Enhancing Self-Regulated Learning through Flipped Classroom and Gamification in Applied Computer for Business Courses

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ABSTRACT

This study examined the impact of a flipped classroom with gamification on students' self-regulated learning (SRL) among students in the Applied Computer for Business course. Research questions addressed: (1) How does this approach affect students' SRL? (2) What are students' perceptions of this method? A mixed-methods approach was employed, using pre- and post-implementation questionnaires, open-ended questions, and interviews. Results indicated a significant increase in SRL across all dimensions, with the mean SRL score improving significantly ($p < 0.05$). The content analysis results showed that 85% of students were satisfied with the instruction, and 78% believed the approach enhanced their learning management skills. The findings suggested that the success of the flipped classroom with gamification depends on providing adaptation support, ensuring internet access, selecting suitable content and activities, and addressing individual differences. Instructors are advised to offer clear explanations, precise gamification planning, and utilize online platforms for real-time updates to enhance the effectiveness of this approach.

1. Introduction

According to the 2020 strategy of Thailand's Ministry of Higher Education, Science, Research, and Innovation (MHESI), the main focuses of these strategies aligned with the 13th National Economic and Social Development Plan (NESDP) (Royal Thai Government, 2020; Education Reform Commission, 2022; Thailand Development Research Institute, 2023) preparing a digitally capable workforce for the 21st-century economy, emphasizing on integrating mobile and online technologies into education, reflecting a global shift towards mobile learning (MHESI, 2020). Therefore, all educational institutions were encouraged to augment student experiences by integrating mobile and online technologies.

The students at this international college, were mostly from Generation Z who were born in 1994 or later. These students were considered to be digital natives who naturally integrated digital technology skills into their learning (Schneider, 2018). The students often struggled with low patience for long-term tasks, leading to inefficient time management. They tended to expect quick results, which could cause frustration or loss of interest when faced with time-consuming and effort-intensive assignments, especially in practical courses that require

assignments or project submissions. Moreover, given the global language of instruction at the International College and the predominance English as a second language students in Thailand, students faced challenges when the instruction for business subjects was in English. The struggle with learning and instruction in English could reduce student engagement and motivation within business learning content and practical courses. This became a challenge for instructors to stimulate students' interest and maintain their engagement in the learning process. To address these issues, innovative teaching approaches such as flipped classroom and gamification emerged as potential solutions.

The flipped classroom, among various contemporary technology integrated pedagogies, exemplified this movement (UNSW, 2020; Sudha, 2019). Number of studies have consistently illustrated that the flipped classroom teaching method is an engaging pedagogical approach that could enhance student motivation. In the context of digital technology integration, the flipped classroom model has been identified as having a positive impact on learning outcomes (Alten et al., 2019). Furthermore, self-efficacy is noted as a significant predictor of academic achievement, with research indicating a positive relationship between student perceptions of the flipped classroom and their motivation and engagement (Xiu & Thompson, 2020; Huynh & Nguyen, 2019; Låg & Sæle, 2019; Tomas et al., 2019). Specifically in Thailand, Jintavee Khlaisang (2019) found the approach to be exceedingly beneficial for higher education students.

The gamification, or the application of game elements in non-game contexts, has been defined as an effective approach for boosting students' self-regulation in learning. The quintessential premise of gamification in education lies in its capacity to embed game elements into the learning experience, thereby bolstering student motivation, self-efficacy, and higher-order thinking skills (Zainuddin, 2018). The gamification could support this learning behavior by helping students regulated and completed their learning goals. Furthermore, the conceptualization of gamification within pedagogical strategies has been operationalized to augment the teaching and learning process. This pedagogical approach necessitates a degree of student autonomy, mandating self-discipline and self-regulation in learning (SRL) to manage personal learning endeavors, particularly in settings outside the traditional classroom and self-managed assignments. The construct of SRL emerges as a pivotal competency within this learning and instruction. According to Zimmerman (1986, 1989) and Panadero (2017), SRL encompasses cognitive, metacognitive, behavioral, motivational, and emotional/affective aspects of learning, each essential for academic success.

The flipped classroom and gamification are two pedagogical approaches gaining traction for their ability to enhance student engagement and motivation. The fusion of the flipped classroom model with gamification has been recognized as a synergistic implementation that enhances educational delivery (Ekici, 2021). Therefore, the combination of flipped classrooms and gamification would not only enhance motivation of learners but also lead to more efficient and effective learning, therefore providing students for the challenges of the digital revolution and globalization.

