"The Influence of Gamification and Flipped Learning on Learning Achievement and Engagement of Adult Business Education Programmes under the COVID-19 Pandemic."

submitted by

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Statement of Originality

I declare that this folio, submitted in partial fulfilment of the requirements for the degree

of Doctor of Education at the Education University of Hong Kong, represents my own work,

except where due acknowledgement is made, and that it has not been previously included in a

thesis, dissertation or report submitted to this University or any other institution for a degree,

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The three published studies (Chapters Two, Three and Four) are included in this folio with

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Ng Lui-Kwan

Abstract

The pedagogical evolution started with the quest for the continuity of educational programmes via pedagogical re-design to technology-led pedagogical transformation. This research project involved three studies with a total of 212 student participants (aged 24-46, with a mean of 34, 71% female) for 32 weeks from November 2021 to July 2022. The researcher witnessed the impacts of the COVID-19 pandemic on the sustainability of educational programmes for branding and marking in one of the higher education institutes (HEIs) in tier one city of Eastern China. The pandemic accelerated the adoption of various innovative techno-pedagogies, in which gamification and flipped classrooms were two of the most found options in practice.

Study One first sought to understand the impacts of the pandemic on the continuity of educational programmes and immediate possible pedagogical solutions with special attention to learning engagement and performance (N = 68, November 2021 to January 2022) with three pedagogical approaches (gamified flipped classroom, GFC; gamified traditional classroom, GTC and non-gamified flipped classroom, NFC). Results showed that GFC promoted learning engagement, and the GTC enhanced learning performance. The heavy implementations of the COVID-19 confinement and lockdown policies that happened from February to April 2022 impacted the sustainability of educational programmes. HEIs immediately did the pedagogical re-design for fully online instruction to overcome the challenge. Hence, the second study (N =

68) investigated the efficacy of gamification and flipped classroom approaches in a fully online instruction environment. Although the non-gamified online flipped classroom showed the highest levels of learning engagement and performance, the overall levels of learning engagement and learning performance dropped. Similar mixed and contradictory results found between Studies One and Two were reported in other literature. As HEIs needed to have innovative pedagogical solutions to maintain quality education during the pandemic, the third study (N = 76, May to July 2022) did the research in practice with an action research approach. The results showed that online pedagogies included gamification in flipped classrooms, promoting learning engagement and sustained learning performance.

With the three studies, this research project deepened the understanding of using techno-pedagogies in higher education, namely gamification and flipped classroom approaches. Grounded on self-determination theory (SDT), Study One addressed the adoption of these techno-pedagogies during the early stage of the COVID-19 pandemic and focused on the continuity of educational programmes. Study Two explored the re-design and further application of these two techno-pedagogies in a fully online instruction environment based on SDT and adult learning principles. Study Three consolidated the 386 quotes from two action research cycles to propose a practical framework incorporated with SDT and adult learning principles to enable further technology-led pedagogical advancement for the current and post-COVID-19 practice of HEIs.

The main contribution of the research project is helping teachers to have a deep thought by re-visiting the classical motivation theory (i.e., SDT) and adult learning principles (i.e., adult learning principles), with the proposal of a practical framework. The practical framework included flexibility, all-in-inclusive, coopetitive learning, technical support, and sustainable learning (F.A.C.T.S.). The pedagogical evolution will continue as more advanced technologies emerge, and a practical framework can help HEIs face such everchanging online and face-to-face learning environments.

Acknowledgements

I would like to take this opportunity to express my heartfelt gratitude to the people who have helped me during my Doctor of Education study journey. I cannot accomplish this without all their generous support, patience and guidance during the past six years.

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I want to thank the teachers and teaching assistants who supported me all the way during the experimental interventions and data collection of the three studies. Moreover, the Institute of China Business for giving me a precious chance to explore innovative techno-pedagogies for the improvement of instructional design. We did overcome tremendous difficulties and challenges while completing the three experimental studies during the peaks of the COVID-19 pandemic period from November 2021 to July 2022 in China.

I would also like to have a special acknowledgement and thanks to the reviewers* of the last publication of this research project (i.e., Ng & Lo, 2023) for their recognition and encouraging comments as follows:

"From the results of the research, a model emerged that showed an increase in sustainable learning performance of students. The model can represent guidelines for university teachers in strengthening their ICT competencies and an attempt to implement this model in their own teaching practice, respecting the contextual elements of the higher education institution where they work and operate."

"The fundamental contribution of this paper is the incentive for every higher education teacher to actively think and examine ways to improve the quality of teaching - which is ultimately reflected in sustainable student engagement and their satisfaction with studies in general - regardless of discipline and characteristics of national higher education frameworks."

Last but not least, I would like to express my gratitude to my parents, wife and two lovely children for their endless support and understanding of my absence for hundreds of evenings and nights.

* A double-blinded review without knowing the names of both authors and reviewers.

Statement on Submission of Thesis by Folio with Publications

This is a statement that the current folio is a compilation of three publications. The content of the thesis is best presented as a folio by publications because:

(a) this type of thesis writing enables the researcher to conduct research, studies and produce publishable articles independently in parallel.

(b) this type of thesis presentation can interpret the research project and research questions in a deeper and more detailed way.

(c) the publication benefits the researcher's learning by getting peer reviews from professional parties in the academic fields.

(d) each study in this folio can be linked coherently to the same research project and key objectives, that is, examining the efficacy of different techno-pedagogies on learning engagement and performance.

List of Publications Included in the Folio

Study One:

Ng, L.-K., & Lo, C.-K. (2022a). Flipped Classroom and Gamification Approach: Its Impact on Performance and Academic Commitment on Sustainable Learning in Education. *Sustainability*, *14*(9), 5428. https://doi.org/10.3390/su14095428

Study Two:

Ng, L.-K., & Lo, C.-K. (2022b). Online Flipped and Gamification Classroom: Risks and Opportunities for the Academic Achievement of Adult Sustainable Learning during COVID-19 Pandemic. *Sustainability*, *14*(19), 12396. https://doi.org/10.3390/su141912396

Study Three

Ng, L.-K., & Lo, C.-K. (2023). Enhancing Online Instructional Approaches for Sustainable Business Education in the Current and Post-Pandemic Era: An Action Research Study of Student Engagement. *Education Sciences*, *13*(1), 42. https://doi.org/10.3390/educsci13010042

Permission to include Studies One to Three in the folio has been granted from the publishers and attached to this folio in Appendix 4.

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Chapter Four (Study Two)

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

Chapter Five (Study Three)

Enhancing Online Instructional Approaches for Sustainable Business

Education in the Current and Post-Pandemic Era: An Action Research Study of

Student Engagement

List of Abbreviations

Abbreviation	Meaning
AMR	Annual Monitoring Report
COVID-19	Coronavirus Disease 2019
F.A.C.T.S.	Flexibility, All-in-inclusive, Coopetitive learning, Technical Support and Sustainable learning
GFC	Gamified Flipped Classroom
GOFC	Gamified Online Flipped Class
GOTC	Gamified Online Traditional Class
GTC	Gamified Traditional Classroom
HEIs	Higher Education Institutes
ICT	Information Communication Technology
LMS	Learning Management System
MOOC	Massive Open Online Course
NFC	Non-gamified Flipped Classroom
NOFC	Non-gamified Online Flipped Class
OFC	Online Flipped Classroom
OGC	Online Gamified Flipped Classroom
OTC	Online Traditional Classroom
PBL	Points, Badges, and Leaderboards
QCAs	Qualitative Content Analyses
RQ	Research Question
S	Student
SCWSL	Suspending Classes Without Stopping Learning
SDGs	Sustainable Development Goals
SDT	Self-Determination Theory
SLE	Sustainable Learning in Education
SPSS	Statistical Package for the Social Sciences
T	Teacher
TA	Teaching Assistant
VR	Virtual Reality

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Chapter One

1.1 General Overview

Albert Einstein said: "I never teach my pupils. I only attempt to provide the

conditions in which they can learn" (Goel, 2010, p. 1). The statement reminded us about

teaching and learning for adults, especially in business higher education. It was noted that

change is afoot in business education, and such change is necessary in response to the need of

students to face the ever-shifting business world (Bratianu et al., 2020). Even with increasingly

dynamic changes in business management and operations nowadays, it is ironic that the

instructional approaches of business educational programmes still retain their traditional way.

It was until the COVID-19 pandemic which the disruptive evolution of techno-pedagogical

transformation in business schools of higher education institutions (HEIs) started. The

disruption was mainly caused by the emergent shift from face-to-face to fully online instruction.

This shift led the business schools of HEIs to a technology-led pedagogical evolution

(Krishnamurthy, 2020).

This research project aimed to understand the impact of such instructional disruption and

transformation on adult learners' learning engagement and performance. Adult learners were

most affected as education is part of their personal and career planning. The research recognised

the challenges, problems, benefits, and solutions faced by HEIS, teachers and students under

the shadow of the COVID-19 pandemic. There were three studies, which lasted 32 weeks, with

212 students and 6 participants from the teaching team. We experienced three phases of

instructional evolution: instructional continuity, instructional re-design, and technology-led pedagogical transformation. Finally, a practical framework was proposed to guide the design of new technology-led instructional approaches.

