

Article

Online Flipped and Gamification Classroom: Risks and Opportunities for the Academic Achievement of Adult Sustainable Learning during COVID-19 Pandemic

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Abstract: The online traditional and the online flipped classroom approaches have been adopted worldwide in higher education during the prolonged city lockdowns. Research has suggested that gamification is a technopedagogy which can be integrated into these approaches to promote learning outcomes. Hence, this study aims to uncover various risks and opportunities involved in adopting the online flipped and gamified classroom approaches, especially in terms of their impact on academic achievement, for ensuring sustainable adult education during the pandemic. We conducted a mixed-method study grounded in self-determination theory and adult learning principles, in which learners enrolled in a postgraduate business management programme were divided into three instructional conditions for one module: a gamified online flipped class (GOFC, $n = 25$), a nongamified online flipped class (NOFC, $n = 24$), and a gamified online traditional class (GOTC, $n = 19$). Quantitative and qualitative data from the learners, teachers, and teaching assistants were collected and analysed to compare academic achievement across the classes. Contrary to the expectations of gamification proponents, the learners in the nongamified online flipped class significantly outperformed those in the two gamified online classes. Qualitative findings revealed that technical support, professional training for teachers, and building learners' sense of belonging to their classes were necessary to ensure the sustainability of learning in fully online classes. The findings, thus, have important implications for the effective implementation of these pedagogical approaches in adult education programmes in a fully online environment.

Keywords: gamification; online flipped classroom; COVID-19; business education; postgraduate education

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1. Introduction

COVID-19 has posed considerable challenges to the sustainability of education programmes [1]. Higher education institutes (HEIs) have been forced to rearrange their classroom approaches to offer sustainable and flexible learning options amidst the COVID-19 lockdowns. These options include prerecorded online video lectures provided by teachers during the uncertain period of intermittent lockdowns, which enables learners to utilise asynchronous online self-study [2]. Advancements in information and communication technology (ICT), including digital devices, networks, and skills, have made such pedagogical approaches to online instruction feasible [3]. Asynchronous and synchronous are two online instructional approaches that present opportunities but also pose potential risks to the sustainability of adult education during the city lockdowns due to the pandemic [4]. Nevertheless, these approaches allowed China's HEIs to continue their education programmes during the pandemic. Gamification, a relatively new technopedagogy that applies game elements (e.g., points, badges, and leaderboards) in nongame contexts, has also been proposed to motivate learners to improve academic achievement and

participation in learning activities [5]. These new pedagogical approaches not only promote quality education but also help sustain adult education programmes amidst COVID-19 to yield economic and social benefits for the country [6].

Online instructions are conducted in a virtual environment, and the instructors use various strategies different from those used in traditional in-person classes to convey knowledge and skills [7]. Hence, learners' and teachers' digital literacy and the online learning community have become more critical [8,9]. A recent review conducted by Amiti [7] revealed that three types of online classes were adopted the most during the pandemic: (1) asynchronous online self-study video lectures, (2) synchronous online traditional lectures, and (3) online flipped classes (asynchronous self-studying followed by synchronous online classroom sessions). The online traditional classroom approach is the traditional instruction moved to online lectures. It can be asynchronous self-study or a synchronous classroom with the instructor and students attending simultaneously. The online flipped classroom approach, which incorporates both asynchronous prerecorded self-study video lectures and synchronous online classroom sessions, provides learners with more time flexibility. Learners can maintain their educational progress by reducing the reliance on in-person class attendance, as in traditional classes [10]. Nevertheless, the impact of such abrupt changes in instructional approaches needs to be evaluated. Academic achievement is a key indicator of the success of HEI in adopting new instructional approaches [11].

Perera and Richardson [12] found that learners had low academic achievement in online classes. Furthermore, Baxter and Hainey [13] encountered contradictory opinions on learners' motivation in asynchronous and synchronous online classes. Xie et al. [14] found that academic achievement was related to the motivation for learning and participation levels in the online classroom. Therefore, it is important to consider the learners' learning motivation and participation levels when comparing learners' academic achievement across various online instructional approaches. Self-determination theory (SDT) theorises that intrinsically motivated learners exhibit high levels of participation in learning activities [15]. From the perspective of SDT, gamification might promote academic achievement and participation levels in both online and in-person classes [16,17]. Moreover, gamification may help to attract learners' attention and promote an interactive and enjoyable online learning experience [18]. We, therefore, found it necessary to explore the impact of the online flipped and gamification classroom approaches on learners' academic achievement based on SDT theoretical foundations. Furthermore, there is a paucity of research on fully online instructional approaches for adult education programmes for business management grounded in SDT in China.

Three pedagogical interventions: gamified online flipped class (GOFC), nongamified online flipped class (NOFC), and gamified online traditional class (GOTC), were used to explore the risks and opportunities for sustainable adult education during the pandemic. The following two research questions were set:

RQ1. How does the flipped classroom approach impact the academic achievement of adult learners in a fully online environment compared to its traditional counterpart?

RQ2. How does gamification impact the academic achievement of adult learners in fully online classes compared to a nongamified environment?

2. Literature Review

We first discuss the risks and opportunities for the sustainability of adult education during the city lockdowns. Second, we review the impact of ICT-enabled online flipped, and gamification classroom approaches on academic achievement with SDT and adult learning principles. Third, we examine how the implementation of these approaches supports and sustains adult education programmes in detail.

2.1. Risks and Opportunities for Sustainable Adult Education Programmes during the Pandemic

The traditional in-person class lectures, which have the risk of infection, are not allowed under the dynamic COVID-zero policy in China. Therefore, HEIs have to continue to adopt fully online instructional approaches for adult education programmes [19]. Online pedagogical approaches, which are also flexible, accessible, and not limited by physical spatial barriers, provide opportunities for restoring the learning momentum and sustainability of education programmes in HEIs. There are two main online alternatives for the continuation of adult education programmes [7]:

- Asynchronous online self-study provides prerecorded video lectures, which allow autonomy and flexibility of time for adult learners.
- Synchronous online lectures require the online presence of the teacher and learners simultaneously, which allows learners' collaborative learning.

Online flipped instruction is an approach that has both asynchronous online self-study and synchronous online lectures. With the advantage of freeing up class time for in-class learning activities (e.g., peer-to-peer collaborative learning, discussion, and problem-solving exercises), the online flipped classroom approach has been widely used even before the pandemic [11]. Due to this ability to enable more interactive learning activities, flipped classroom approaches may also promote learners' academic achievement and belongingness [20].

The flipped classroom approach emphasises autonomous learning during asynchronous self-study sessions and problem-solving learning activities during synchronous online classroom sessions. Hsia et al. [21] found that the flipped classroom approach enabled independent and collaborative learning and promoted interactive and active learning and problem-solving skills. Moreover, learners in China are highly concerned about education progress delays [10]. Asynchronous, synchronous, and flipped classroom approaches, therefore, provide them with opportunities to continue their educational programmes even during home confinement or campus closure. However, prolonged online learning leads to the risk of boredom and a lower participation level in learning activities, which may eventually affect academic achievement [9].

