environment and found that the gamification environment contributes to the development of learners' engagement, helps students to solve problems in learning, and attracts learners to be involved and enjoy learning. Gamification can be a valuable tool in attracting more users to the educational system. It also increases learners' interaction and engagement. Research has shown that learning in a gamification environment contributes to the development of learning engagement and helps students succeed in solving problems. Learning in a gamification environment can be seen as a tool for engaging learners to increase their interaction and engagement in learning (Bouchrika et al., 2021; Park et al., 2019; Zainuddin et al., 2020).

Gamiplus Application

The Gamiplus application is an add-on to Google Classroom, developed by the Educational Innovation and Invention Research Unit at Chulalongkorn University. Gamiplus empowers teachers to create a gamification environment in Google Classroom that includes digital badges, a leaderboard, and a level, which can be operated by the teacher. Users can operate this as an add-on, which can be installed through Google Workspace Marketplace and can be used for free by connecting to the teacher's Google Account as an add-on. Gamiplus will retrieve information about students, courses, and students' grades from Google Classroom for digital badges. Teachers can submit the development in the leaderboard and level by creating a link to send to students or a Google Classroom announcement in the course. Students do not need to install Gamiplus. Some interesting Gamiplus features used to increase learners' engagement include the digital badges that can be identified as stars ☆☆☆ to increase the score on each badge, leaderboard, and level. Also, learners can check their digital badge level scores when clicking on their name list. Moreover, teachers can customize digital badges or levels according to the course or assigned activities.

Conceptual Framework

From the literature review of learning engagement, online learning, gamification learning environment, and Gamiplus application, the conceptual framework of this research was developed to blend the online learning with cloud technology and mechanisms of gamification conducted through Google Classroom with the installed Gamiplus gamification environment add-on, based on relevant ideas, theories, and studies as shown in Figure 1.

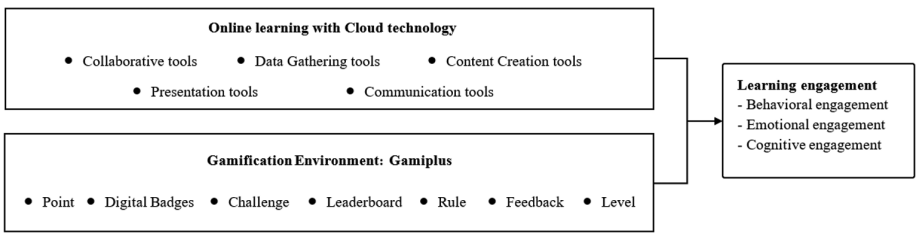

Figure 1 Conceptual framework

Research Questions

This research studied the learning engagement in the educational gamification environment of the students of the Faculty of Education, Thonburi Rajabhat University, Thailand, and their satisfaction with the use of gamification environment in learning. The research questions were as follows:

1. What is the learner's learning engagement when studying with the gamification environment using the Gamiplus application?

2. What is the learner's satisfaction when studying with the gamification environment using the Gamiplus application?

Methodology

This research was designed as the quasi-experimental research by using the self-assessment form for learning engagement and the engagement checklist form to study the engagement behavior of the learners. For the experimental model, the data from the self-assessment in learning engagement were collected before and after the experiment. Meanwhile, the data from the engagement checklist were collected in the 1st, 3rd, and 5th experiments. The experiment would be conducted through Google Classroom with the installed Gamiplus gamification environment add-on. After completing the study, there would be a questionnaire to evaluate the satisfaction from learning with Gamiplus.

Participants

This study was conducted at Thonburi Rajabhat University, Thailand, in the academic year 2021, with a total of 33 students participating from the Faculty of Education majoring in Social Science. The criteria for selecting the participants were: (1) studying in an institution that is ready for learning with technology; (2) equipped with mobile learning devices necessary for the experiment such as a tablet computer and Wi-Fi Internet; and (3) willingness to participate in this study. Participants were required to participate in the experiment and complete all the scheduled activities on a voluntary basis. There were 4 study hours per week in class as well as self after-class work.