1.2 Context of the Research Project

The onset of the COVID-19 global pandemic imposed a negative impact on the continuity of educational programmes in higher education (Chen et al., 2022). During city lockdowns, HEIs transitioned from solely face-to-face traditional classroom teaching to include technology-led flexible pedagogies with the aid of information communication technology (ICT), such as fully online or online and face-to-face blended learning (Martin & Godonoga, 2020). Techno-pedagogies might enable effective teaching and delivery of course materials online and in traditional classrooms (Gurukkal, 2021). Gamification and flipped classrooms were the most widely adopted innovative techno-pedagogies that integrated with ICT for the purposes of promoting learning engagement and performance (Huang, Hew & Lo, 2019). Grounded on self-determination theory and adult learning principles (Reeve, 2002), this series of studies aimed to investigate the influence of these techno-pedagogies on HEIs concerning learning engagement and performance. Participants were recruited from part-time postgraduate business educational programmes of the Institute of Business in Eastern China.

During the outbreak of the COVID-19 pandemic, more than 30 million students were

affected in the main cities of China (Peters et al., 2022). During the frequent closures of the campuses, HEIs were forced to shift their instruction to more flexible online approaches with the aid of ICT (Divaharan & Chia, 2022; Han et al., 2021). However, HEIs had shown lacking proper planning and experience in designing online instruction during disease outbreaks (Hallgarten, 2020). Thus, transitioning from traditional face-to-face classroom lecturing to online instruction caused problems such as learning disengagement and learning performance loss in actual practice (Kuhfeld et al., 2020). Exploring effective pedagogies with theoretical principles that could sustain the education programs and mitigate the negative impact of the COVID-19 pandemic was deemed necessary. In particular, research was needed to help teachers deeply understand adult learning and devise innovative techno-pedagogies to promote learning engagement and sustain learning performance in the ever-changing online and face-to-face learning environment in such pseudo- and post-COVID eras (Oded & Oded, 2022).

1.3 Research Gap and Objectives

Despite the vast advancement of ICT, multi-media, and social platform applications in recent years, Chinese HEIs still relied on traditional lecturing with limited online teaching experience before the pandemic (Guo et al., 2019). Most teachers lacked experience, knowledge, and skills in planning online instructions (Hallgarten, 2020). The traditional lecturing instructions were connected to the learning cultures of the Chinese, resulting in low

levels of learning engagement and learning performance loss (Zhu et al., 2022). Under the dynamic COVID-zero and suspending classes without stopping learning (SCWSL) policies, teachers kept organising online instruction to continue their education programmes (Zhang et al.,2020). Adopting online lecturing in Chinese HEIs was challenging, and efficacy was in doubt (Ashraf et al., 2017). Moreover, it was found that online teaching tended to be less effective (Cao et al., 2021). Teachers needed to understand how to improve the efficacy of running educational programmes in a fully online or online and face-to-face environment.

This series of studies included two mixed methods research (Studies One and Two) and one action research (Study Three) over a period of nine months during the COVID-19 pandemic from November 2021 to July 2022. With the development of the COVID-19 pandemic, there were different execution levels of dynamic COVID-zero and SCWSL policies in various stages (Zhang et al.,2020). The lockdowns could be from a few blocks of residence, a few districts to the whole city, and the period varied from days to months depending on the scales of the COVID-19 infection spreading. Therefore, HEIs needed contingency plans for the educational programmes' continuation (i.e., completion) and sustainability (i.e., keeping operation). The contingency plans included pedagogies which enabled individual online self-study and synchronous online and campus face-to-face classrooms (Petronzi & Petronzi, 2020). The efficacy of different pedagogies was always the most important consideration, guiding the research design of the three studies on improving the efficacy of different techno-pedagogies

(Kalaichelvi & Sankar, 2021). Learning engagement and performance were the two most important evaluation factors for the efficacy of pedagogies (Han et al., 2021).

This research project had three studies, all focused on learning engagement and performance of the pedagogies under different situations the HEIs, teachers and students faced during the 32 weeks. The learning environment shifted from face-to-face, on-site classroom learning to part of online learning with pre-recorded instructional videos in Study One to fully online instruction in Studies Two and Three. Moreover, the class modes were also affected by the development of the COVID-19 pandemic. Table 1.1 shows the periods and class modes of the three studies of the research project.

Table 1.1. The three studies and period of the research project.

Study and Research period	n	Class mode and interventions	Research method	Published article
Study One Nov 2021 to Jan 2022 (10 weeks)	68	Face-to-face and online: Experiment Group 1: Gamified flipped classroom (GFC) Experiment Group 2: Non-gamified flipped classroom (NFC) Experiment Group 3: Gamified traditional classroom (GTC)	Mixed methods	Ng & Lo, 2022a
Study Two February to April 2022 (10 weeks)	68	Fully online: Experiment Group 1: Gamified online flipped classroom (GOFC) Experiment Group 2: Non-gamified online flipped classroom (NOFC) Experiment Group 3: Gamified online traditional classroom (GOTC)	Mixed methods	Ng & Lo, 2022b

Study Three May to July 2022 (12 weeks)	76	<u>Fully online:</u> Pre-intervention: Online traditional classroom (OTC) Cycle 1: Online flipped classroom (OFC) Cycle 2: Online gamified flipped classroom (OGC)	Action research	Ng & Lo, 2023

The studies adopted an explanatory sequential design with a mixed methods approach in which quantitative and qualitative data were analysed. It was because when the qualitative analysis followed the quantitative analysis, it helped to explain and understand the mechanism behind the quantitative results (Plano Clark, 2019).

1.4 Significance of The Research Project

Chinese students were very concerned about the delays in their academic progress, especially adult learners who had educational planning for career development (Cao et al., 2020). The definitions of adult learners were diverse; the research shared the simplest one defined by Elias and Merriam (2005), that adult learners shared common social roles (i.e., working full-time and having monetary independence). Therefore, they favoured flexible instruction modes as they could benefit from self-directed independent study during the city lockdowns. Meanwhile, they looked to engage in collaborative learning activities once face-to-face classroom teaching was allowed (Jang & Kim, 2020). However, flexible instructional arrangements were not common in HEIs before the onset of the COVID-19 pandemic. HEIs in

China provided teacher-centric didactic instruction in which programmes were traditionally conducted face-to-face with fixed and scheduled timetables (Xiong et al., 2021). The COVID-19 pandemic precipitated an abrupt transition from the traditional classroom to mixed modes with flexible online and face-to-face instructional approaches. Thus, additional research with grounded theory and principles was needed to investigate the influence of such abrupt pedagogical transition on learning engagement and performance (Heo et al., 2021; Lo et al., 2018; Zainuddin, 2018).

Three studies were conducted in this research project. Study One investigated the impact of the pandemic on the continuity of educational programmes and the influence of gamified and flipped classroom approaches on learning engagement and performance during the early stage of the city lockdown (November 2021 to January 2022). At this stage, face-to-face classrooms were allowed once the lockdown was lifted. The research questions of Study One were as follows:

- RQ1. How did the adoption of the flipped classroom approach influence (a) learner achievement and (b) learner engagement compared to non-flipped approaches?

- RQ2. How did the adoption of gamification influence (a) learner achievement and (b) learner engagement compared to non-gamified approaches?

Study Two experimented in a fully online environment due to the total lockdown of the city for more than two months (February to April 2022). Moreover, the research questions were as

follows:

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

- RQ2. How did gamification impact the academic achievement of adult learners in fully online classes compared to a non-gamified environment?

After the pedagogical re-design for fully online instruction in Study Two, Study Three was experimented with in a fully online environment due to more frequent lockdowns and uncertainty for campus re-opening from May to July 2022. The research questions were as follows:

- RQ1. What was the efficacy of the current online pedagogy regarding student engagement and sustainable learning performance?

- RQ2. How could we improve the efficacy of online instruction using the new techno-pedagogy regarding student engagement and sustainable learning performance?

- RQ3. What was a practical framework for building new techno-pedagogies for the current and post-COVID-19 era?

The following chapters (Chapters 2-5) will provide details of the literature review, Study One, Two and Three, which lead us through the whole journey of the techno-pedagogical changes under COVID-19. It is a journey of 32 weeks from November 2021 to July 2022, witnessing

the ever-experienced pandemic in our generation, together with our teachers and students.

Lastly, Chapter 6 will provide an overall discussion and concluding remarks on the research

project.

Chapter 2

2.1 Literature Review

The following subsections first present a literature review of China's COVID-19 policies and their impact on the continuity of HEIs educational programmes in comparison with other countries (both developed and developing ones). Second, how teachers in China coped with the situation and overcame the problems and challenges of adult education programs. Third, the literature review of theories and principles adopted in higher education contexts. Lastly, the evolution of techno-pedagogies based on SDT and adult learning principles and the need for a practical framework for educators.