While these methods intended to enhance student motivation and active participation, their effectiveness in developing students' self-regulated learning (SRL) skills and their reception among students remain areas for investigation. This leads to important questions: How does the integration of flipped classroom and gamification approaches affect students' SRL? What are students' perceptions of this combined method? Hence, this research study was conducted to leverage digital technology to develop and implement appropriate teaching approaches addressing these challenges. The combination of flipped classroom and gamification

techniques was implemented to provide the international students with the necessary encouragement and support for their academic needs.

2. Literature Review

In order to conduct this research, the study of the related principles, theories, and concepts is shown as follows:

2.1. Flipped Classroom

The flipped classroom model has been described as an innovative teaching approach that reversed the traditional teaching models, where learning material occurred at home or outside the classroom, while implemented teaching and learning activities such as exercises and homework took place during classroom time (Låg & Sæle, 2019). This flipped classroom was identified as a distinct teaching and learning approach where the roles of in-class activities and homework were interchanged (Huynh & Nguyen, 2019). This teaching and learning method enabled learners to engage with video-based learning and other learning resources at their own pace, changing homework into the classroom tasks to deepen understanding through interaction and personalized guidance (Nwosisi et al., 2016). It was simplified that students studying instructional material before class and applying this knowledge during in-class activities (Alten et al., 2019). This was multifaceted in its application, encompassing active learning, experiential study, learner engagement, and hybrid course design (Mojtahedi et al., 2020).

Related Research: Tomas et al., (2019) at James Cook University demonstrated the empirical evidence that the flipped classroom could significantly enhance students' engagement, particularly through video resources that supported their learning. Alten et al., (2019) from Utrecht University, revealed result of comprehensive meta-analysis encompassing 114 studies, by that flipped classrooms generally yielded positive impacts on learning outcomes, although no significant effect on student satisfaction was stated.

A research study by Xiu & Thompson (2020) from the University of Illinois, conducted a research investigating the correlation between the implementation of online learning materials in flipped classroom practice and students' motivation and learning performance. The research findings revealed a positive correlation with motivation, and students' self-efficacy was also emerged illustrating a vital academic success and attitudes of students towards the flipped classroom.

In Thailand context, Jintavee Khlaisang (2019) from Chulalonkorn University examined the application of flipped classroom teaching and learning method via the CU Flipped Smart System (CUFS). It was the integration of smart technology with flipped classroom teaching and learning, and gamification. This concept was designed based on cognitive and social constructivism, and self-regulated learning principle. The research result illustrated that flipped classroom approach was significantly effective for higher education students. This could provide practical guidelines for effective implementation in real-world teaching scenarios.

From these evidences, the flipped classroom model could enhance self-regulated learning by allowing students to study at their own pace at home and apply knowledge through interactive in-class activities. Furtheremore, integrating digital technology in learning would amplify these benefits, making the flipped classroom a powerful approach to increase student's self-management, engagement, and motivation, that could lead to better academic outcomes.

2.2. Gamification

The concept of gamification was initially revealed by Brett Terrill on a blog post in a 2008, which was built upon concept previously discussed by Nick Pelling (2002). Terrill defined gamification as the application of game mechanics to non-game contexts to enhance user engagement. The term gained industry drafting in 2010, as it was indicated by Deterding et al., (2011) who defined gamification as the implementation of game elements in the non-gaming contexts which characterized the differences between the attributes of playing and gaming which distinguish between games themselves and their elements.

Gamification Elements: Gamification was characterized by the integration of game-based elements or mechanics, such as points, badges, levels, or leaderboards, to enhance learners' engagement and motivation via competitive dynamics (Baxter, Holderness et al., 2016).

Langendahl, Cook, and Herbert (2016) proposed three types of classification of game elements encompassing surface elements, underlying dynamics, and the gaming experience. Gafni, Achituv, Eidelman, and Chatsky (2018) offer an extensive list of gamification components, referred to as artifacts or mechanics, further expanded upon by Dicheva, Dichev, Agre, and Angelova (2015), who listed common elements including points, levels, badges, trophies, medals, rankings, leaderboards, scoreboards, and virtual goods. These game elements played a critical role in the learning process (Richter, Raban, & Rafaeli, 2015).