Materials and Tools

The instruments employed in the experiment were:

1. Self-assessment form for learning engagement which consisted of questions on a 5-level scale. The developed and improved assessment form according to the experts' recommendations was tested with a tryout group of 30 learners with qualities similar to the sample to check the validity of the questionnaire using Cronbach's alpha-coefficient, which was found to be .960.

2. Learning engagement checklist on a 5-level scale. The developed and improved checklist form according to the experts' recommendations was tested for internal conformity, which resulted in a positive statistically significant Pearson correlation coefficient at .05 (r_{xy} = .982).

3. Learning satisfaction with Gamiplus questionnaire on a 5-level scale. The developed and improved questionnaire according to the experts' recommendations was tested with a tryout group of 30 learners with qualities similar to the sample to check the validity of the questionnaire using Cronbach's alpha-coefficient, which was found to be .982.

4. The expert-approved Google Classroom, Innovation and Digital Social Media Studies course installed with the Gamiplus application gamification environment was found to be suitable and could be used in teaching and learning (M = 4.31, SD = 0.26).

Data Collection

In this research, the researchers set a schedule for each week's activities. In each week, there were scores for engagement in activities, submissions, interactions, and extra scores for answering each week's questions in the Innovation and Digital Media Social Studies course. The data collection process took 7 weeks to complete. The details are shown in Figure 4. The digital badge, leaderboard, and level images from the research are shown in Figure 2 and Figure 3.

Data Analysis

The data were analyzed using a comparative analysis of score differences from the self-assessment of learning engagement before and after learning via the dependent t-test statistical test. Data were analyzed to compare the differences in engagement scores from the learning engagement rubric from the 1st, 3rd, and 5th learning activity using one-way repeated measure ANOVA. Also, the data from the learning feedback questionnaire were analyzed using frequency, percentage, and standard deviation.