Considering the risks and opportunities for the sustainability of adult education during the pandemic, as discussed above, we need to investigate the impact of these abrupt pedagogical changes on adult learning outcomes, especially academic achievement. It is imperative in countries where the reliance on online instruction is still high due to the frequent interruptions caused by the COVID-19 lockdowns.

2.2. ICT in Education, SDT, and Adult Learning Principles

ICT-enabled online classroom approaches provide the opportunities, accessibility, and flexibility required for sustainable education, which are not limited by physical space and time but by digital literacy [22]. In a recent literature review on flipped classroom approaches, Divjak et al. [23] found that HEIs experienced in using face-to-face flipped classroom approaches before the pandemic were more likely to succeed than HEIs without previous experience in conducting fully online instruction. They also found that learners' motivation, attention, and participation levels in learning activities, as well as technical support and professional training for teachers, are factors for success.

SDT stated that motivation is the key catalyst for sustainable learning behaviours, and learners inherently possess the interest to learn and develop [24]. When we fulfil learners' intrinsic psychological needs (i.e., autonomy, relatedness, and competence), sustainable learning is more likely to occur, thereby achieving better academic performance [25]. ICT-enabled asynchronous, synchronous, and online flipped classroom approaches could support those intrinsic psychological needs [26]. Asynchronous prerecorded video lectures promote learners' autonomy by allowing them to pursue self-directed, independent learning at their own time and pace. Synchronous online classroom sessions provide

opportunities for hands-on problem-solving activities and peer-to-peer collaborative learning, thereby enabling relatedness and competence [27].

Pelikan et al. [28] found that HEIs fulfilling those learners' intrinsic psychological needs directly influenced their participation levels and sustainability of learning. Motivated and engaged learners invest their time and effort to participate and exceed the basic requirements in learning activities, thus, improving learning outcomes. Therefore, high levels of motivation and participation among learners, as mentioned by SDT, are needed for the sustainability and success of online education programmes in HEIs during the pandemic [29]. Additionally, teachers' supportive feedback is essential for learner motivation, and it can be conveyed with the game elements, such as points, badges, and leaderboards (PBL), via the ICT system. The practise of applying game elements in nongame contexts (e.g., education) is known as gamification [5]. Thus, gamifying the synchronous online classroom learning activities, guided by the SDT, has the potential to promote learning outcomes [27].

ICT provides a platform for online learning and tools to share ideas. The platform facilitates peer-to-peer interactions for collaborative learning, which helps adult learners develop critical thinking and problem-solving skills [30]. Adults are self-directed learners with life experience and are responsive not only to internal motivators (such as the intrinsic psychological needs of autonomy, relatedness, and competence suggested by SDT) [24], but also to external motivators (such as personal and career goals, including problem-solving skills, job promotion, and higher salaries) [31]. Thus, a pedagogical approach for online instruction guided by adult learning principles should (1) acknowledge and leverage adult learners' previous experience and knowledge, (2) be problem-based, and (3) be highly relevant to the lives and careers of the learners [32]. Since adult learners are more knowledgeable and experienced than typical university undergraduates, a pedagogical approach incorporating meaningful, interactive and peer-collaborative learning should be used [33].

2.3. ICT-Enabled Integration of the Online Flipped and Gamification Classroom Approaches for Sustainable Adult Education

ICT systems are being used in formal and informal education for adult learners [34], and fully online instructional approaches have been envisioned as a new solution for sustainable adult education during the pandemic [35]. ICT in education supports online self-directed study and collaborative class learning through the learning management system (LMS), which is an online system for instructional content delivery and student management. However, early studies have found that fully online instructional approaches did not achieve desired learning outcomes because of the adoption of inappropriate motivational techniques and inadequate experience in technological and technical implementations [36]. Recently, ICT has enabled the integration of flipped classrooms and gamification approaches for fully online classes. Such pedagogy has been shown to impact academic achievement positively [37]. However, model cases of the application of gamification in fully online instructional approaches in higher education for adult business programmes are still scarce [38].

Using the PBL game elements to motivate learners in a nongame environment [5] has frequently been used in flipped classes of higher education during the pandemic [39]. Santos-Villalba et al. [40] have found that applying gamification in flipped classroom approaches supports academic achievement and promotes learners' participation levels in learning activities by providing feedback and updates on learners' status. These help to encourage healthy competition in the class. Gamification allows the status recognition of the learners, self-expression opportunities, collaborative learning, and healthy competition to happen in online classes [41].

Adult learners find problem-based learning tasks, especially tasks relevant to their personal goals (e.g., career success), to be intrinsically motivating [42]. Gamification promotes learners' participation in learning activities, supports knowledge to be transferred

to practice, and enhances academic achievement [43]. However, applying the online flipped and gamification classroom approaches to adult education programmes is not without challenges [44,45]. Therefore, our study aimed to investigate how the online flipped and gamification classroom approaches impact academic achievement in adult education grounded in SDT and adult learning principles from the perspectives of learners, teachers, and HEIs.

3. Research Methods

The explanatory sequential design of the mixed methods approach was adopted, which included quantitative and qualitative research phases [46]. The qualitative phase followed the quantitative phase and helped explain the quantitative results. The mixed methods approach could provide an insightful comparison of the online flipped and gamified classroom approaches for adult education programmes.

3.1. Participants

Participants included teachers, teaching assistants, and learners. Three teachers and three teaching assistants with more than one year of working experience in the school participated in the study. Three hours of online self-learning, video recording, and editing training were provided to the teachers. Instructions and briefings were provided for all three teaching assistants before classes commenced.

Learners were recruited from the three classes of education programmes for business management at the China Institute for Business, and they were all business executives from consumer marketing backgrounds. Their participation was voluntary and without incentive. All classes were taught online, and three instructional interventions were applied, starting from the second module of the programme in weeks 6–10: (1) gamified online flipped class (GOFC, $n = 25$, mean age at 33, 68% female), (2) nongamified online flipped class (NOFC, $n = 24$, mean age 35, 67% female), and (3) gamified online traditional class (GOTC, $n = 19$, mean age 32, 74% female), as shown in Figure 1. In the self-study stage (weeks 6–8), the participants in all three groups had access to their textbooks for self-study. In addition, the instructors provided prerecorded video lectures for the online flipped classes (GOFC and NOFC). Relevant guidelines and information for the learners in each class were made available on LMS in week 6, as shown in Figure 2.