Related Research: Ozer et al., (2018) observed that the implementation of gamification within the flipped classroom model was synergistic. This alignment was predicated on gamification's core function: the incorporation of game elements that aimed to elevate learners' motivation, self-efficacy, and advanced cognitive processing (Zainuddin, 2018).

In addition, a research study by Gafni et al., (2018) explored the connection between gamification and motivation of participants. This study differentiated levels of human desire, for instance, rewards, status, success, self-expression, and competition. The integration of extrinsic motivators such as rewards, recognition, and competitive elements was seen as a significant contributory factor in the efficacy of gamification strategies.

Therefore, implementing a flipped classroom with gamification would be able to enhance students' self-regulated learning by combining self-paced study with engaging, game-like elements. This approach could make learning more engagement and enjoyable, enhancing a deeper comprehension and consistent self-regulation in learning.

2.3. Self-Regulated Learning (SRL)

Self-Regulated Learning (SRL) was conceptualized by Zimmerman & Schunk (1989) as the process through which students became architects of their own educational journeys. It entailed the self-initiation of thoughts, feelings, and actions that are systematically tuned to the accomplishment of personal goals (Zimmerman, 2000).

Boekaerts (2002) further explained SRL as the process by which students directed their cognitive and affective capability towards the fulfillment of their learning goals, implementing systematic strategies to achieve these goals.

Pintrich (2000) characterized self-regulation in learning as a dynamic and constructive process that learners establish their learning goals and attempt to monitor, regulate, and control their cognitive, motivational, and behavioral patterns, within the scopes of their learning objectives and environmental contexts.

Components of SRL: Panadero (2017) regarded SRL as a comprehensive framework encapsulating cognitive, metacognitive, behavioral, motivational, and emotional dimensions of learning.

Synthesizing these perspectives, SRL could be understood as a framework demonstrating how students could exert control over their learning trajectories by setting goals and employing strategic monitoring, regulation, and behavioral adjustments to achieve these goals. Therefore, self-regulated in learning comprised of the learners' capability to systematically plan, actively monitor, effectively manage, and critically reflect upon their own learning processes.

The Self-Regulation Formative Questionnaire, was developed by a Research Collaboration (2015). This concept was executed into a reliable instrument that resonated with Pintrich's model of SRL. This questionnaire delineated four integral components of self-regulation, which encompass:

Planning - Learners are required to plan what they would like to accomplish.
Monitoring - The learners monitor their own progress.
Controlling - Learners take control of their own processes, which can be changed.
Reflecting - Learners reflect on how they learn.

Each parts of this questionnaire provided insight into the multifaceted nature of SRL, and served as a practical tool for educators and learners to assess and enhance self-regulatory capacities.

3. Materials and Methods

This research study implemented a mixed-methods methods, incorporating qualitative and quantitative data through self-rating questionnaires and semi-structured interviews.

This research study started with a comprehensive literature review to explore all the related principles, the in-depth theoretical frameworks and empirical research findings relevant to the application of flipped classroom teaching methods integrated with gamification, as well as their impacts on students' self-regulated learning.

3.1. Research Sampling

The target group this research included 15 students from a business program who enrolled in Applied Computer for Business Course. The participants were selected using purposive sampling to ensure participants represented the typical student population for this course. Out of these, five students were randomly chosen as the sample group for the in-depth interview, ensuring a diverse range of perspectives. The self-regulation formative questionnaire was validated by three experts in the field and tested for reliability with a pilot group of 20 students, achieving a Cronbach's alpha coefficient of 0.85.

3.2. Research Instruments

To assess students' self-regulated learning, a self-rating questionnaire was developed based on the Self-Regulation Formative Questionnaire by Noonan & Gaumer (2018) by synthesizing the components of SRL and adjusting the details of items relevant to the teaching and learning process at the international college. The questionnaire included three parts: 1) General information: Collected demographic details of participants; 2) Self-regulation in learning questions : Utilized the Likert five-point rating scale to measure different dimensions of SRL ranging from 1 to 5, was used to gauge students' opinions, with

5 indicating *"Very like me/Strongly agree" and 1 indicating "Not like me at all/Strongly disagree."*; 3) Open-ended questions: Collected students' opinions on the implementation of the flipped classroom method with gamification in teaching and learning applied in this study.