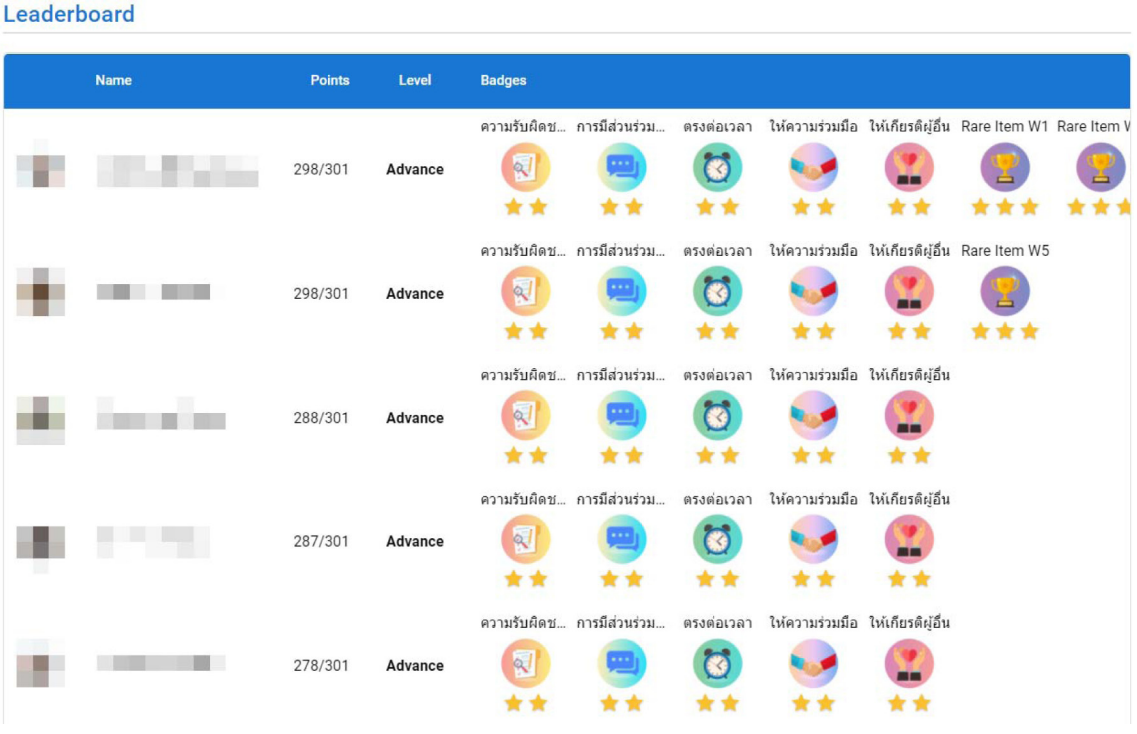

Figure 2 The learners' digital badge on the leaderboard

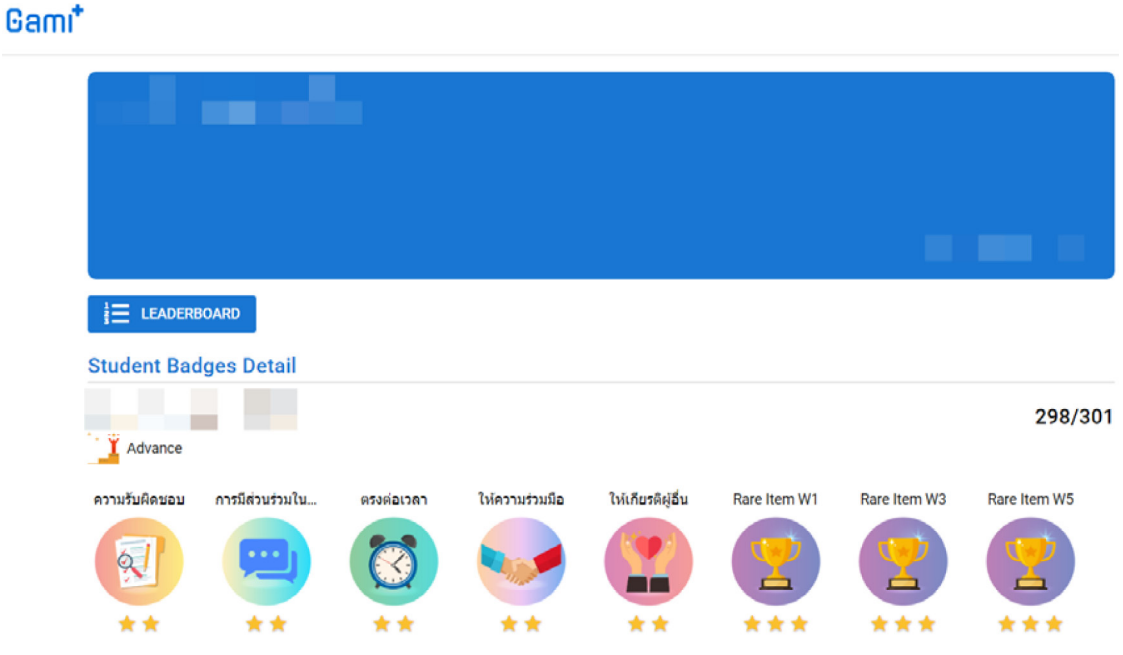

Figure 3 The digital badge and level of a learner

Week 1 Student orientation, group students as appropriate, usage introduction, students do self-assessment on their engagement before class.

Weeks 2-6 Conduct a Google Classroom class with Gamiplus online gamification environment on the topic: Creating Digital Media with Local Wisdom Learning Resources.

1. Teachers provide knowledge by giving examples of media and activities suitable to promote the local wisdom resources, give work examples to create interest (can be recorded as a video clip for after-class study), and implement learning activities according to the 6 steps of local knowledge resources.