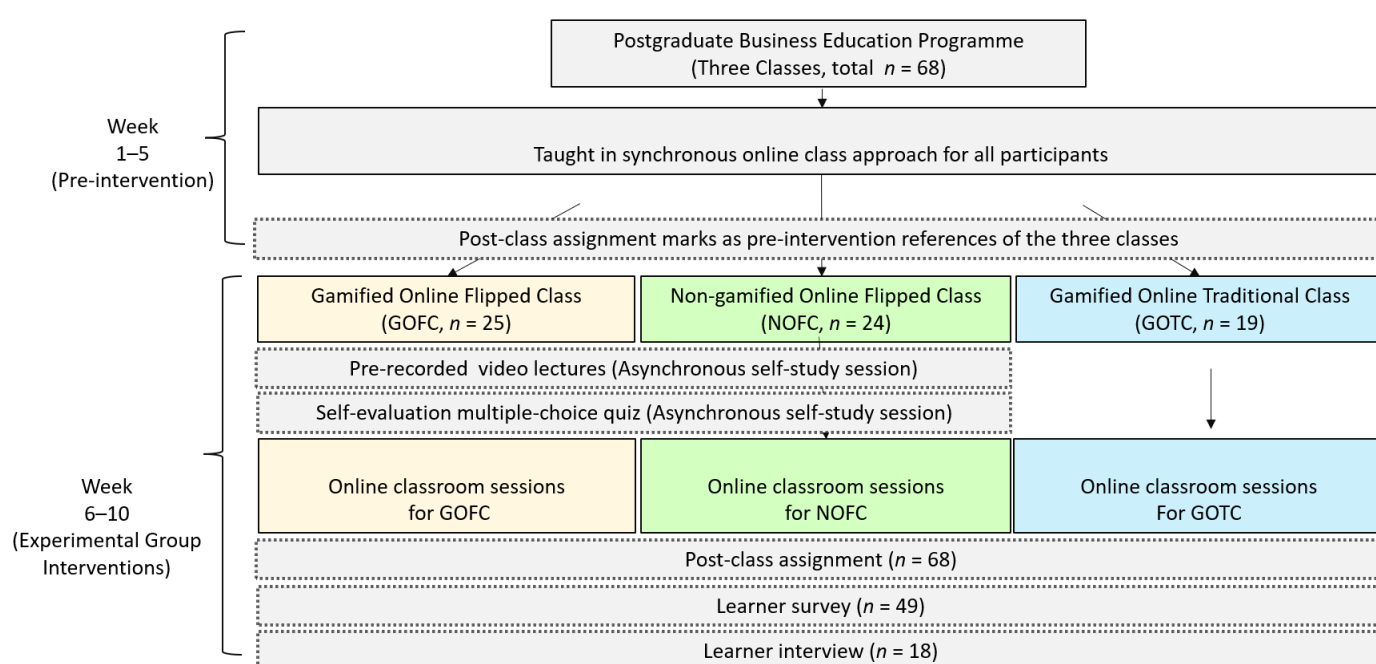


Figure 1. Learners and classroom sessions.

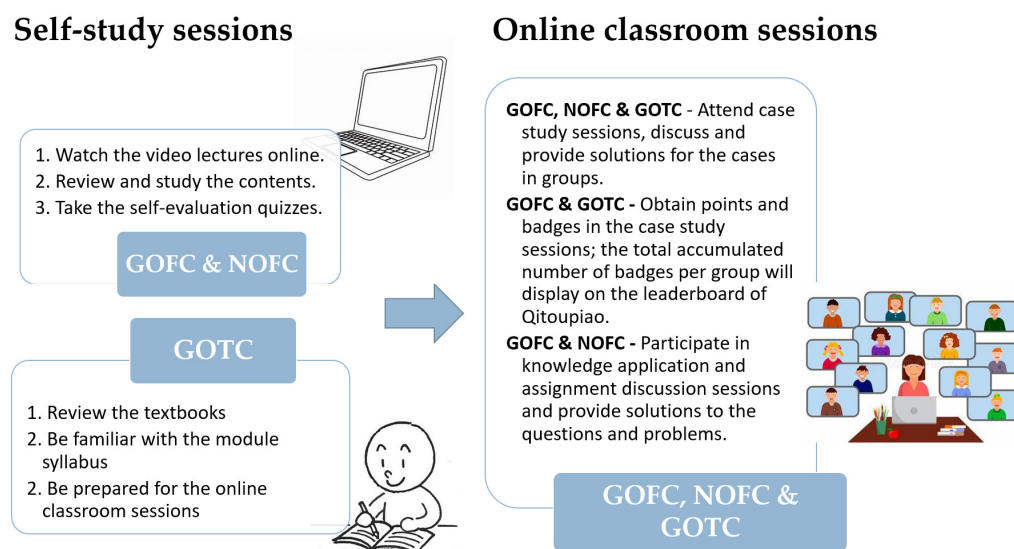


Figure 2. Guidelines and tasks for asynchronous self-study and synchronous online classroom sessions.

Learners assigned to the online flipped classes (GOFC and NOFC) were encouraged to complete self-evaluation quizzes after watching the video lectures. All learners of the three instructional approaches attended the synchronous online classroom sessions in week 9, in which the teachers provided lectures mainly focused on advanced topics and problem-based learning activities. After completing the synchronous online classroom sessions, the learners of all classes would complete a post-class assignment, in which they responded to a series of questions in a single essay of approximately 2000 words. The assignment questions focused on solving real business problems by applying the knowledge they learned in the module.

3.2. Research Design

Two modules were conducted in ten weeks. The first module lasted for five weeks and consisted of 16 h of synchronous online classroom sessions. The three interventions (GOFC, NOFC, and GOTC) started in the second module from the sixth to the tenth week. The GOFC and GOTC experimental groups were compared to investigate the impact of the online flipped classroom approach on academic achievement (RQ1). Additionally, GOFC and NOFC experimental groups were compared to assess the impact of gamification on academic achievement (RQ2) (Table 1).

Table 1. The research design for addressing the research questions.

Experimental Approaches	Gamified Online Flipped Class (GOFC)	Nongamified Online Flipped Class (NOFC)	Gamified Online Traditional Class (GOTC)	Research Question and Group Comparison
Flipped	Yes	Yes	No	RQ1: GOFC and GOTC
Gamified	Yes	No	Yes	RQ2: GOFC and NOFC

3.2.1. The Class Rundown

Prerecorded video lectures were provided to the online flipped classroom approaches (GOFC and NOFC). The learners in these two groups were also provided with a short self-evaluation quiz in the self-study stage (weeks 6–8), which they could complete before attending the synchronous online classroom sessions. The total self-study time estimate was four hours. The learners in all three groups attended the synchronous online classroom sessions in week 9; the formats of which varied between the classes. The learners then completed their essay assignments in the last week of each module.

3.2.2. Online Classroom Session Schedules (RQ1 and RQ2)

All three experimental groups (GOFC, NOFC, and GOTC) had four hours of synchronous online classroom sessions on the mornings of Day 1 and Day 2. Then, the classes followed two hours of case study sessions for collaborative learning in the afternoon. For the online flipped classes (GOFC and NOFC), two hours of knowledge application and assignment discussion sessions would follow in the late afternoons of Day 1 and Day 2, respectively. For GOTC, there were lecture sessions in the late afternoons of Day 1 and Day 2 instead (Figure 3).