2.1.1 China HEIs in the COVID-19 Pandemic

As the outbreak and spreading of the COVID-19 pandemic in early 2020, China deployed the dynamic COVID-zero and SCWSL policies (Zhang et al., 2020), which were basically unchanged till the end of the research period (i.e., July 2022). HEIs needed to continue and sustain their educational programmes while frequently interrupted by campus closures and city lockdowns (Cao et al., 2021). Moreover, HEIs had to take up the responsibility of equipping students with the knowledge and skills to cope with such once-a-lifetime challenging and complicated circumstances. Therefore, HEIs had to overcome the barriers and interruptions due to the COVID-19 pandemic and support the continuity of educational programmes for students (Ben-Eliyahu, 2021). In fact, HEIs in China were among the first compelled to rapidly

re-design teaching approaches and classroom arrangements to offer flexible instruction during the COVID-19 outbreaks (Yu et al., 2022). It was because millions of students and thousands of HEIs were affected if educational programmes could not be continued and sustained (Peters et al., 2022). The same impacts were also found in both developing and developed countries such as Australia, Canada, Denmark, Japan, New Zealand, Norway, Singapore, the United Kingdom, the United States, Europe and APAC countries (Murphy, 2020; Quay et al., 2020; Şakan et al., 2020; Zainuddin et al., 2021). Educators swiftly learnt and adopted new technologies and information communication systems to support the education programmes for students and teachers during the pandemic (Quay et al., 2020)

The advancement of ICT, multi-media and social platform applications in China supposedly provided a good foundation for flexible and effective online instruction (Han et al., 2021). HEIs in China re-designed their teaching by providing students with online self-study materials during campus closures or in the uncertain period of intermittent lockdowns. That was the application of techno-pedagogies in the initial stage, in which teachers simply put lectures online as the contingency plan for the continuity of educational programmes. Students were still looking for face-to-face classes as their most preferred choice of instruction (Yu et al., 2022). This research project started in November 2021 (Study One) and ended in July 2022 (Study Three). It witnessed the impacts of the COVID-19 pandemic on higher education, from a few interruptions in which face-to-face instructions were still possible (Study One) but with

some delays till a complete campus closure and only fully online instruction was feasible (Studies Two and Three). After the completion of Study One, more frequent and prolonged city lockdowns forced all HEIs to have educational programmes put on fully online. Hence, there were all online instructions for Studies Two and Three.

Part-time adult learners were the most affected by the COVID-19 pandemic, as education was part of their life and career plans (Aristovnik et al., 2020). HEIs providing part-time postgraduate programmes were seriously impacted by delays, unconfirmed, and always re-scheduling timetables (Huang et al., 2020a). Thus, exploring an effective pedagogy to continue the education programs on track and mitigate the disruptions to adult learners was deemed necessary. It was especially important for countries which execute stringent COVID-19 protection policies (Huang et al., 2020a). However, transitioning from a traditional classroom to online instruction was not as smooth as we thought. It was full of problems and challenges which caused learning disengagement and learning performance loss in actual practices (Kuhfeld et al., 2020). Therefore, ensuring learning outcomes and performance undisrupted, even if the campuses were disrupted, became the mission of the HEIs in China (Huang et al., 2020a).

Three major challenges and two critical concerns arise if HEIs wanted to continue and sustain the learning programmes, namely the following (Huang et al., 2020b; Kuhfeld et al., 2020):

Challenge 1:

Lack of preparation and techniques – neither HEIs nor teachers had adequate experience preparing teaching content quickly and were adaptable to flexible or fully online instructions.

Challenge 2:

Lacking all-in-inclusive online learning – it was the first-ever instruction without the face-to-face classroom. Both teachers and students were separated and isolated and could only interact through the computer screens.

Challenge 3:

Lacking effective pedagogical approaches – the drop-out rates of online learning educational programmes were generally much higher than campus face-to-face classes. Therefore, new techno-pedagogical approaches were needed to motivate students, especially for long hours of online instruction.

Concern 1:

Learning engagement – poor learning engagement and participation levels in learning activities in online classes, which led to unsatisfactory learning performance and non-sustainable learning in the long run.

Concern 2:

Learning performance – the ultimate outcome of learning results in examination or

assignment marks. Sustaining and improving learning performance ensured the quality of education of the HEIs.

There should be some missing parts and knowledge that could help with such a transition of instruction. The potential pedagogies for success should be grounded in theory and principles (Lo et al., 2018). Therefore, it would be worth investigating how innovative techno-pedagogies could help the continuity and sustainability of HEIs educational programmes for adult learners during the pandemic regarding the mentioned challenges and concerns.

2.1.2 HEI Teachers and their Practices before and during the COVID-19 Pandemic

The Chinese Ministry of Education (CMoE) and education specialists started discussing using ICT to provide online and distance learning approaches in April 2020 (Huang et al., 2020b). Two major directions were given in the Handbook on facilitating flexible learning during the educational disruption of COVID-19 outbreaks (Huang et al., 2020a). The two directions were (1) enabling techno-pedagogy with the aid of ICT to motivate and sustain learning and build learning communities and (2) providing flexible learning pathways for students allowing individual self-directed and collaborative peer learning. To achieve these two directions mentioned by CMoE in actual practice, we needed to understand the efficacy of the current pedagogies and how we could further improve them. Specifically, how we could overcome and address the three challenges and two concerns faced by HEI teachers.

HEI teachers in China, like their peers worldwide, had limited experience, knowledge and skills in planning flexible online instructions (Ashraf et al., 2017), which affected the effective delivery of their online educational programmes. Online instruction with a traditional lecturing style was one of the most common ways of instruction adopted immediately in the early stage of the COVID-19 pandemic outbreak. Moreover, flipped classroom approach was later adopted by HEIs. Students watched pre-recorded instructional videos online, which were recorded by the teachers before attending their face-to-face class sessions upon the reopening of campuses (Cao et al., 2021). The flipped classroom approach supposedly created more in-class time for collaborative learning and boosted learning engagement (Rotellar & Cain, 2016). Providing pre-recorded online instructional videos to students enabled their self-directed learning (Alqarni, 2018). Thus, flipped classrooms allowed flexible learning through the provision of online self-study instructional videos and enabled advanced collaborative learning in the class sessions (Peterson, 2016).

Teachers should not just adopt different pedagogies as a formality or contingency plan during the COVID-19 pandemic (Ferrari & Fabbri, 2022). Kuhfeld et al. (2020) reminded us of the two important considerations of all flexible pedagogies: learning engagement and performance. They were the two indicators for quality HEIs educational programmes (Pilotti & Ghazo, 2020). HEIs and teachers should take up the responsibility to assist students in continuing their education by overcoming barriers impeded by the pandemic (Yassin et al.,

2020). To achieve these goals and continue quality education, teachers needed to evaluate the efficacy of commonly adopted pedagogies. They also needed to design new pedagogy incorporated with advanced technology, such as ICT (Lo, 2022). The pedagogies should ground on theory and principles that could motivate the students (Halpern & Tucker, 2015; Lo et al., 2018).

2.1.3 SDT, Adult Learning Principles and Techno-pedagogies

Higher education programmes consist of services to motivate adult learners to continue and sustain their studies. However, there were multiple definitions and theories of motivation, from philosophical to practical disciplines. For the research project, the definition of motivation from Mcdevitt and Ormrod (2012) was adopted: "Motivation energises, directs and sustains behaviour and can be either intrinsic or extrinsic". The motivation was also distinguished into intrinsic, which referred to action for inherent interest or enjoyment, and extrinsic, in which the action was for specific noticeable outcomes. In addition, achieving personal goals, which could be either intrinsic or extrinsic, motivated adult learners to engage in learning activities to improve performance. Intrinsic and extrinsic motivation was the most relevant to learning behaviours. Intrinsically motivated students were more likely to credit the successes to internal factors (e.g., effort invested), while extrinsically motivated students looked for external factors (e.g., higher marks and ranking) (Bandura, 1991).

The most cited theory and popular principles for adult education were self-determination theory (SDT) and adult learning principles (Brookfield, 1986; Patton & Owens, 2023). SDT is a need-based theory and proposes the drives for motivation centred on the intrinsic psychological needs of autonomy, competence and relatedness (Deci & Ryan, 2012). Reviews of SDT and the intrinsic needs for motivation articulated a principle regarding facilitating student learning behaviours. That was the perceived support to intrinsic needs of autonomy, competence and relatedness, regardless of task success or failure (Deci & Ryan, 2000; Reis et al., 2000). In other words, SDT argued that extrinsic rewards (e.g., contingent monetary rewards) reduced intrinsic task motivation (Deci, 1972).

However, with the peculiarities of adult learners, both personal (e.g., competence) and career development factors (e.g., employability and professional competence) play an important role in learning situations (Kellenberg et al., 2017). Understanding the relationship and interaction between learners' intrinsic and extrinsic motivation and their effects is critical in promoting optimal learning achievement and engagement in adult education (Lemos & Veríssimo, 2014).

Adult learners in business management programmes were responsive to job-related motivation, which could be either extrinsic factors, such as those that influence their promotion and increase in salary, or intrinsic factors, such as self-esteem and self-enhancement (Heine, 2005). Lemos and Veríssimo (2014) also found that both intrinsic and extrinsic rewards can co-

exist and are not contradictory. Moreover, Hamner and Foster (1975) also found that these extrinsic rewards have an additive effect on intrinsic rewards on task motivation in boring task settings. Obviously, the research should include adult learning principles as the theoretical support to verify the factors that promote learning achievement and engagement.