Step 1 - Guideline and planning for applying classroom studies to the community. Teachers provide planning topics about the search for information from local wisdom learning resources.
Step 2 - Study and explore local wisdom learning resources. Teachers observe the learners' engagement in activities, searches, and traces of work in Google Jamboard and Google Docs.
Step 3 - Discussion and exchange of findings and reflection of knowledge gained from community wisdom. Teachers observe the learners' engagement in the activities, discussions, opinion sharing, and traces of work in Google Jamboard and Google Docs and suggest additional resources if learners have questions through the online system.
Step 4 - Production of works from local wisdom learning resources. Teachers assign learners to develop the work that they have chosen at the beginning with a determined submission date (Canva, PowToon, Thinglink, Google Site) and remind students to consider ethics in using resources in the searched community context through the online system.
Step 5 – Presentation and summary of learning outcomes. Teachers and learners share their opinions on other people's work online and provide suggestions and feedback.
Step 6 – Reflection. Teachers reflect on their opinions and give feedback.

Score → **Digital**
- **Badge** - Responsibility
- **Badge** - Engagement
- **Badge** – Punctuality
- **Badge** - Cooperation
- **Badge** – Respecting others

2. After completing all 6 steps, the teachers assign learners to record their learning using the given tools, observe learning engagement behavior, and give awards (digital badges) or scores collected from both individual and group work. According to the results, the outcome is presented in the form of a leaderboard and the teachers inform the learners about answering the challenge questions.

Challenge question → **Rare Item Badge**

Score → **Leaderboard**

Note: All 6 steps would be learned and completed within a week and the media production topic is rotated every week. The evaluated scores of the learning engagement rubric are collected in the 2nd, 4th, and 6th week activities.

Week 7 - Learners complete a self-assessment form on their learning engagement after learning. Summary table of the score.