The process of validity and reliability of the instruments were: prior to conducting the data collection, the formats, item details, and the questions of questionnaire and semi-structured interview were examined and proved by experts in the area of education and business learning. Then the questionnaire and interview questions were readjusted and improved following the comments and suggestions of the experts.

3.3. Data Collection

Data collection included both qualitative and quantitative methods:

Quantitative Data: Students were asked to complete the self-rating questionnaire at the beginning and the end of the semester. This pre-test and post-test design allowed for measuring changes in self-regulation over time.

Qualitative Data: Five students were systematically selected for the in-depth interview using the semi-structured interview questions. These interviews aimed to gain deeper insights into students' experiences and perspectives on the flipped classroom methodology.

Data Collection Procedures: All students were asked to complete a questionnaire as their SRL pre-test at the beginning of the course.

During the course, the lecturer introduced the instructional process of the flipped classroom combined with gamification to learners who enrolled in the business course. The lecturer assigned learners to watch videos which were posted on a designated Facebook group, which served as teaching and learning content delivery platform and communication between the lecturer and the learners. These videos, ranging from 10 to 40 minutes. The videos contained fundamental learning content and were posted to be available for students to view before attending class. In preparation for the in-class activities, students were not only assigned with viewing the posted videos but also encouraged to source additional relevant videos independently. This preparatory work included aspects of computer programs and applications that learners were expected to be familiar with upon entering the classroom. Subsequently, during in-class sessions, the instructor would provide summaries of the important points, followed by task-based or practical in-class activities. Learners were able to revisit these videos during class to support their engagement with the tasks, with the instructor available for help as required. At the end of the course, all learners were given a questionnaire to complete as their SRL post-test, five students were selected for the in-depth interview using a randomized method of selection.

The attributes of gamification were implemented through structured practice of classroom activities and assignments. These activities were designed to enable learners to earn badges. These badges, representing distinguish levels of task achievement. It required learners to complete all associated tasks to successive levels, thereby embedding elements of progression and reward into the teaching and learning procedure.

Table 1.
The gamification badges used in this study

Badges	Name of the badge	Condition
Level One		
	The Learner	Upon joining the class
Level Two : IT Learners		
	IT Information	Upon completing the general knowledge assignment on information technology.
	IT Ethics	Upon completing the assignment about the ethics of using information technology.
Level Three : Digital Marketing		
	Social Media Marketing	Upon submitting the social media marketing assignment.
Clipartmax (2019)	Facebook Page	Upon submitting the Facebook business page assignment.
Level Four : Office Operator		
Iconlibrary (2019)	MS-Words	Upon submitting the Microsoft Word assignment.
Iconlibrary (2019)	MS-Excel	Upon submitting the Microsoft Excel assignment.
Level Five : Presenter		
Iconlibrary (2019)	MS-Power Point	Upon submitting the Microsoft Power Point presentation assignment.
Powtoon (2019)	Powtoon Presentation	Upon submitting the Powtoon presentation assignment.
Supermonitoring (2019)	Prezi Presentation	Upon submitting the Prezi presentation assignment.
	The Presenter	Upon presenting one of the assigned presentations.
Level Six : Graphic Designer		
	Photo Editor	Upon submitting the photo-editing assignment.
Iconlibrary (2019)	Photoshop Editor	Upon submitting the Photoshop photo-editing assignment.
	VDO Editor	Upon submitting the VDO editing assignment.
Level Seven : Finisher		
	The Submission	Upon completion and submission of all course assignments.
	The Finisher	Upon completion and revision of all course assignments.
Complete the course		

3.4. Data Analysis

The analysis of the data consisted of: Quantitative Analysis: The data collected from Self-Regulation Formative Questionnaire were analyzed using the SPSS software program to calculate frequency, percentage, mean, and standard deviation in detail as follows. The paired sample t-test was analyzed to fine the comparison results of the students' self-regulation in learning before and after the application of flipped classroom with gamification. Qualitative Analysis: The content from the open-ended questions and interview scripts was analyzed using content analysis.

The content validity of the questionnaires was approved by three experts implementing the standards of the Item Objective Congruence (IOC). After that, the approved and adjusted self-reported questionnaires were tested with 20 students to examine their reliability

regarding Cronbach's alpha coefficient. Items that were not significant at the level of 0.05 or higher were removed. The questionnaires were then improved by adjusting and deleting certain questions according to the experts' comments and the results of Cronbach's alpha coefficient.