The underpinning concept of adult learning principles was that adults differ from children or undergraduates. For more than 30 years, both strong detractors (e.g., Hartree, 1984) and supporters (e.g., Holton & Swanson, 1998) had discussed and made connections of pedagogy to post-modern psychological theories such as self-determination theory (SDT) (Houde, 2006). The common core focus of both pedagogy and SDT was motivation to drive students' learning engagement and performance but with different discerning principles (Holton et al., 2008). The assumption about adult learners was that "while adults are responsive to some external motivators (better jobs, promotions, higher salaries, and the like), the most potent motivators are internal pressures for external expression (i.e., the desire for increased job satisfaction, self-esteem, quality of life, and the like in comparison to peers)." (Knowles, 2002). Moreover, motivation played an implicit role in building adult learning principles (Houde, 2006). In traditional settings, students were motivated by internal (intrinsic) and external (extrinsic) stimuli. Extrinsic motivators were often observable externally and culturally driven (e.g., awards and higher academic scores). SDT and adult learning principles address the motivational need to promote learning engagement and performance (Pew, 2007).

There were four principles of adult learners:

i.   self-concept

ii.   role of experience

iii.   readiness to learn

iv.   learning orientation

Knowles (1977) portrayed adult learners in above mentioned four aspects. In order to answer the challenges from the detractors, the concept of adult learning principles could not remain in sloganeering (McKenzie, 1977). Supporters of adult learning principles and Knowles further explored the implications of these four principles in practice.

Applying adult learning principles in educational programmes could avoid the misapplication of critical motivators and prevent dropouts (Chan, 2010). Knowles' adult learning principles were further developed in the 21st century (Chan, 2010; Forrest & Peterson, 2006):

i.   self-concept: the needs for self-directedness, autonomy and independent learning

ii.   role of experience: learned from each other as adults have a rich repository of experience and knowledge

iii.   readiness to learn: when the need to know and learn enabled self-fulfilment and self-enhancement

iv.   learning orientation: real-life orientation for problem-solving and task-focused

learning

As a grown-up adult, the maturation process leads the person toward increasingly self-directedness in learning (Elias & Merriam, 2005). Second, adults accumulated an increasing reservoir of personal experience and knowledge which was a rich resource for peer learning with each other (Reischmann, 2017). Third, adults were much more ready to learn when they experienced the need for self-enhancement and achieving their full potential (Cai et al., 2010). Last, adults were more satisfied with real-life tasks and application-oriented learning (Eripuddin & Jufrizal, 2021). The instructional design with these considerations fulfilled Knowles' concept of adult learning principles (Chan, 2010), which already included the latter two newly added assumptions as adults were intrinsically motivated and the need to know (Knowles, 2002).

Although adult learning principles were proposed by Knowles (1977) for more decades, it was not readily found in higher education till modern days in schools (Rachal, 2002). Pew (2007) believed that the instructional approach had to be different if we assumed we were teaching adults, not children or undergraduates. Adults see themselves as learners, doers and knowledge producers (Knowles, 1984), and hence the educators of adult education programmes need to be aware of the underlying assumptions of adult learning principles. These assumptions include that adult learners are self-directed, have a wealth of usable experience and knowledge, and are keen on real-life and problem-based learning (Pew, 2007; Pratt, 1993).

2.1.4 The Covid-19-induced Techno-pedagogies Evolution.

The multi-state lockdown in countries impacted not just the education sector but also the business world. The businesses of various industries, including retail, marketing, hospitality, food and beverage, could only survive during the pandemic if digitally transformed (Krishnamurthy, 2020). Therefore, students in business schools might expect that as the business world changes, so do the ways of instruction in school should change too. Although, the social distancing due to the COVID-19 pandemic had led to the abrupt swift of traditional face-to-face to online instructions through the use of ICT and digital technologies (Zimmerman, 2020). HEIs and teachers were sceptical about the efficacy of online instruction. The pandemic forced and helped HEIs and teachers to overcome various challenges and problems, and they experienced the benefits of techno-pedagogical solutions with digital tools. For example, the gamified and flipped classrooms enabled synchronous, asynchronous, face-to-face and online flexible learning arrangements (Amiti, 2020). Therefore, the COVID-19 pandemic accelerated the techno-pedagogical evolution and technology-led pedagogical transformation in HEIs (Lederman & Jaschik, 2020).

COVID-19 provided a discontinuous disruption of business-as-usual school practice and led to technology-led transformation, as Norris and Lefrere noted (2011). The HEIs and business schools faced a once-in-a-lifetime shift from emergency online instruction (i.e.,

instructional continuity) to fully online virtual classes (i.e., instructional re-design) and transformation of teaching and learning (i.e., technology-led transformation). Similar technology-led evolution and transformation also happened in the business world. Lederman & Jaschik (2020) summarised the keys considerations for evolving new, effective, and sustainable techno-pedagogies:

i. "students can learn what they need and when they need to learn" (i.e., flexible learning)

ii. "changes in use and roles of teachers, students and classrooms" (i.e., all-in participation)

iii. "seeking effective pedagogies to enable rapid completion of learning objectives and goals" (i.e., collaborative and competitive learning)

iv. "technology availability and support" (technical support and training)

v. "considering the future and continuity of the institution and higher education" (sustainability)

They were survey results from 172 principals of HEIs (Lederman & Jaschik, 2020). The most commonly quoted responses included flexibility in learning, constructive feedback from students and teachers, interactive and motivated online learning, technology resources and training, and moving from the current crisis to future sustainable education. Two major challenges mentioned by the principals were maintaining student engagement (n=144/172,

84%) and ensuring the academic standards (i.e., learning performance) (n=155/172, 90%).

Techno-pedagogies, such as flexible online and face-to-face flipped classrooms, could facilitate

learning engagement and performance (Lozano-Jiménez et al., 2021; Lederman & Jaschik,

2020). In addition, both SDT and adult learning principles admitted that supportive feedback

from teachers was a strong motivator for students (Pilotti & Al Ghazo, 2020). In gamified

classrooms, teachers' supportive feedback could be conveyed via game elements such as points,

badges, and leaderboards (Deterding et al., 2014). Figure 2.1 presents the evolution of techno-

pedagogies based on SDT and adult learning principles which founded the basis for the design

of this research project.
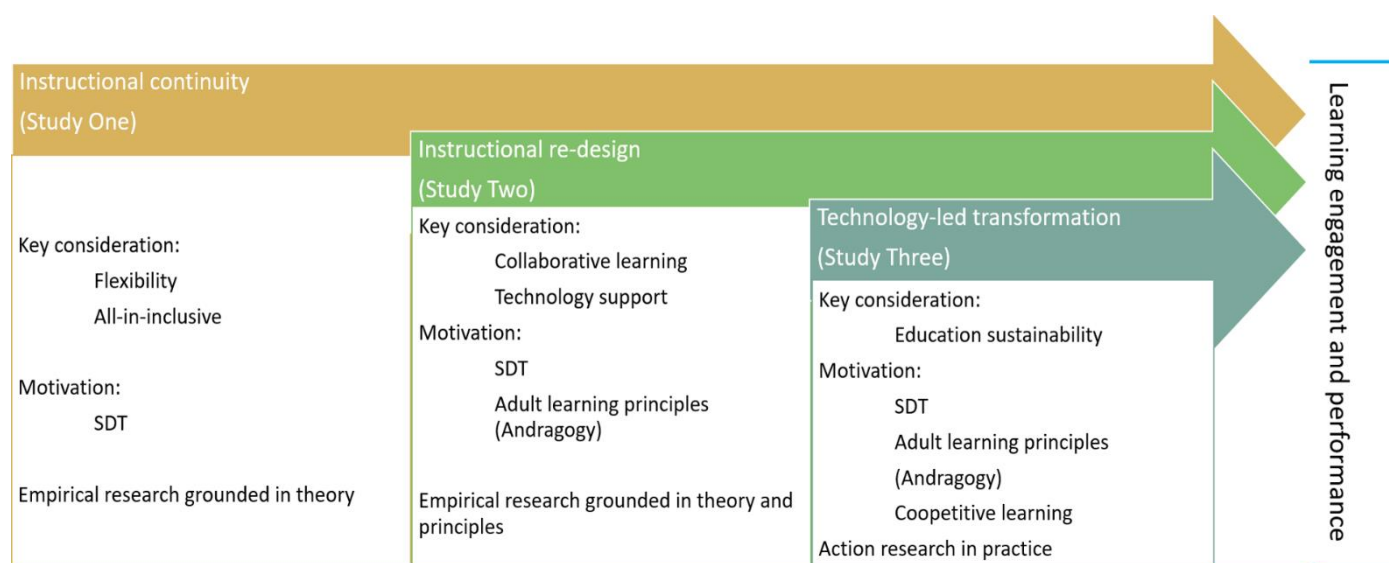
Figure 2.1. The techno-pedagogies evolution and the research project design.

After reviewing the above literature, theory and learning principles, especially those on

learning engagement and achievement, educators need a practical framework as the tool to

ensure the needs of the adult learners they serve are satisfied. A practical framework well

addresses the important factors impacting the continuity and persistence of adult learners

through completion of their study are deemed necessary (Patton & Owens, 2023).