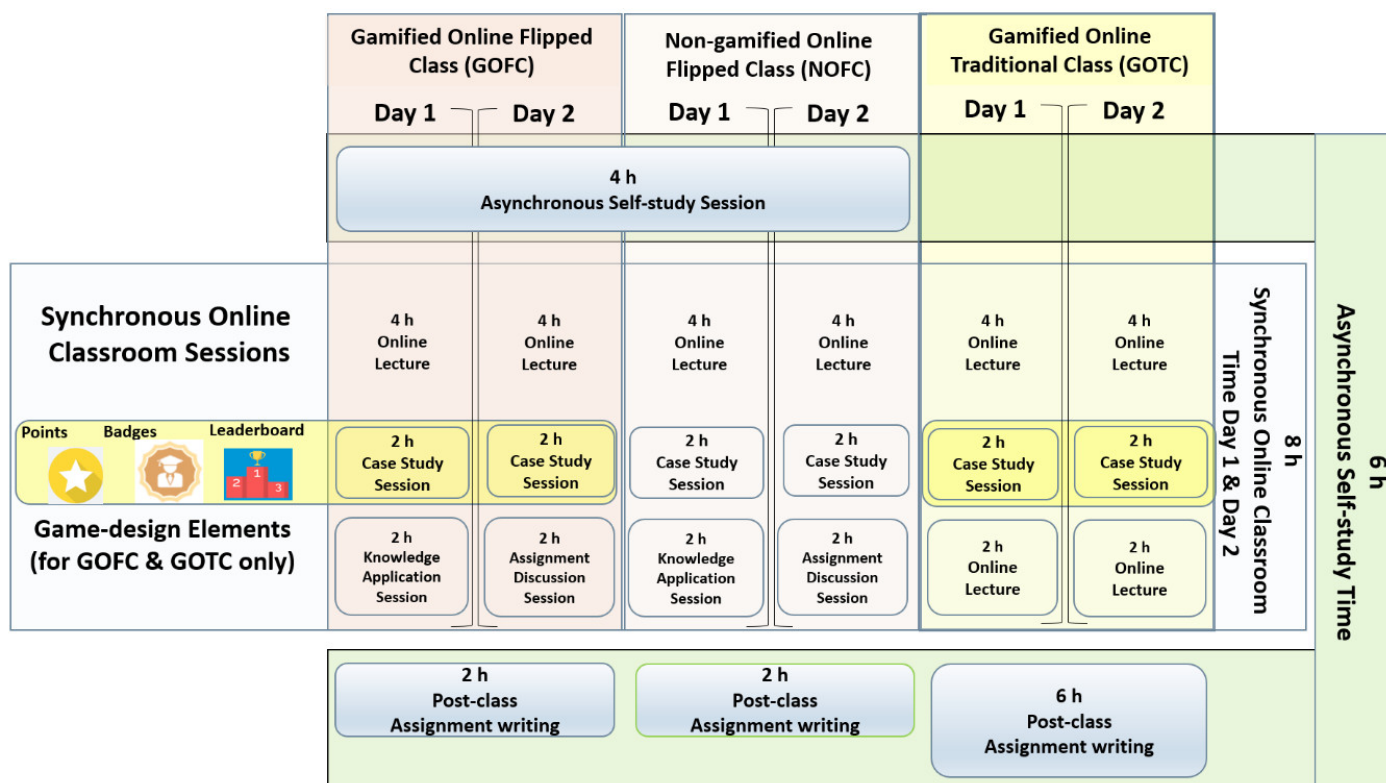


Figure 3. Online classroom session schedules.

The case study sessions in all three classes (GOFC, NOFC, and GOTC) began with business cases relevant to the morning lectures. The learners in each class were grouped into five to seven students per group for the case study discussion, guided by the instructor. For example, Figure 4 shows the “Wheel of Emotion” case. The discussion results were presented at the end of the case study sessions.

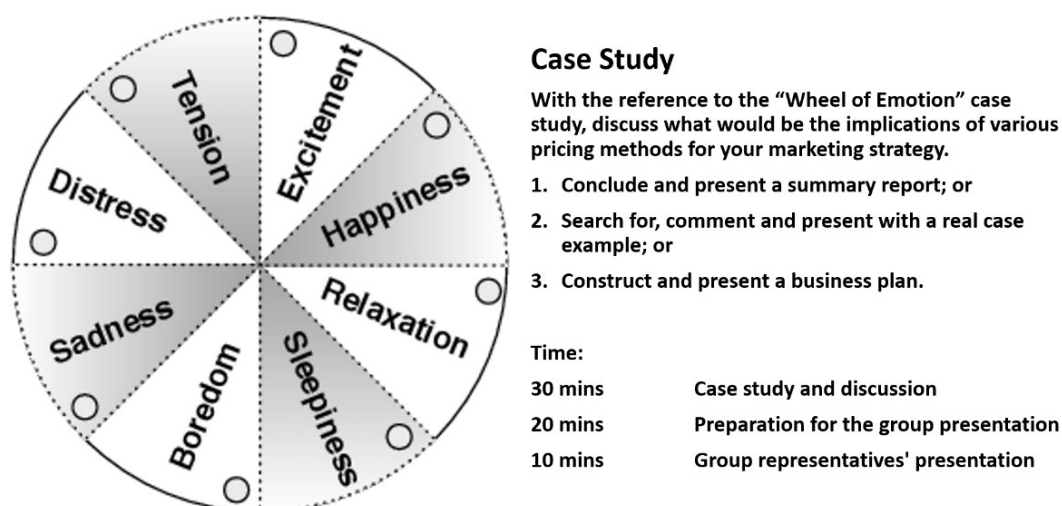


Figure 4. Example of a case study learning activity in the online classroom.

A two-hour knowledge application session and a two-hour assignment discussion session were held in the two flipped classes (GOFC and NOFC) during the late afternoon of Day 1 and Day 2, respectively. The instructor would introduce a topic that focused on applying the knowledge acquired in the morning lectures to solve simulated business problems in the knowledge application learning session (Figure 5). The knowledge application session was intended to strengthen their problem-solving ability to apply the knowledge acquired, which promoted knowledge transferability. This ability was highly relevant to learners’ jobs and employment capabilities. The assignment discussion allowed peer-interactive discussion and learning (Figure 6). Both the knowledge application and assignment discussion sessions used the in-class time available in the two online flipped classes (GOFC and NOFC) to encourage peer interaction and collaborative learning, which prompted additional ideas and new thoughts for the solutions. The learners of the two online flipped classes (GOFC and NOFC) discussed the assignment questions with their peers in class, and they took less time to finish the assignments after the synchronous online classroom sessions. In contrast, the learners in the GOTC had to work on the assignments for four hours by themselves after the online classroom sessions.

We learned price anchoring in the morning lectures. We will apply our learning in real business situations in this session.

Q1. What is price anchoring?

Q2. Please elaborate on the principles of using price anchoring.

Q3. How will you use this pricing strategy in your promotional campaign?

Figure 5. An example topic of the knowledge application session.

Fashion does not equal luxury
Aren't fashion and luxury the same thing?

Luxury Reviews
What is "luxury" to you?



Assignment Question

Please choose one brand or product, with a specific model, which can be mobile, personal consumable, financial and banking, tourist products...etc. Based on the knowledge acquired from the consumer psychological principles module, analyze and devise the marketing activities and campaign (word count: 2000)

Include:

- 1) people, scenario and activities and campaign descriptions (15%)
- 2) consumer insight with analysis of personality, motivation, behaviours and goals (25%)
- 3) describe the process of consumer psychology, emotion and experience (30%)
- 4) analyze how the consumer's psychological needs are satisfied, and the influence of consumer decision (30%)

Figure 6. Example of an essay assignment question.