After the content validity was analyzed and approved, the final version of research instruments were approved by the CMRU Ethics Committee on Human Research to ensure that this project was conducted in accordance with the laws and regulations of the international human research ethics principles.

3.5. Theoretical Framework

This study was grounded in the theories of flipped classroom model integrated with gamification to enhance students' self-regulated learning (SRL) as conceptualized by Zimmerman (1989) and Panadero (2017). SRL involves planning, monitoring, controlling and reflecting on cognitive, metacognitive, behavioral, motivational, and emotional aspects of learning. Application in this study comprised the flipped classroom model aligned with SRL by requiring students to engage in pre-class learning and in-class application, fostering cognitive and metacognitive processes. Gamification supports SRL by providing motivational elements that encourage students to set goals, monitor progress, and reflect on learning outcomes.
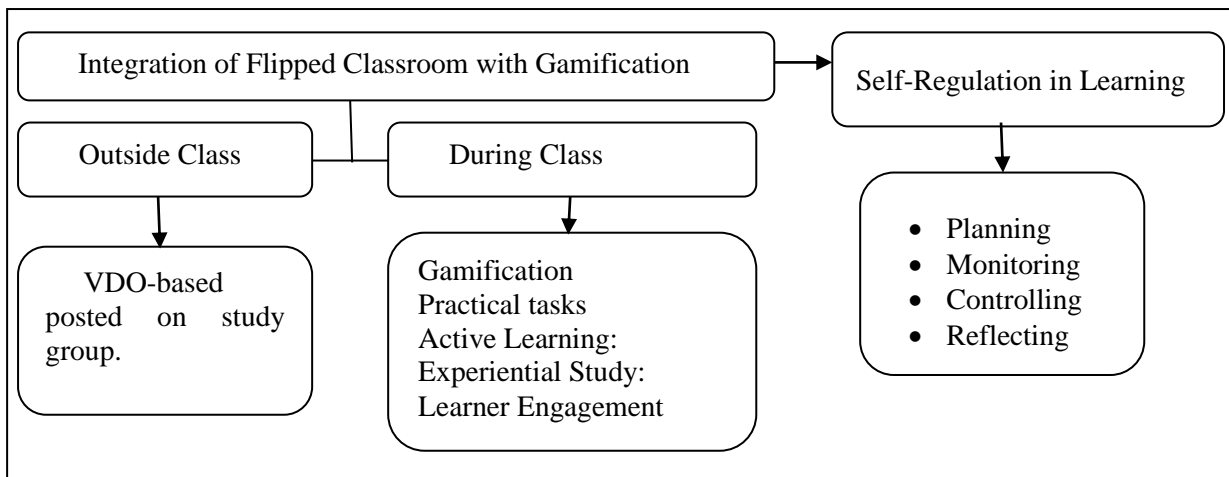
Figure 1. Theoretical Framework

4. Results

The results are presented in three parts: part one details of student demographic details; part two encompassed students' self-assessment of self-regulation in learning; and part three consisted the results of qualitative analysis of the interviews and the open-ended questions.

4.1. Part 1: The Student Demographic Details

There were 15 students participated in this study consisting of: 7 male (46.67%), 7 female (46.67%), and 1 student (6.67%) who preferred not to declare their gender. All students were in their second year, and aged between 21 and 25 years old. The majority (66.67%) used mobile phones as their primary devices of communication and learning, followed by 26.67% using tablets, and 46.67% utilized computers for their learning activities.

4.2. Part 2: The Students' Self-Assessment of Self-Regulation in Learning

The students' self-regulation in learning was assessed across four dimensions: planning, monitoring, controlling, and reflecting. The results showed significant improvements in all dimensions after the intervention.