Chapter Three

Study One

Flipped Classroom and Gamification Approach: Its Impact on Performance and Academic Commitment on Sustainable Learning in Education

(Ng & Lo, 2022a)

3.1 Introduction

The onset of the COVID-19 global pandemic has imposed a negative impact on the Sustainable Development Goals (SDGs) of Education 2030 (SDG 4) declared by the United Nations in 2015 (Chen et al., 2022; Leicht et al., 2018). The goal of SDG 4 is to equip adult learners with the knowledge and skills necessary for the benefit of global sustainable development by providing flexible education pathways in higher education (Martin & Godonoga, 2020). Higher education institutes (HEIs) have to equip adult learners with the knowledge and skills of sustainable learning in education (SLE) to cope with challenging and complicated circumstances (Ben-Eliyahu, 2021; Pilotti & Al Ghazo, 2020). Thus, HEIs are responsible for assisting adult learners in overcoming barriers and interruptions by providing sustainable quality education, which is essential for the country's SDGs (Rovio-Johansson, 2016; Yassin et al., 2020). HEIs were compelled to rapidly redesign teaching approaches and classroom arrangements to offer flexible and sustainable learning pathways for SLE in the

times of COVID-19 lockdown (Hays & Reinders, 2020; Pfeiffer et al., 2020).

Instructors in China innovatively planned their teaching by providing learners with pre-class self-study materials during in-campus classroom lessons due to the uncertainty of intermittent lockdowns (Yu et al., 2022). Advancements in information communication technology have made such learning arrangements that combine pre-class and in-classroom learning activities feasible. These arrangements are critical for the sustainability of educational programmes under enforced home confinements and campus lockdowns during the pandemic (Murphy, 2020; Pérez-Jorge et al., 2020). Most importantly, these new pedagogical approaches can alleviate the threats of the pandemic on the sustainability of the country's education system and promote SLE amid COVID-19 (Ben-Eliyahu, 2021; Le, 2022).

Learners with flipped classroom approaches were provided with instructional materials for self-study at home before participating in practical learning activities in the classroom, reducing the reliance on face-to-face teaching instead of a traditional classroom arrangement that is totally reliant on it (Yang, 2020). Learner achievement and engagement are two important indicators of the success of flipped classrooms in HEIs (Ardhaoui et al., 2021; Bowden et al., 2021). Research also indicates that the success of flipped classrooms depends on sustained learner engagement in learning activities (Jang & Kim, 2020; Huang et al., 2019). According to self-determination theory (SDT), gamification has the potential to promote learner achievement and motivate learner engagement in the learning activities of flipped

classrooms (Sailer & Sailer, 2021). SDT is an empirically derived theory in social contexts that differentiates human motivation in terms of autonomous and controlled, in which autonomously motivated learners thrive in educational settings (Reeve, 2002; Ryan & Deci, 2017). Gamification is the use of game-design elements in non-gaming contexts and can potentially motivate learning (Deterding et al., 2011; Dicheva et al., 2015). Based on SDT, gamification is hypothesised to foster intrinsic motivation and satisfy the psychological needs for autonomy, competence, and social relatedness in flipped classrooms (Sailer & Sailer, 2021).

Flipped classroom approaches have also been adopted in HEI programmes during the COVID-19 pandemic for sustainable learning in higher education (Collado-Valero et al., 2021). Instructors provide pre-recorded instructional videos to enable learners to study on their own during home confinement periods. In addition to the flexibility, the flipped classroom approach also allows more in-class time for promoting SLE. The key components of SLE are (1) active learning; (2) independent learning; (3) collaborative learning; (4) renewing and relearning; (5) knowledge and skills transferability (Ben-Eliyahum, 2021). The key learning activities in flipped classrooms are pre-class self-study (i.e., independent learning), knowledge application (i.e., transferability), problem-solving (i.e., renewing and relearning), and peer-assisted learning (i.e., collaborative and active learning) (Akram et al., 2021; French et al., 2020); these are especially advantageous in promoting SLE. HEIs in China flexibly adopted flipped classroom approaches in response to the government's policy of "suspension of classes without

interrupting learning" during the COVID-19 pandemic (Peters et al., 2020; Wu, 2020). However, additional research is required to investigate the impact of the abrupt pedagogical change caused by flipped classrooms in the long history of Chinese education, which is dominated by traditional didactic teaching (Li et al., 2020a).

This study investigated the impact of the flipped classroom and gamification approaches on learner achievement and engagement in postgraduate business programmes for SLE in China during the COVID-19 pandemic. Three classes with different instructional interventions were applied: gamified flipped classroom (GFC), non-gamified flipped classroom (NFC) and gamified traditional classroom (GTC). Furthermore, the study was guided by the following two research questions:

- RQ1. How does the adoption of the flipped classroom approach influence (a) learner achievement and (b) learner engagement compared to non-flipped approaches?

- RQ2. How does the adoption of gamification influence (a) learner achievement and (b) learner engagement compared to non-gamified approaches?

3.2 Literature Review

We have the following three sections of the literature review. First, we discuss the SLE and flipped classroom approach during the COVID-19 pandemic. Second, we review how the SDT framework supports and motivates SLE and flipped classrooms. Third, we explore the

integration of gamification with flipped and traditional classrooms for SLE.

3.2.1. SLE and Flipped Classroom during COVID-19 Pandemic

SLE is a philosophy of learning and teaching, not limited to education for or about sustainability (Leal Filho et al., 2018). SLE supports SDGs in education for adult learners, whose past knowledge and skills are viewed as flexible and receptive to modification (Willats et al., 2018). SLE is an emerging and timely concept designed to enable learners to keep pace with technological and social changes (Hays & Reinders, 2020). HEIs with SLE initiatives provide learners with individual and group learning (Hays, 2015). SLE promotes learners' willingness to participate and contribute to the learning process, reflected in learners' behavioural, emotional, and cognitive engagement in learning activities (Azevedo, 2015; Ben-Eliyahu & Linnenbrink-Garcia, 2015). Ben-Eliyahu (2021) summarised the key components of SLE as:

1. Active learning: refers to seeking information actively and intentionally;

2. Independent learning: refers to self-sustained learning, which involves learning by oneself, being autodidactic, identifying and finding sources for what needs to be learned;

3. Collaborative learning is conducted in groups with peers of different levels of knowledge and is a process of acquiring and creating knowledge;

4. Renewing and relearning is the self-reflection and awareness of our knowledge that might have been forgotten or need to be relearned because of advancements in a field;

5. Knowledge and skills transferability: refers to using knowledge and skills learned in one setting (e.g., in the classroom) to another setting (e.g., at work).

SLE could be integrated into education settings with information communication technology (ICT), online courses (e.g., MOOC), and pre-class and in-class learning (Hays & Reinders, 2020). Such flexible pedagogical approaches are especially beneficial to ensure learning sustainability when classroom teaching is suspended during uncertain and complex situations (Hettiarachchi et al., 2021).

The COVID-19 pandemic impedes learning sustainability by imposing academic uncertainty on HEIs. Learners reported negative emotions and decreased satisfaction due to interruptions to their sustainable learning (Li et al., 2020b; Šakan et al., 2020). HEIs in China needed to rapidly adjust their instructional practices to anticipate the changes in the country's confinement policies (Carrillo & Flores, 2020). In sync with this development, teachers in China quickly adopted the flipped classroom approach with the aid of information communication technologies (Li et al., 2020b; Wu, 2020). The flipped classroom approach is a technology-enhanced pedagogy that frees class time by providing pre-class instructional videos (Bishop & Verleger, 2013). Flipped classrooms emphasise learner-centric and problem-solving activities inside the classroom (Abeysekera & Dawson, 2015), which enable

independent and collaborative learning (Mahmud et al., 2020). Peer-to-peer and peer-to-teacher interactions promote active learning, and problem-solving activities encourage knowledge renewing and relearning of SLE (Ben-Eliyahu, 2021; Li et al., 2020a). In addition, problem-solving activities for knowledge transferability also enhance perceived learning and learner achievement (Galindo-Dominguez, 2021; Hsia et al., 2021).

Chinese learners are very concerned about delays in their academic progress (Cao et al., 2020). Therefore, they favoured flipped classroom approaches as they could benefit from the self-paced independent learning enabled by pre-class instructional materials, such as pre-recorded videos, even during confinement and closures of campus. They could then look forward to increased engagement in collaborative learning once classroom teaching is allowed (Jang & Kim, 2020). However, the flipped classroom approach was not common in HEIs worldwide or in China before the onset of the COVID-19 pandemic (Hernández et al., 2020). HEIs in China have long adopted teacher-centric didactic pedagogy in which programmes are primarily conducted face-to-face with scheduled timetables (Xiong et al., 2021). The COVID-19 pandemic precipitated an abrupt transition in traditional classroom teaching approaches. Thus, additional research with a solid theoretical foundation is required to investigate the impact of this abrupt pedagogical change on learning, mainly learner achievement and engagement (Collado-Valero et al., 2021; Zainuddin, 2018). This is especially important during the interruptions and frequent transitions between pre-class and in-class modes of learning

caused by the COVID-19 pandemic (Ahshan, 2021; Heo et al., 2021; Kuhfeld et al., 2020).

3.2.2 Self-Determination Theory

Motivation is the main catalyst for sustainable learning behaviour (Luria et al., 2021). SDT posits that humans inherently possess the propensity to be curious and interested in learning and developing (Ryan, 1995; Silvia, 2008). The desire for sustainable development of business executives and entrepreneurs helps to attain the SDGs of the country (Ashari et al., 2021). SDT states that when learners' three basic psychological needs (i.e., autonomy, competence, and relatedness) are fulfilled, they are motivated and are more likely to engage in education contexts (Niemiec & Ryan, 2009; Ryan & Deci, 2000). Learner engagement is characterised by learners' investment in learning, desire to exceed standard requirements, and preference for challenges of varying difficulty levels (Connell & Wellborn, 1991). Learner engagement includes behavioural, emotional, and cognitive dimensions (Newmann, 1992). Studies by Abeysekera and Dawson (2015) and Sergis et al. (2018) indicate that SDT could be drawn upon to support learning in flipped classroom environments. As less class time is consumed by lectures, learners have more opportunities for self-directed, independent, peer-to-peer collaborative learning and hands-on problem-solving activities for knowledge transfer (Sergis et al., 2018). Hence, flipped classrooms facilitate autonomy, and supportive feedback from teachers and peers promotes competence and relatedness (Lo & Hew, 2020).