3.2.3. Gamification (RQ2)




During the synchronous online case study sessions, game elements were applied in the gamified classes (GOFC and GOTC). In contrast, the learners in the nongamified class (NOFC) engaged in the same case study learning activities but without the application of game elements. The game elements (PBL) were used to motivate learning performance in the class and promote academic achievement [47]. The game elements acquired did not count towards their academic grades to provide fairness to the three classroom approaches.

The PBL were displayed through the Chinese class application Qitoupiao ('Voting Together'). A screenshot of the Qitoupiao application is shown in Figure 7. Additionally, Table 2 below explains the characteristics and mechanisms of PBL.



Figure 7. A screenshot of the Qitoupiao application.

Table 2. Application of PBL in gamified online classes (GOFC and GOTC).

Game Element (RQ2)	Purpose [47]	Award
Point 	Serve as the granular feedback to encourage the completion of subsequent learning tasks and activities.	For activity groups in the case study sessions, based on their learning tasks and activities.
Badge 	Recognise learners' social conformity to expected learning behaviour and promote contribution and participation in the learning process.	It is awarded to the activity groups when they proposed innovative ideas or solutions to the case study problems during the case study sessions.
Leaderboard 	Encourage teamwork within an activity group (i.e., intragroup collaborative learning) and healthy intergroup competition in the online classrooms when the learners try to obtain more badges for a prominent position on the leaderboard.	The accumulated number of badges for each activity group would rank and show on the leaderboard.

3.3. Data Collection

Data (both quantitative and qualitative) were collected (Table 3). Assignment marks, which served as quantitative data, were collected in the post-class stage. Qualitative data were collected online, including learner and teacher interviews. Teaching assistants recorded class observation reports during the synchronous online classroom sessions.

Table 3. Data collection.

Stage	Data	Purpose (RQ Addressed)
Synchronous online classroom stage	Class observation reports	Evaluate the learners' participation level under the three instructional approaches. (RQ1 and RQ2).
	Learner interviews	Evaluate the learners' perceived academic achievement and participation level in the three classes. (RQ1 and RQ2).
Post-class stage	Assignment marks	Evaluate the learners' academic achievement in the three classes. (RQ1 and RQ2).

The individual essay assignments were marked by strictly following the rubrics and marking schemes provided by the school to ensure a fair assessment of academic achievement. The assignment questions and topics for group discussion were assessed and approved by the academic team and school-appointed professional practitioners from the business field.

Data from class observation reports and interviews were collected to evaluate learning participation during the synchronous online classroom activities. Studies have found that learners' behaviours reflect their willingness and effort to participate in the learning activities [48]. Therefore, the participation level of each activity group in the learning activities was recorded. The learning participation levels ranged from the least engaged condition (i.e., passive receiving) to active manipulation, constructive generation, and the most engaged condition, interactive dialoguing [49]. The teaching assistants recorded the learners' participation levels in groups by checking the box that most closely described their observations (Figure 8).

The level of difficulty chose to present the group discussion result. (Please check one of the following three descriptions that most closely matches your observation)			
Easy <input type="checkbox"/>	Medium <input type="checkbox"/>	Hard <input type="checkbox"/>	
Conclude and present a summary report.	Search for, comment and present with real examples.	Present the group discussion with a concrete business plan.	

Level of participation in the online case study session. (Please check one of the following four descriptions that most closely matches your observation)			
Passive receiving <input type="checkbox"/>	Active manipulation <input type="checkbox"/>	Constructive generation <input type="checkbox"/>	Interactive dialoguing <input type="checkbox"/>
Listening and watching without displaying any other reaction (e.g., giving thumbs-up or clapping hands emoji).	Take notes and recapitulating important points and solution steps.	Asking questions and queries. Demonstrating newly acquired knowledge by applying it to solve real business problems in the case study sessions.	Asking comprehensive questions, arguing and defending a position or point with peers or partner classmates in the virtual chatrooms. Co-creating new knowledge, ideas, alternatives, perspectives and new directions to solve the problems during the case study sessions.

Figure 8. Class observation report form.

Interviews were conducted to understand the learners' self-described learning participation and experience (Table 4) after the synchronous online classroom sessions at the end of the second module (week 9). The interviews were guided by a protocol with seventeen semi-structured questions and three open questions (Table 4). The topics covered were based on works from Fredricks et al. [50], Samuel [51], and Sun and Rueda [52], which included (1) behavioural participation (e.g., how the learners participated and completed their learning tasks), (2) emotional participation (e.g., whether they enjoyed the learning process or experienced boredom), and (3) cognitive participation (e.g., how they invested efforts into the learning). The interviews were conducted online in Chinese via Zoom or Tencent Meeting. Each interview lasted thirty minutes, and the researcher would probe and elicit recalls of learners' deep feelings about the experience. The researcher recorded all interviews.

For reporting purposes, parts of the transcripts were translated into English. Draft transcriptions were sent to the interviewees for checking, and discrepancies were corrected to ensure accuracy through email or WeChat (the most commonly used social application in China). In total, 18 learners consented to be interviewed, and interviews with them were conducted (GOFC $n = 6$, NOFC $n = 5$, GOTC $n = 7$).

Table 4. Samples of semi-structured questions in the learner interview protocol.

Aspect	Sample Question
Behavioural	Did the online classroom format change the way of your study preparation for the module compared to other classes you have attended previously?
Emotional	Did you find any (most/least) interesting parts while studying for this module online?
Cognitive	Did you do anything extra to help you learn when studying for this module online?

3.4. Data Analysis

3.4.1. Quantitative Data

The individual assignment marks were analysed using the statistical package Social Science (SPSS Version 27). The data were tested for normality [53]. The results of the Kolmogorov–Smirnov test showed that the academic achievement of the three classes exhibited a significant deviation from normality in the first and second modules (first module: $p < 0.00$; second module: $p = 0.02$). Thus, nonparametric tests were adopted for further analysis [53].

The nonparametric Kruskal–Wallis test for multiple group comparisons was performed on the assignment marks of the first module, as all three classes were taught using the same synchronous online traditional classroom approach. The results were used as the initial reference for the equivalence of the three experimental groups (GOFC, NOFC, and GOTC). The results showed that they were equivalent in academic achievement based on the assignment marks. The assignment marks of the second module across the three classes were repeated with the Kruskal–Wallis test. If any significant differences were found, post hoc pairwise comparisons with multiple Mann–Whitney tests were conducted at a significance level of 0.0167 (i.e., $0.05/3$) [54]. The corresponding effect size (r) was calculated [55].

3.4.2. Qualitative Data

Class observations and interviews were coded, categorised, and analysed using the procedures proposed by Creswell [56]. These data were transcribed in their original language and organised into thematic categories for further analysis. Direct quotations were used to ensure the validity of the data [57]. We followed the qualitative analysis procedures suggested by Creswell [56]. Initial disparities were discussed between the teachers, and multiple reviews were conducted to rectify any misunderstanding or misinterpretation [58].