Table 2.
Summary of Self-Regulation Scores (Pretest vs. Posttest)

Item	N	Pretest		Posttest		t	df	Sig
		Mean	*SD*	*Mean*	*SD*			
Planning (5 items)	15	3.28	0.82	4.04	0.59	-4.269	14	.001
Monitoring (6 items)	15	3.42	0.81	4.17	0.57	-4.690	14	.001
Controlling (6 items)	15	3.51	0.83	4.09	0.55	-4.249	14	.001
Reflecting (5 items)	15	3.79	0.73	4.25	0.47	-3.426	14	.006
Average	15	3.83	0.712	4.14	0.43	-2.375	14	.032

As shown in Table 2, in the planning dimension, the total mean score was 3.28 for the pre-test, and 4.04 for the post-test. In the monitoring dimension, the total mean score for the pre-test was 3.42, and 4.17 in the post-test. In the controlling dimension, the total mean score for the pre-test was 3.51, and 4.09 for the post-test. Finally, in the reflecting dimension, the total mean score for the pre-test was 3.79, and 4.25 for the post-test. The overall mean score for the pre-test was 3.83, and 4.14 for the post-test. The total t-test score was -2.375, with the highest t-test score in the monitoring dimension at –4.690, followed by the planning dimension at -4.269, the controlling dimension at -4.249, and the reflecting dimension at -3.426. In summary, the overall results showed that students' self-regulation in learning (SRL) levels significantly increased in all dimensions, indicating that the implementa5tion of flipped classroom with gamification could enhance students' self-regulation in learning.

4.3. Part 3: Qualitative Analysis of the Interview and Open-Ended Question Responses

The qualitative data were analyzed using content analysis, presenting into four aspects: planning, monitoring, controlling, and reflecting.

Planning: Students reported that the flipped classroom with gamification provided structure and motivation to plan and organize their schedules effectively.

Monitoring: Interview responses highlighted that learners were able to self-manage by tracking their own progress on the study's progress board. This allowed greater degree of autonomy in their learning process.

Controlling: The data suggested that the flipped classroom with gamification played a crucial role in maintaining students' focus and direction towards achieving their learning goals.

Reflection: This approach was found to have a positive effect on the students' ability to introspect on their work progress, which, in turn, fostered improvements in their assignments.

5. Discussion

This research study has empirical test on the effects of integrating a flipped classroom with gamification on self-regulated learning (SRL) among students enrolled in an Applied Computer for Business course. The findings revealed a significant enhancement in students' SRL across four dimensions: planning, monitoring, controlling, and reflecting, which were instrumental for academic success in digital learning environments, as highlighted by the Self-Regulation Formative Questionnaire and Pintrich's (2000) conceptual framework

The quantitative data analysis: The data illustrated significant rises in the mean scores for all SRL dimensions after the intervention. These results suggested that the flipped classroom, when integrated with gamification elements, could create an organized and engaging learning environment that enhanced students' intrinsic motivation and enhances their learning behaviors. This aligned with the studies of Tomas et al., (2019); Mojtahedi et al., (2020); and Xiu &Thompson (2020) which reported positive influences of flipped classroom on student performance and engagement.

Qualitative data analysis: The data from interviews and open-ended questions further supported these findings. Students perceived the flipped classroom with gamification as a facilitator that assisted and stimulated their planning skills, enabling them to effectively organize their learning schedules. The monitoring element allowed learners to self-manage their progress, which was a vital for SRL. The controlling element ensured that learners remained aligned with their learning goals, and the reflection element facilitated deeper self-regulated on their learning processes and results. This was consistent with the study of Xiu & Thompson (2020), that found a positive impact in flipped classroom practice and students' motivation and self-efficacy.

Despite the overall positive impact, several challenges were identified. These included technical limitations such as software licensing issues, manual updates to gamification elements like badges and leaderboards, and inconsistencies in internet speed, particularly for mobile data users.

6. Conclusion

The study concluded that integrating a flipped classroom with gamification significantly enhanced students' self-regulated learning across dimensions of planning, monitoring, controlling, and reflecting dimensions. This integrated approach provided a structured and engaging learning environment that fosters intrinsic motivation and effective learning behaviors. However, technical limitations and individual differences must be addressed for successful implementation.

7. Recommendations

Based on the research results, these following recommendations are proposed for educators and institutions considering the implementation of flipped classrooms with gamification:

Technical support: Institutions should provide robust technical support to ensure that all learners have access to the necessary software and hardware required for the course. This includes addressing licensing restrictions and ensuring equitable internet access via institutional support or partnerships with service providers.

Consider individual differences: Instructors should prepare course content and gamification elements to accommodate individual differences in student personality, behavior, and learning style to broader engagement and effectiveness.

Learning management system: Future study should investigate the application of learning management systems that provide real-time updates on students' progress and allow the addition of customized badges to promote motivation.

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