A recent study of HEIs during the COVID-19 pandemic found that learning persistence and sustainability were also directly impacted by learners' needs for autonomy, relatedness, and competence (Pelikan et al., 2021). Therefore, higher engagement resulting from motivation, as explained by SDT, is a prerequisite for the sustainability of educational programmes during the COVID-19 pandemic (Chiu, 2022). Supportive feedback from teachers is especially crucial for engaging learners and can be conveyed via game-design elements such as points, badges, and leaderboards. Learner engagement is positively related to perceived learning and sustainable learning (Bayoumy & Alsayed, 2021; Panigrahi et al., 2020). Thus, flipped and gamified classrooms based on the SDT framework may promote learning through knowledge transferability in problem-solving activities and collaborative and active learning (Lozano-Jiménez et al., 2021). Furthermore, the adoption of flipped classrooms and game-design elements based on SDT has the potential to promote SLE in HEIs during the COVID-19 pandemic (Orazbayeva et al., 2021).

3.2.3 Gamification

Gamification is the use of game-design elements in a non-game environment (Deterding et al., 2011), which can be a sustainable method to achieve the United Nations' Sustainable Development Goals for quality education (SDG 4) (Park & Kim, 2021). In the context of education, both gamification and SDT aim to promote learner achievement and engagement

(Ekici, 2021). Gamification is typically used in flipped classrooms to provide feedback, encourage learners to take on task challenges with progressively increasing difficulty levels and motivate independent and collaborative learning (Hammill et al., 2021). Feedback and challenges are important to promote learning achievement and engagement (Langendahl et al., 2016). A progressive increase in the difficulty level intrinsically motivates learners to complete more challenging tasks, especially those tasks that are relevant to their personal goals (Deci & Ryan 2016). One major personal goal for learners in higher education business programmes is to translate knowledge to practice (i.e., knowledge transferability), as it enhances their employability (Rosenbaum et al., 2021). Gamification promotes active learning and engagement in problem-solving activities that bridge the knowledge-to-practice gap (Chang et al., 2021; Kressler & Kressler, 2020). Game-design elements engage learners by helping them to build new knowledge (i.e., renewing and relearning) and support learning achievement (Hammill et al., 2021). Therefore, pedagogies with gamification promote SLE (i.e., renewing and relearning, collaborative and active learning, and knowledge transferability) (Jusas et al., 2022).
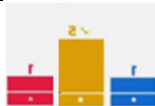
The most common game-design elements used to motivate learning in higher education are points, badges, and leaderboards (Deterding et al., 2021). These game-design elements serve the following specific purposes (Sailer et al., 2017) (Table 3.1):

1. Points capture granular feedback directly related to learners' specific actions, e.g.,

participation in in-class learning exercises and pursuing optional and challenging tasks.

2. Badges capture sustained feedback to recognise learners' progress and contributions

    to the activity group tasks.

3. Leaderboards capture cumulative feedback on a series of actions performed by the

    learner and their contributions to completing tasks by displaying the number of badges

    earned in activity groups during the entire course.

Table 3.1. Game-design elements and feedback.

Game-Design Element	Picture	Feedback	Description
Points		Granular feedback	• Rewards for specific actions and participation in learning exercises. • Encouragement for pursuing optional and increasing difficulty levels of tasks.
Badges		Sustained feedback	• Rewards and recognition for progress and contributions to problem-solving exercises in the activity groups (e.g., case studies).
Leaderboards		Cumulative feedback	• Ranking of learners in activity groups according to total badges earned.

Gamification can be adopted in flipped classrooms to motivate learners to increase their

efforts and participation during the COVID-19 pandemic (Rincon-Flores & Santos-Guevara,

2021). Recent studies found that gamification (Santos-Villalba et al., 2020) and flipped

classrooms support positive learning achievement and engagement. Further, SDT provides the

theoretical foundation on which gamification and flipped classroom pedagogies can be

grounded (Ahmed & Asiksoy, 2021). Nevertheless, there is a paucity of research on

gamification applied in flipped classrooms for business education among adults (Bredow et al., 2021).

3.3. Research Methods

We adopted an explanatory sequential design with a mixed-methods approach using both quantitative and qualitative research methods. When the quantitative phase is followed by the qualitative phase, it helps to explain the mechanism behind the quantitative results (Creswell et al., 2013). This approach can also be adopted to provide an insightful comparison between flipped classrooms with gamification to traditional classrooms in the existing study (Lo & Hew, 2020). In this section, we first introduce participants, followed by the research design, data collection, and analysis.

3.3.1 Participants

Participants were adult business executives (aged 25–42 years) studying postgraduate business programmes of HEI in eastern China. Their participation was voluntary, and participants could withdraw from the study without negative consequences at any time. They were assigned to one of the three different instructional approaches (GFC, n = 25; NFC, n = 24; GTC, n = 19) for the second module in weeks 6–10. For flipped classrooms (i.e., GFC and NFC), the learners were provided with pre-class instructional videos recorded by the teacher

via the institution's learning management system (Moodle) four weeks before the scheduled in-class lessons. The videos were intended to impart basic knowledge before the in-class lessons. After watching the videos, the learners could complete self-evaluation multiple-choice quizzes during their free time. Owing to the high degree of trust and coordination between the government and Chinese higher education institutes (Yang, 2020), universities reopened soon after local COVID-19 cases were contained. Rigorous hygiene measures enabled the resumption of regular face-to-face lessons in classrooms. Teachers focused more on advanced topics during the in-class lessons once the institute was allowed to reopen. In this study, the learners in the flipped classrooms spent more in-class time on learning activities such as knowledge applications for solving real and simulated business problems and assignment discussions.

The learners in the gamified classrooms (i.e., GFC and GTC) were given an account and access code to Qitoupiao. Guidelines and descriptions of expectations throughout the pre-class (GFC only) and in-class learning stages (GFC and GTC) were provided. These learners were not graded or provided marks for the points or badges they gained in the learning activities to prevent them from aiming at high marks instead of being motivated by the game-design elements. A summary of the guidelines and necessary information was made available on Moodle, as shown in Figure 3.1.

(a) Pre-class learning activities (for GFC & NFC)

- Watch the lecture videos in Moodle
- Review and study the instructional contents
- Do the self-check multiple-choice quizzes

(b) In-class learning activities

- Attend case study lessons and attempt to solve the problems in the cases (GFC, NFC & GTC)
- Attend knowledge application and assignment discussion lessons and attempt to solve the problems and challenges in assignment questions (GFC & NFC only)
- Results can be presented in the following three ways (GFC, NFC & GTC):
  a) a summary report, or
  b) a summary report with comments and real examples, or
  c) a plan to solve the problems
- Obtain badges by innovative ideas and solutions, number of badges accumulated is displayed on Qitoupiao leaderboard (GFC & GTC)

Figure 3.1. Summary of guidelines. (a) Guidelines for pre-class learning activities; (b) Guidelines for in-class learning activities.

Participants in the three classrooms had to submit a post-class assignment in an essay of around 2000 words after completing classroom lessons at the end of each module. Assignment questions mainly focused on knowledge application for solving real business problems the learners are facing at work. Furthermore, all assignment questions were evaluated and approved by the programme academic team and external examiners.

3.3.2. Research Design

The study was conducted in the context of adult postgraduate business educational programmes in China during the COVID-19 pandemic from November 2021 to January 2022. The programmes consisted of two modules. Each module lasted for five weeks and consisted

of 16 h of in-class lessons (eight hours each day for Day-1 and Day-2). Three kinds of

intervention, namely the gamified flipped classroom (GFC, experimental group1), the non-

gamified flipped classroom (NFC, experimental group-2), and the gamified traditional

classroom (GTC, experimental group-3), were introduced in the second module, which started

at the sixth week. To evaluate the influence of flipped classrooms on learner achievement and

engagement (i.e., RQ 1), we compared the GFC and GTC experimental groups, and to evaluate

the influence of gamification on learner achievement and learner engagement (i.e., RQ 2), we

compared the GFC and NFC experimental groups. The experimental design is summarised in

Table 3.2.

Table 3.2. Experimental design.