Qualitative data included class observation reports, and one-third of the qualitative data from interviews were picked randomly for double coding by independent coders [59]. The coding results were compared with Cohen’s kappa for inter-rater reliability (IRR) by using SPSS (Version 27). Cohen’s kappa was found to be 0.68, which is considered a substantial agreement for IRR [60]. The disagreements were resolved through discussion.

Data from the interviews, learner feedback, teachers and teaching assistants, and class observation reports were analysed with triangulation [59]. This approach can comprehensively understand and better explain the quantitative results.

4. Results

4.1. Academic Achievement

The nonparametric Kruskal–Wallis test showed that the academic achievement results of the first module ($H = 0.26$, $p = 0.88$) of the three classes were statistically equivalent. However, there was a significant difference between the three classes regarding academic achievement based on the assignment marks of the second module ($H = 10.04$, $p = 0.03$). A boxplot of the academic achievement across the three classes based on assignment marks is shown in Figure 9.

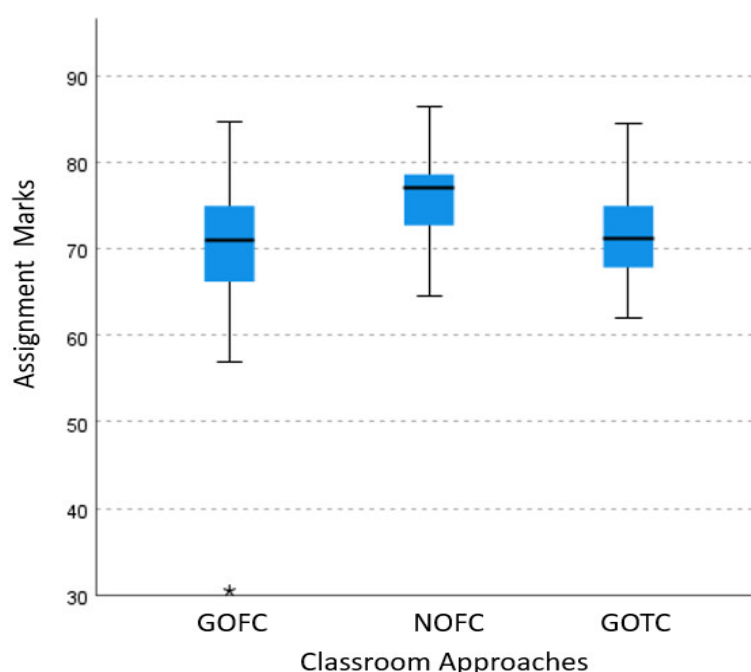


Figure 9. Boxplots of academic achievement results in the second module across the three classes.

Pairwise comparisons with Mann–Whitney tests indicated no significant difference ($p = 0.610$) between GOFC and GOTC. The academic achievement as presented in the assignment marks in the NOFC scored significantly higher in the GOFC ($U = 150.05$, $z = 3.00$, $p = 0.03$, effect size $r = 0.43$) and the GOTC ($U = 134.00$, $z = 2.30$, $p = 0.021$, effect size $r = 0.35$). The results are shown in Table 5.

Table 5. Pairwise comparison of academic achievement results in the second module:

(a) Pairwise Comparison of NOFC and GOFC					
Assignment Marks	N	Mean	SD	Mean Rank	Pairwise Comparison
NOFC	24	76.39	5.50	31.23	NOFC > GOFC *
GOFC	25	69.55	10.25	19.02	
(b) Pairwise Comparison of NOFC and GOTC					
Assignment Marks	N	Mean	SD	Mean Rank	Pairwise Comparison
NOFC	24	76.39	5.50	25.92	NOFC > GOTC *
GOTC	19	72.29	6.73	17.05	

* $p < 0.0167$ (Bonferroni correction).

Regarding RQ2, the quantitative data indicated that the learners in the gamified classes (GOFC and GOTC) did not show significantly higher academic achievement marks. Instead, the results showed substantially higher academic achievement in the nongamified NOFC among the three fully online classes. Contrary to the general expectation of proponents [5], gamification in online classes did not lead to improvements in academic achievement in terms of assignment marks. No statistically significant difference was found between the flipped GOFC and the nonflipped GOTC (RQ1; $p = 0.07$).

4.2. Explanation of Academic Achievement Results with Qualitative Data

The qualitative data from the interviews reflected the benefits of the nongamified online flipped classroom approach (NOFC). For example, ‘flexible time management’ (NOFC-Learner 1) and ‘pre-class self-study materials allow me to prepare better before attending the online classroom sessions’ (NOFC-Learner 5). Learner interviews from the GOFC and

GOTC experimental groups revealed more drawbacks than benefits of gamification in the fully online environment, such as distraction and wastage of time, but also increased learning curiosity and fun (Table 6).

Table 6. Example quotes from learners about the gamified online classroom approaches (GOFC and GOTC).

Theme	Example Quote
Distraction	<i>‘Teachers should save more time to answer our questions instead of playing games’ (GOTC-Learner 6)</i>
Excitement/curiosity	<i>‘It was an exciting and engaging session with fun’ (GOFC-Learner 3)</i>

The learners in the two gamified online classes (GOFC and GOTC) also mentioned that they did not understand the purpose of gamification:

‘I did not understand why the teacher played games during the online classroom sessions; it wasted our time as it took more time back and forth to clarify (for the details about the knowledge points) with the communications online.’ GOTC-Learner 6.

There were also delays in awarding points and badges. Additionally, the learners did not see the leaderboard, as there was no time to check the Qitoupiao gamification application during the online classrooms because the teachers and learners had to focus on learning through the computer screens:

‘I could not remember how many points or badges we had obtained. Playing games in the online sessions was inappropriate for us, as we are not students in primary or secondary schools.’ (GOFC-Learner 4).

‘I think I needed one more teaching assistant to help in the gamified classes, as it was too difficult to teach, answer, give the students points and badges, and show them the leaderboard during my lectures.’ (Teacher 3).

‘The teachers did not remember to show the students their rankings (of the badges) on the leaderboard. Teacher 3 often forgot to give points and badges, even though the students had given the right answers or proposed new ideas.’ (Teaching Assistant 3).

4.3. Learning Participation

Regarding the participation levels, the learners in the NOFC mostly engaged in constructive generation. In contrast, those in the GOFC and GOTC engaged in active manipulation. The participation levels indicated that the most engaged class was NOFC among the three classes. Gamified classroom approaches (i.e., GOFC and GOTC) did not elevate the participation levels of learning in the fully online environment. Instead, learners in the NOFC had more time to ask questions and participate in knowledge application discussions without interference (Table 7).

Table 7. Participation levels of the synchronous online classroom sessions.

Class	Participation Level
GOFC	Active manipulating
NOFC	Constructive generating
GOTC	Active manipulating

Learner interviews of NOFC are captured below:

‘I took notes actively and seriously in the online classroom sessions.’ (NOFC-Learner 2).