Figure 4 Activity details

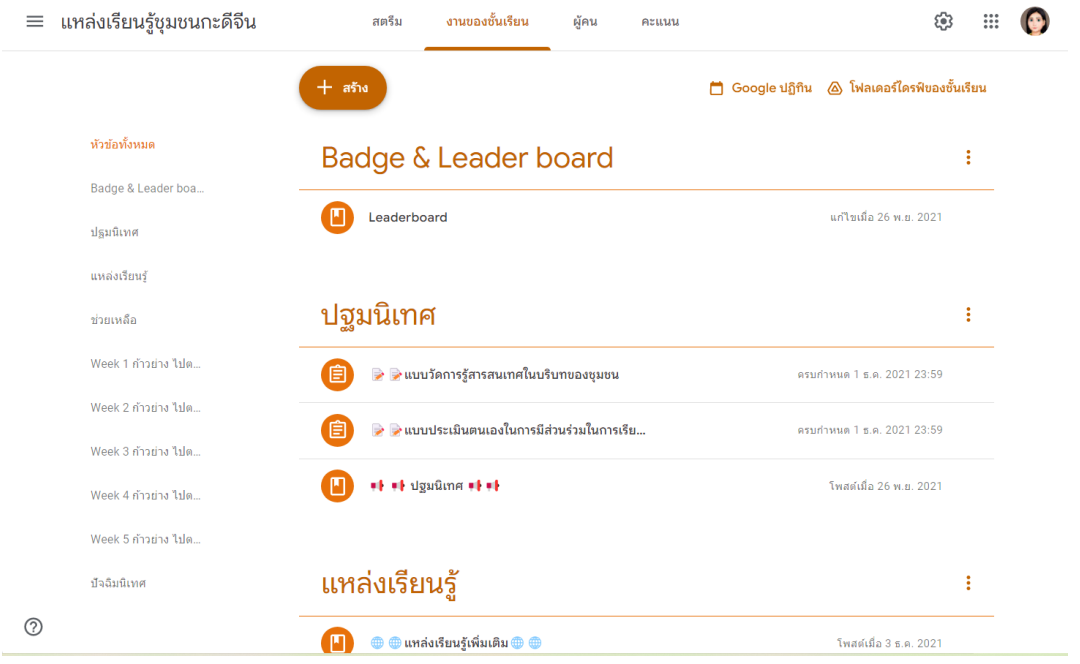

Figure 5 Google classroom screenshot

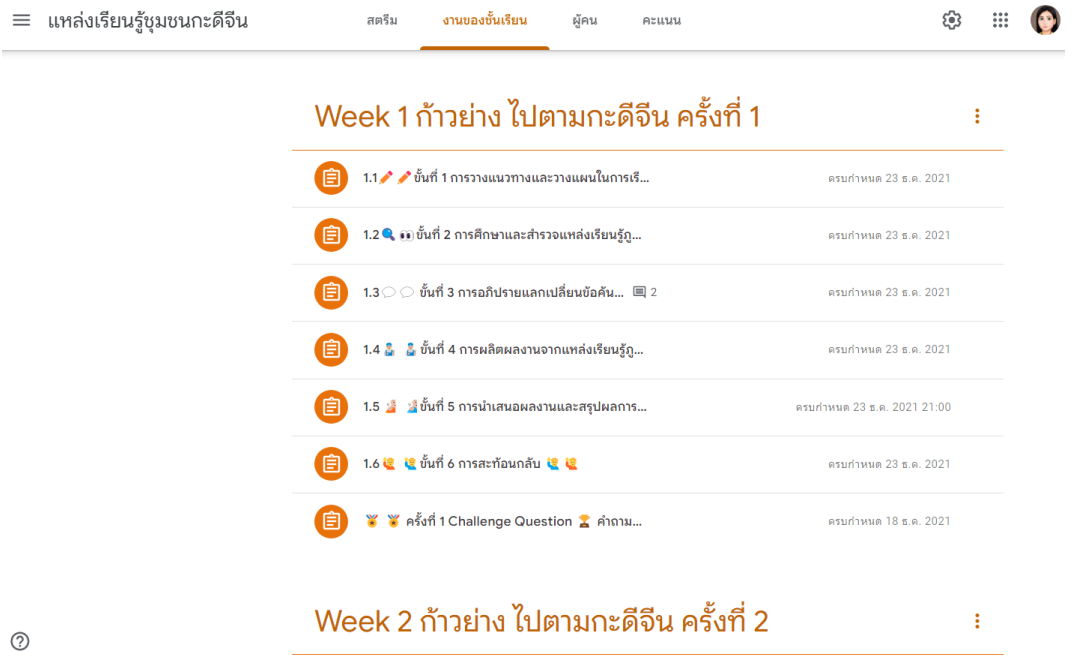

Figure 6 Google classroom screenshot with 6 learning steps

Results

The results from the self-assessment scores of learning engagement before and after learning using a dependent *t*-test statistical test are shown in Table 2. The engagement scores from the assessment checklist of learning engagement rubric in the 1st, 3rd, and 5th learning activity by one-way repeated measure ANOVA are shown in Table 4 and Table 5.

Analysis of the differences of the average scores' comparison from the self-assessment form for learning engagement before and after learning showed that there was a difference at the .05 level ($t = 2.396$; $p = .023$). The scores from the post-test ($M = 4.01$; $SD = 0.61$) were higher than the scores from the pre-test ($M = 3.80$; $SD = 0.62$) as detailed in Table 2.

The results of the Mauchly's Test of Sphericity were found to be significant ($p \leq .05$), suggesting that, the assumption of sphericity was violated in the multiple treatments conducted. The degrees of freedom were adjusted using Greenhouse-Geisser correction, based on which, it was clear that there was a significant difference learning engagement score. Greenhouse-Geisser assumption was used to further analyze the data, the results of which are shown in Table 3.

Table 2 The results of the scores' comparison from the self-assessment form for learning engagement before and after learning

Self-assessment form for learning engagement	*N*	*M*	*SD*	*t*	*p*
Pre-test	33	3.80	0.62	2.396	.023
Post-test	33	4.01	0.61		

Note: $p < .05$.

Table 3 Within-subject effects of learning engagement

Source	Type III sum of square	*df*	Mean Square	*F*	*p*	Partial Eta Squared
Learning engagement Greenhouse-Geisser	1.852	1.582	1.171	15.340	.000	0.324
Error (learning engagement) Greenhouse-Geisser	3.863	50.614	0.076			

Note: $p < .05$.