Experimental Groups and Approaches	Experimental Group 1: Gamified Flipped Classroom (GFC)	Experimental Group 2: Non-Gamified Flipped Classroom (NFC)	Experimental Group 3: Gamified Traditional Classroom (GTC)	Research Question and Group Comparisons
Flipped classroom	Yes	Yes	No	RQ1: GFC & GTC
Gamified classroom	Yes	No	Yes	RQ2: GFC & NFC

3.3.2.1 Class Rundown

All in-class lessons were conducted face-to-face after city lockdowns were lifted. In the

first module (weeks 1–5), the students in all three experimental groups learned under the

traditional classroom approach (i.e., teacher-centric didactic approach with no pre-class videos

and gamification). The assignment marks from the first module were recorded as pre-

intervention references. The three instructional interventions were adopted for the respective

experimental groups in the second module during weeks 6–10 (Figure 3.2). For the flipped

classrooms (GFC and NFC), eight sessions of pre-recorded instructional videos with a duration

of 30 min each were recorded by the module teacher and provided via the institution's learning

management system (Moodle). Self-evaluation multiple-choice quizzes with only ten questions

were offered to avoid heavy cognitive load in the pre-class stage of learning (Abeysekera &

Dawson, 2015; Ho et al., 2021).
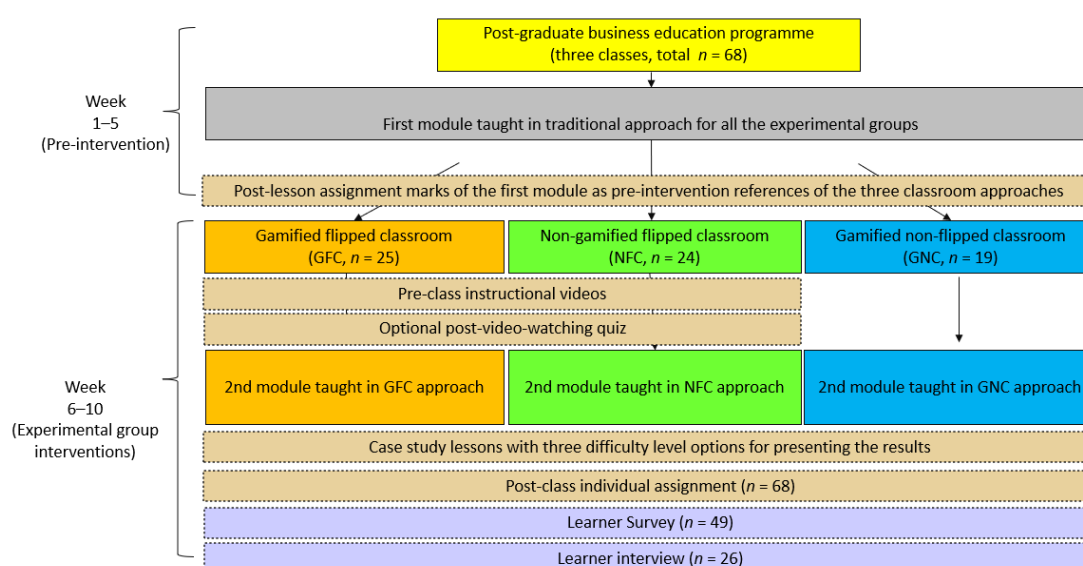
Figure 3.2. Class rundown.

3.3.2.2 Lesson Schedule

The face-to-face lesson schedules were the same across the three experimental groups for

the first four morning hours of lecture lessons. This was followed by two hours of case study

lessons in the early afternoon for all three classrooms (GFC, NFC, and GTC). The case study

lessons served to expand the scope of learning and knowledge through peer interactive and

collaborative learning. For the flipped classrooms (GFC and NFC), there were two hours of

knowledge application and assignment discussion lessons in the late afternoon of Day-1 and

Day-2, respectively. In contrast, for the non-flipped classroom (GTC), there were lecture

lessons instead of knowledge application and assignment discussion in the late afternoon of

both Day-1 and Day-2. Figure 3.3 provides details of the lesson schedule.
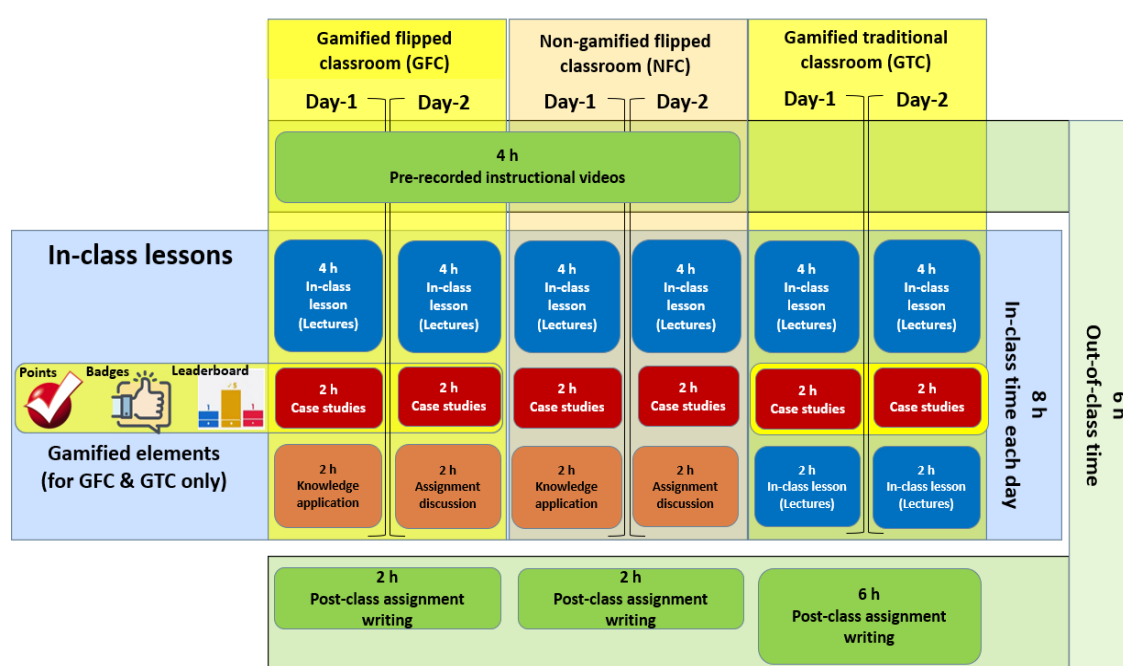
Figure 3.3. Lesson schedule.

The case study lesson format was the same for all three classrooms, which started with a

business case relevant to the morning lectures. Learners were grouped into activity groups of

five to seven peer members to discuss the case according to the guiding questions. For example,

the learners discussed the case of emotional pricing and its implications for marketing strategy

in Figure 3.4. Each activity group could then choose one of three levels of difficulty to present

their results: a summary report of the discussion (Easy level), real application with examples

(Medium level), or real application with a business plan (Hard level). The learners' choices were recorded in class observation reports by teaching assistants.
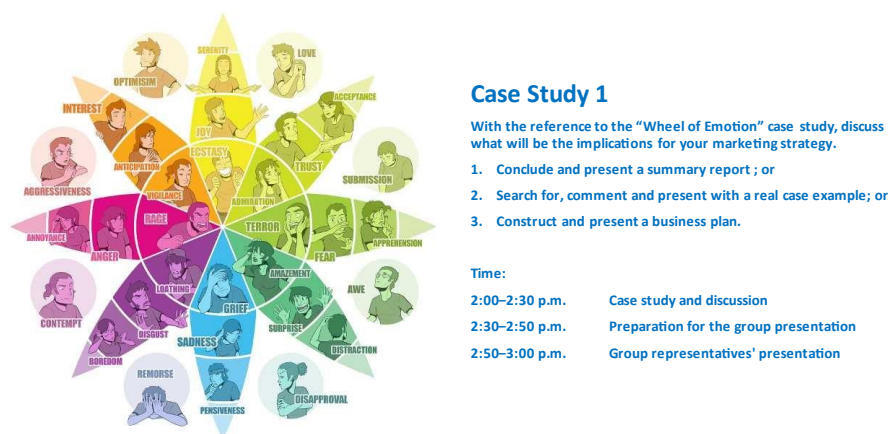
Figure 3.4. Example of an in-class case study learning activity with three difficulty levels for presenting the results.

For the two flipped classrooms (GFC and NFC), there were two hours of knowledge application (Figure 3.5) and two hours of assignment discussion (Figure 3.6) during the late afternoon of Day-1 and Day-2, respectively. In the knowledge application lessons, the teachers introduced a topic or questions that focused on applying the knowledge learned. For example, as shown in Figure 3.3, the learners learned different pricing strategies in the morning lessons and then attempted to apply them in real or simulated business scenarios. These lessons were intended to strengthen their ability to apply their knowledge for solving real or simulated business problems, which was knowledge transferability and most relevant to their jobs and employment. Lastly, the assignment discussion lessons on Day-2 allowed the learners to discuss the individual assignment questions and learn with their peers collaboratively. Peer-to-

peer interactive and collaborative learning could inspire further thoughts, ideas, and solutions to the business problems listed in the assignment questions. Learners could renew and relearn in the process. Because the learners in the flipped classrooms (GFC and NFC) were aided by the knowledge application and assignment discussion lessons, they subsequently required less time to complete the same assignment writing as the requirement for all three experimental groups after the classroom lessons. By contrast, those in GTC had to work on their assignment writing from the beginning and required more time to complete it by themselves after classroom lessons.