‘I focused on key and relevant knowledge points as I was afraid of missing important points because we were learning online.’ (NOFC-Learners 5).

‘The voices of various classmates inspired me and stimulated my deep thinking, but

sometimes I could not hear very clearly in the online environment.' (NOFC-Learner 5).

'I was very focused on the teacher's teaching, jotted down important notes to discuss with the classmates.' (NOFC-Learner 3).

In contrast, the feedback from the gamification classes (GOFC and GOTC) was related to how the time was spent in the synchronous online classroom sessions:

'I wish the teacher could have allowed more time for us to ask questions during the online classroom discussion.' (GOTC-Learner 1).

'The time was short in the online classroom sessions; I still have much to ask and learn.' (GOTC-Learner 3).

The learner interviews provided a deeper understanding of the underlying causes for the inadequate levels of learning participation, which reflected the importance of a learning community and socialisation among peers:

'I didn't know the other classmates well, as we had never met each other in person. It's not like learning in a real (physical) classroom where we can exchange ideas and ask each other questions' (GOTC-Learner 3).

'I didn't know what the other classmates were doing, how they progressed in their study...and I found myself lacking momentum to continue the self-studying between the (synchronous) online classroom sessions.' (GOTC-Learner 6).

'I didn't have (the feeling of) belonging to the class, as we just met once a month online for the (synchronous) classroom sessions, and most of the time, we just studied by ourselves alone.' (NOFC-Learner 5).

The need to build a learning community and peer study groups was also echoed in the teaching assistants' interviews:

'We need a minimum of 15–20 min of ice-breaking before the online classroom sessions start, as the learners did not know or had not seen each other for more than a month. Although we had shared with them the information of their backgrounds, such as years of working experience, industries and positions, they came to the online classroom sessions as strangers to each other.' (Teaching Assistant 2).

'We divided them into small groups during the (synchronous) online classroom sessions, but they were silent or closed their screen windows in the virtual group chatrooms. They only opened their screens and talked when the teacher visited and stayed in the chatroom.' (Teaching Assistant 3).

'We did not know how the progress of their learning was; we sent reminders to them to finish the self-study contents and submit their assignments on time, but did not receive their reply or respond (to our reminders).' (Teaching Assistant 1).

Based on this important insight, we further triangulated our qualitative findings from the feedback from learners, teachers, and teaching assistants. The most prominent themes and their implications are summarised in Table 8.

Table 8. Feedback on fully online classroom approaches from the learners, teachers, and teaching assistants.

Theme	From Learner	From Teacher	From Teaching Assistant	Implication
Dialogue and communication	<i>'I need more time to ask questions and understand what the teacher said in the online classroom sessions.'</i> (GOTC-Learner 2)	<i>'Teaching the same instructional contents online took much longer than in-person classrooms.'</i> (Teacher 2) <i>'I needed to speak slowly and elaborate more when teaching online.'</i> (Teacher 2)	<i>'There were often a few seconds delays in the communication between the learners and the teacher.'</i> (Teaching Assistant 2) <i>'The students' attention was short, and more breaks were needed in the online classroom'</i>	The need for technological and technical support

			sessions than in-person classrooms.’ (Teaching Assistant 1)	
Network and connectivity	‘My network at home is poor, and it was often disconnected.’ (GOTC-Learner 7)	‘The teaching was interrupted frequently due to the unstable internet connection, and I often had to repeat when there were disconnections from time to time.’ (Teacher 1)	‘Both the teacher and some students were “blackout” from time to time due to network problems.’ (Teaching Assistant 3)	
Teaching techniques	‘The teacher speaking on-screen was boring, and I fell asleep during the online classroom sessions.’ (NOFC-Learner 1) ‘I found the teacher did not answer my questions.’ (GOFC-Learner 6)	‘I needed to handle both the on-screen teaching and behind-the-screen operations such as responding to student messages and re-connecting back to the network if disconnections occurred.’ (Teacher 1) ‘Teaching and presenting online made my teaching load heavy, and I felt exhausted every time after teaching online sessions.’ (Teacher 3)	‘The teachers often missed or forgot to answer students’ inquiries and questions posted in the virtual chatrooms.’ (Teaching Assistant 3) ‘The teacher often seemed unable to find the appropriate buttons or missed the arrow pointer on the screen while teaching.’ (Teaching Assistant 2)	
Sense of belonging	‘I did not experience the feeling of belonging to the class.’ (GOTC-Learner 2)	‘The students were not very active in discussion with their peers (in comparing to teaching in in-person classrooms).’ (Teacher 3)	‘The students talked to the teachers but had fewer dialogues with their peers in the online discussion sessions than in in-person classrooms.’ (Teaching Assistant 3)	The need for a learning community and study groups
Emotion	‘I was worried about the progress of my learning programme.’ (NOFC-Learner 5)	‘The students had anxiety and stress when attending the online classroom sessions and were more aggressive in expressing their concerns and worries.’ (Teacher 1)	‘The students were more prone to complaining.’ (Teaching Assistant 1)	

In summary, academic achievement differed significantly between the three online classroom approaches. The learners in the NOFC showed the highest academic achievement results among the three classes. Moreover, the class observation reports indicated that NOFC exhibited the highest participation level in the learning activities. The need for technological (i.e., the use of ICT) and technical (i.e., teaching online and with ICT) support, learning communities, and study groups that facilitate socialisation among learners was discovered.

5. Discussion

Our study found that the impact of two ICT-enabled online classroom approaches, the online flipped (RQ1) and gamification (RQ2) classroom approaches, prompts us to reconsider how fully online classroom approaches for adult education programmes during the COVID-19 pandemic should be implemented. A major yet counterintuitive finding regarding RQ2 was that gamification (GOFC) did not show enhanced academic achievement compared to a nongamified counterpart (NOFC) in the fully online learning environment. Additionally, the learners in the gamified classes (GOFC and GOTC) did not exhibit a higher learning participation level than those in the nongamified class (NOFC) (Table 7). We also found that more support is needed for such an abrupt pedagogical shift from an in-person to a face-to-screen online classroom approach to be successful. We first

discussed the insights found from our study regarding the opportunities for fully online instruction for adult education programmes. Then we delved into the need for additional support, teacher professional training, and suggestions for fully online classroom approaches. Lastly, we discussed the challenges and support required to ensure the success of classroom approaches in a fully online environment.

5.1. Opportunities to Enhance Academic Achievement and Learning Performance

Based on the literature, we expected that the online flipped classroom approach, which fulfils the need for autonomy by facilitating the self-motivated and self-directed learning of adult learners, would improve the learning outcomes (RQ1). However, the results of our findings were mixed. In the NOFC, in which both asynchronous and synchronous online sessions were conducted, the learners showed improvements in academic achievement and learning participation, consistent with the study by Amiti [7]. However, in the GOFC, neither academic achievement nor learning participation was significantly enhanced, in contrast to Lo [17] and Hew et al. [61].