In Table 4, the engagement scores from the assessment checklist for learning engagement with the highest mean value is the 5th assessment (M = 2.89; SD = 0.21), followed by the 3rd assessment (M = 2.71; SD = 0.32), and the 1st assessment (M = 2.56; SD = 0.44) respectively.

The results of the Bonferroni post hoc tests (Table 5) revealed that the 5th assessment (M = 2.89; SD = 0.21) and the 3rd assessment (M = 2.71; SD = 0.32) had significantly stronger effects than the 1st assessment (M = 2.56; SD = 0.44).

Figure 7 shows the learning engagement, developed over time, throughout the 1st, 3rd, and 5th experiment. Observable from the learning engagement, there is increase from the 1st, 3rd and 5th assessment.

The quantitative data of learners' satisfaction with the use of Gamiplus from the satisfaction questionnaires are shown in Table 6. This signifies that the learners have an overall satisfaction at a high level (M = 4.45, SD = 0.71).

From the study, the use of a gamification environment was found to greatly promote learning engagement. This could be further elaborated from the interview extracts below.

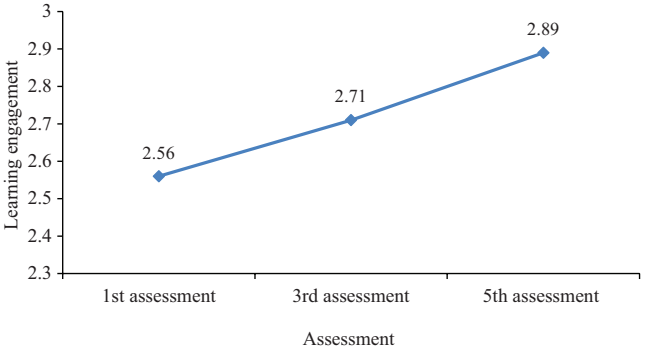

Figure 7 Learning engagement from the 1st, 3rd and 5th assessment

Table 4 The mean and standard deviation of the engagement scores from the assessment checklist for learning engagement rubric between the 1st, 3rd, and 5th experiment

Assessment	*N*	Min	Max	*M*	*SD*
No. 1	33	2.40	2.71	2.56	0.44
No. 3	33	2.60	2.83	2.71	0.32
No. 5	33	2.82	2.97	2.89	0.21

Table 5 The results of a pairwise comparison of the engagement scores from the assessment checklist for learning engagement rubric between the 1st, 3rd, and 5th experiment using one-way repeated measure ANOVA

Assessment		Mean Difference	*SE*	*p*	95% Confidence Interval	
					Lower Bound	Upper Bound
1	3	-0.158*	0.059	.033	-.307	-.010
	5	-0.335*	0.073	.000	-.520	-.150
3	1	0.158*	0.059	.033	.010	.307
	5	-0.176*	0.046	.002	-.293	-.060
5	1	0.335*	0.073	.000	.150	.520
	3	0.176*	0.046	.002	.060	.293

Note: $p < .05$.

Table 6 The mean from the survey on learning from local wisdom resources as a base, using cloud-based technology in a gamification environment with the Gamiplus application

Assessment items	*M*	*SD*	Interpretation
Teaching and learning activities			
1 The usage procedures are clarified.	4.58	0.71	Highest
2 The test is appropriate.	4.58	0.66	Highest
3 The learning activities are appropriate.	4.55	0.56	Highest
Learning system			
1 Easy access to the system	4.48	0.76	High
2 Appropriate letters and illustrations	4.70	0.47	Highest
3 Easily-accessed learning tools	4.55	0.56	Highest
4 Convenient and fast access to each page	4.42	0.71	High
5 Easy to use system layout	4.52	0.62	Highest
6 Easy to understand hyperlink formats	4.36	0.74	High
Overall system components promoting learning engagement			
1 Classroom collaboration using online tools made the collaboration more effective.	4.42	0.71	High
2 I could improve my learning.	4.52	0.62	Highest
3 I could work anywhere, anytime.	3.94	1.14	High
4 I was able to systematically collect my knowledge as well as my friends'.	4.36	0.70	High
5 Using gamification in learning made me enjoy learning more.	4.33	0.82	High
6 I developed systematic thinking.	4.39	0.79	High
7 Using cloud-technology tools in learning made group collaboration more convenient.	4.42	0.71	High
8 Learning with a gamification environment could promote learning engagement.	4.45	0.71	High
Total	4.45	0.71	High

- Implementing a gamification environment was engaging and stimulated learning. Having rewards and displaying scores and skills in each activity encouraged a change in learning behavior. This created the urge to make an effort to participate in every learning activity.

- The learning behavior had changed and improved. It made me want to study. Studying was not boring and was even exciting all the time because various formats make learning more interesting.

- Learning by using gamification techniques encouraged more responsibility. This gave us clear goals in our work. Also, there was an encouragement for group collaboration to win.

- The use of games in teaching encouraged students to be more active in learning. Adding more rewards was positive reinforcement. Students would be interested and enjoy learning as well.

- This made me want to learn more because it focused attention and was not boring. We focused on winning higher ranks in the class. It also developed punctuality to complete work on time.

- Students got more involved, were more encouraged, and focused on rewards, lessons, and goals in playing (learning).

From the context, it could be seen that the implementation of a gamification environment in learning made the learners interested in learning, generated positive behaviors, and encouraged changes in learning behavior in a positive way.

Discussion

According to the results from the learning engagement scores in the gamification environment using the Gamiplus application obtained from the learners' self-assessment, it was found that the mean self-assessment scores for learning engagement after the experiment was statistically significantly higher than the mean score of those before the experiment at .05. The mean engagement score from the assessment checklist for the learning engagement rubric in the 5th lesson was higher than the mean score in the 3rd and 1st lessons at a statistical significance of .05. Also, the learners' satisfaction in using the Gamiplus gamification environment was at a very high level ($M = 4.45$, $SD = 0.71$). This might be due to the ease of use and the possibility of using Google Classroom as the platform, which made learners feel it was more convenient (Abuzant et al., 2021; Albashtawi & Al Bataineh, 2020). Moreover, Gamiplus and Google Classroom were linked as tools that promote collaboration. This was another reason why students could conveniently work and discussed ideas together (Kolyada et al., 2021). In the learning process, teachers and learners met in a synchronous manner, which allowed learners to ask questions and exchange conversations between learners and teachers (Northey et al., 2015). Additionally, online learning with the Google Classroom platform also had interesting features such as easy usage, the ability to connect to student's emails and retrieve learners' basic information, availability to work on all devices and operating systems, and support for collaboration (Al-Samarraie & Saeed, 2018; Google, 2022). For online learning on any platform, using gamification techniques to encourage learners to participate in learning created a fun environment for students to learn, reduced stress, attracted learners' attention, and encouraged learners to willingly participate in learning and activities organized online (Donath et al., 2020; Fajri et al., 2021; Handayani et al., 2021; Şahin & Yurdugül, 2022). Moreover, gamification also resulted in learners' satisfying learning experience which increased the interaction between learners (De La Peña et al., 2021; Murillo-Zamorano et al., 2021).

Conclusion and Recommendation

According to the research results, it was found that the use of gamification environments to improve learners' engagement in online learning promoted engagement, stimulated participation for classroom activities, increased learning efficiency, and elevated the level of engagement as well as motivation while reducing boredom. This applies both in normal conditions and emergency situations such as emerging disease outbreaks. With such applications, the integration of technology can effectively solve learning problems. However, for online learning, engagement is necessary. The problem can be solved by adopting and applying a gamification environment in a suitable and easy-to-use platform with add-ons that can fully meet the needs of teachers. The Gamiplus add-on can satisfy the needs for gamification use in the classroom. It can be easily managed and used by teachers. As for the limitations, more research with different contexts is needed such as studies on the effects on academic achievements or other effects on learners.

Conflict of Interest

The author declares that there is no conflict of interest.

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