In RQ2, our findings showed that adult learners did not perceive the motivational aspect of gamification as positive as we assumed. Furthermore, results from the two fully online gamified classes (GOFC and GOTC) showed that gamification did not have an additional motivational effect on academic achievement for self-paced and self-directed adult learners [32]. The feedback from the learners of these two gamified online classes is worth considering while designing fully online classroom approaches for adult learners. The first pertains to the key motivators of adult learners enrolled in our study, primarily job-related factors. The second pertains to the challenges of implementing gamification in a fully online environment.

Certain theories state that people continue to engage in activities that satisfy specific intrinsic psychological needs, for example, relatedness, autonomy, and competence in SDT [15]. Nevertheless, adult learners are more responsive to job-related motivational factors, which can be either extrinsic (e.g., those that influence their promotion and increase in salary) or intrinsic (e.g., self-esteem and job satisfaction). Moreover, Pew [62] pointed out that adult learners tend to be highly self-motivated and enrol in learning programmes with clear objectives, such as expanding their knowledge and skills for career promotion and living standards, unlike undergraduates, who mainly focus on a quest for knowledge. Therefore, educators need to create a learning environment that can facilitate self-directed learning; as such, adult learners can assume accountability for their own learning to enhance their knowledge and professional skills. In addition, unnecessary disruptions and interference with the learning process [63] must be avoided, for example, those caused by gamifying the classes in our study.

5.2. Additional Support and Teacher Professional Training Needed for Gamification Approaches

The impact of gamification was dampened in our study, as it became a distraction and consumed online learning time. Qualitative feedback from the learners, teachers, and teaching assistants also indicated that the effective use of synchronous online classroom time was perceived as necessary for the quality delivery of fully online education programmes [17]. Although gamification can make classroom sessions more fun, it may lead to interruption and distraction if technological (such as network and connectivity) and technical (such as the challenges of media multitasking) problems persist [8].

The class observation reports from the three teaching assistants reflected that the adult learners in the GOFC and GOTC often forgot about their points, badges, and the leaderboard results. Instead, they were keener on acquiring useful knowledge through meaningful interactions with their peers and teachers. However, inadequate ICT support, such as technological and technical training, hindered the effective implementation of gamification in our study. Consequently, gamification adversely affected learners' motivation and interrupted their participation in learning activities [38]. To improve the effectiveness of gamification, the two teaching assistants suggested conducting a short briefing

about the gamification results at the end of each online classroom session. That may enhance the eagerness of the learners to earn points and badges. Professional training for teachers and improving the digital literacy of both teachers and learners are also necessary [8,22].

5.3. Suggestions of Learning Community and Study Groups in Fully Online Classroom Approaches to Avoid the Risks of Learning Disengagement

Participation is the key to the success of asynchronous, synchronous, and online flipped learning [13]. One of the overriding themes that emerged from the learner interviews was that the learners experienced a lack of peer connection and class belonging. They felt isolated from socialisation with classmates and teachers and from belonging to the school. Our study found active participation, positive online learning interactions, and a sense of belonging among the learners [14] through a learning community and study groups [9] can help to ensure the sustainability of online learning. These are important, especially for the new batches of learners who enrolled during the prolonged lockdown periods of the pandemic. Our findings echo Berry's findings [9] on the importance of learning communities and study groups. A learning community provides a feeling of membership, closeness, and belonging within a social group and satisfies the need for relatedness emphasised by SDT [14]. Study groups help learners connect and keep pace with each other to ensure progress and momentum in learning with the aid of ICT. They also enable learners to receive recognition from their peers for their contributions and ideas generated in the groups, promoting competence and further participation in learning activities. Therefore, educational institutions adopting any approach to conducting online instruction, including asynchronous, synchronous, and online flipped classroom approaches, should establish a learning community and study groups [9].

5.4. Challenges Encountered and Support Required in Online Classroom Approaches

Five prominent themes were obtained by triangulation from the views of the learners, teachers, and teaching assistants, which are: dialogue and communication in the online classroom approaches, technological issues, technical issues, sense of belonging, and learner emotion (Table 8). These themes suggest that fully online classroom approaches require support in three main areas: (1) technological support to resolve communication, network, and connectivity issues, (2) technical and professional training on online teaching for teachers to help them with online teaching techniques and skills, and (3) establishing a learning community and study groups to strengthen the sense of belonging to the school and mutual connection between learners [64]. Our findings coincide with the findings from Baxter and Hainey [13].

The triangulation analysis enabled us to address RQ2 better and understand the reasons behind the dampened impact of gamification on the academic achievement and participation level of learners in online classroom approaches (GOFC and GOTC). Gamification could be an extra burden on teachers and a distraction for learners when technical and network connectivity issues are not resolved. These issues worsened the emotional anxiety of learners during synchronous online classroom sessions [36].

6. Conclusions

This study uncovered various risks and opportunities involved in adopting the online flipped and gamification classroom approaches for ensuring sustainable adult education programmes for business management during the pandemic. One of the opportunities uncovered in our study is that by adopting ICT-enabled online flipped classroom approaches (GOFC and NOFC), HEIs can provide sustainable education programmes to relieve the anxiety of adult learners who wish to further their education. This opportunity is evidenced by our findings that the nongamified online flipped classroom approach (NOFC) exhibited the highest academic achievement and classroom participation level.

However, the learners' participation level was not at the optimal level of interactive dialoguing (Figure 8) in any of the three classes. The participation level might be affected due to poor networking and communication in the online environment, which was not comparable to in-person classrooms. The risks to sustainable adult education during the pandemic uncovered in our study were mainly caused by the direct transition of in-person to face-to-screen classroom approaches without providing teachers and learners with additional training and support [8]. Our findings suggest that providing technological and technical professional training and establishing a learning community and study groups can help address these risks. Nevertheless, both SDT and adult learning principles support online flipped classroom approaches. However, in our study, the implementation of gamification in the fully online classroom environment revealed multiple technological and technical challenges that need to be resolved.

The findings of our study suggest the need for HEIs to enhance the technological (e.g., network, connectivity, and digital literacy), technical (e.g., online teaching techniques, presentation skills, and time management), and learning community support (learning community and study groups) given to teachers and learners. By providing the support needed for a vibrant learning community and study groups, HEIs can help build a stronger sense of belonging among the learners and relieve their anxiety. These needs of learners are often neglected, but they have become more important as learners cannot meet in person for classes that commenced during the COVID-19 lockdowns [9]. HEIs should provide teachers and teaching assistants with professional technological and technical training to cope with the abrupt and unanticipated transition from in-person to face-to-screen instructional approaches. Finally, our findings revealed opportunities for promoting SDG-4 in higher education amidst the country's dynamic COVID-zero policy for HEIs that are well prepared [6,19].

7. Limitations

Nevertheless, we acknowledge that the research findings were from one institution (i.e., China Institute for Business) and that could not draw generalisable conclusions. The limitations of this study also included that the gamification application was entirely separate from the LMS and needed manual inputs into the local Qitoupiao application. It might have added an extra cognitive burden on the students and increased the workload for teachers and teaching assistants. At the same time, this study reflected the substantial implications of the need for fully online teaching and learning improvements. It is important to conduct further studies to assist the HEIs in providing a better mode of online instruction delivery.

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