Figure 3.5. Example of a knowledge application lesson.
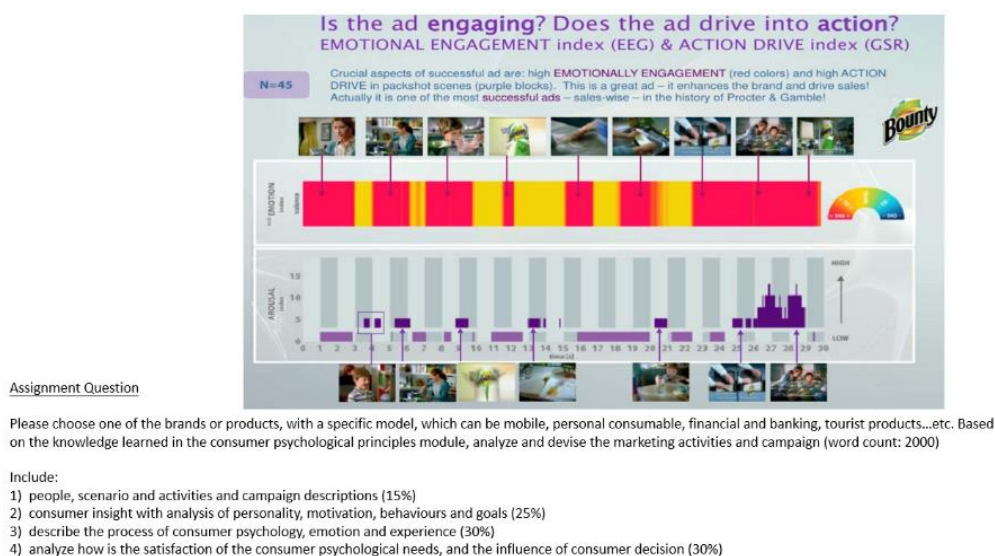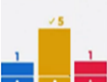
Figure 3.6. Example of an assignment discussion lesson.

Learner surveys, interviews, class observation reports, and written feedback were collected from all three classes at the end of Day-2 after completing all the in-class lessons of the second module (i.e., in week 10).

3.3.2.3 Application of Game-Design Elements

During the case study lessons, the learners were divided into activity groups of 5–7 peers per group. Game-design elements were applied for the gamified classrooms (GFC and GTC). To ensure that gamification was effective, points, badges, and leaderboards were displayed through the Chinese classroom application Qitoupiao ('Voting Together'). These game-design elements and their use in the two gamified classrooms are described below and in Table 3.3.

Table 3.3. Application of game-design elements for gamified classrooms (GFC and GTC).

Game-Design Element	Purpose	How They Were Awarded
Points	Feedback to encourage task completion and progress towards more advanced and challenging learning activities.	Point(s) for in-class learning and presentation activities based on level of difficulty: • Easy—one point for a summary report • Medium—two points for real application with examples • Hard—three points for real application with a business plan
Badges	Recognition of learning efforts, participation, and contributions; promoting social recognition.	Badges were given to learners who presented good ideas, new knowledge or innovative solutions to a problem.
Leaderboards	Inspire intragroup peer learning and intergroup competition for learning advancement.	The number of accumulated badges obtained in each activity group.

1. Points: Learners received points for completing tasks in the in-class learning activities. Points serve as feedback to encourage learners to complete subsequent learning activities and achieve more advanced challenges together in a group (Furdu et al., 2017; Mazarakis, 2015). One point was allotted to activity groups that completed their discussion and presented the results as a summary report, which was the lowest level of difficulty (Easy) to complete their task. Two and three points were allotted to activity groups that chose the intermediate (Medium) or the most challenging (Hard) levels of difficulty to present their discussion results in a real application with examples and a business plan, respectively.

2. Badges: Learners received badges when they provided innovative ideas and solutions to problems and questions during in-class learning activities. Badges serve as recognitions of a learner's contributions and encourage participation during learning activities (Lo & Hew, 2020). Badges also promote social validation as they provide opportunities for learners to show their conformity and progress towards the expected learning behaviour with their peers (Hamari, 2017). Learners in an activity group obtained one badge when any member of the group presented a good idea, new knowledge, or an innovative solution to a problem or question. A 'good idea' refers to a new way to apply the knowledge learned in the class, 'new knowledge' refers to a

point that was not mentioned or taught in the class, and an 'innovative solution' is a solution to a problem-solving task that was not mentioned or taught in the class.

3. Leaderboards: Teamwork was encouraged within each activity group, and the learners were also encouraged to compare their performance with those of other activity groups in the same classroom (Burguillo, 2010). Thus, each activity group's accumulated number of badges was displayed on the class leaderboard. The leaderboard was intended to inspire intragroup peer collaborative learning and healthy intergroup competition amongst the groups to achieve a prominent position on the leaderboard by contributing to learning activities for more badges (Okura & Carfi, 2014; Seaborn & Fels, 2015).

3.3.3 Data Collection

Both quantitative and qualitative data were collected during the in-class and post-class stages (Table 3.4). Class observation reports were collected by teaching assistants during the in-class stages. Data were from the post-class stage and were collected based on three sources: learner survey, learner interview, and assignment marks. The survey used a 5-point Likert scale that ranged from 'Strongly Agree' (5) through 'Neutral' (3) to 'Strongly Disagree' (1). The learner survey and interview focused on the learners' perceptions and their suggestions for pedagogical improvement.

Table 3.4. Data sources and collection.

Stage	Data	Purpose	RQs Addressed
In-class	Class observation report for levels of difficulty and participation	To evaluate learner engagement under the three instructional approaches (GFC, NFC, and GTC).	Learner engagement (RQ1 and RQ2)
Post-class	Learner interview	To evaluate learners' perceived achievement and engagement under the three instructional approaches.	Learner perceived achievement and engagement (RQ1 and RQ2)
	Assignment marks	To evaluate the learner's overall achievement under the three instructional approaches	Learner achievement (RQ1 and RQ2)

The effects of classroom approaches (i.e., GFC, NFC, and GTC) on learner achievement were evaluated based on the assignment marks. The teachers graded the assignment strictly according to the marking scheme and rubrics provided by the institute. All in-class learning activities, topics and assignment questions were approved by the school-appointed external examiner and the academic programme committee. Thirty per cent of the assignment marks were countermarked and sent to the external examiner for final review to ensure accurate assessment. Discrepancies in marks were discussed and were resolved in the board of examiners' meetings.

The learners were invited to complete a survey at the end of classroom lessons in the second module. The survey consisted of questions on four themes: (i) perceived learning (Items 1–3), (ii) behavioural engagement (Items 4–8), (iii) emotional engagement (Items 9–13), and (iv) cognitive engagement (Items 14–17). It also contained one open-ended question (Item 18).

The learners were free to respond, and their responses were tagged using anonymised labels, e.g., GFC-Learner 1, NFC-Learner 2, and GTC-Learner 3. Sample items for each theme from the survey are presented in Table 3.5.

Table 3.5. Sample items of the learner survey.

Survey Items	Supporting Citation
Perceived learning (Items 1–3) I learned more because of the classroom format. (Item 2)	Lo and Hew (2020)
Behavioural engagement (Items 4–8) I participated in in-class activities and discussions. (Item 6)	Skinner et al. (2008)
Emotional engagement (Items 9–13) The class was fun. (Item 11)	Skinner et al. (2008)
Cognitive Engagement (Items 14–17) I was so involved that I forgot everything around me. (Item 17)	Rotgans et al. (2011)

Qualitative data sources included Item 18 of the learner survey, class observation reports, and learner interviews. The class observation was adopted for evaluating learner engagement in in-class activities in accordance with the recommendation of a prior study (Al-Zahrani, 2015). Studies have found learners' behavioural and cognitive engagement to be reflected in their participation in learning activities (Chi & Wylie, 2014; Lo & Hew, 2020). Another study found that the willingness and effort to exceed minimum requirements and adopt more challenging presentation methods indicated a higher learning engagement (Hew et al., 2016). Thus, teaching assistants recorded class observation reports that focused on two aspects of the learners' engagement: (1) the level of difficulty that they chose for their case study results presentation and (2) their learning participation. Learning participation ranges from passive

receiving, active manipulating, and constructive generating to the most engaging interactive

dialoguing (Al-Zahrani, 2015). Learner engagement and participation also reflected the

different components of SLE (Ben-Eliyahu, 2021). Teaching assistants recorded the learners'

participation in in-class activities by checking one box each for the level of difficulty and level

of participation, respectively, that most closely matched their observations of classes during

the in-class case study lessons (Figure 3.7).

Level of difficulty [4, 60]			
Easy ☐	Medium ☐	Hard ☐	
Present the case study with a summary report	Present the case study with real application and examples (SLE component: transferability)	Present the case study real application and a business plan (SLE component: transferability)	

Level of participation [4, 93]			
Passive receiving ☐	Active manipulating ☐	Constructive generating ☐	Interactive dialoguing ☐
1) Listening without doing any extra action else 2) Reading or watching without performing any other action	1) Taking, copying verbatim notes 2) Highlighting, summarising important solution steps	1) Taking notes in one's own words 2) Asking questions and queries 3) Activation of, comparing and contrasting to prior concepts, knowledge and experience 4) Demonstrating newly acquired knowledge by applying it to novel contexts or to solve real business problems	1) Asking comprehensive questions 2) Reflection of, arguing and defending a position or point with peers or partner classmates 3) Co-creating new knowledge, ideas, alternatives, perspectives and new directions to solve the problems
	(SLE components: active and independent learning)	(SLE components: active and independent learning, renewing and relearning)	(SLE components: active, independent and collaborative learning, renewing and relearning; transferability)

Figure 3.7. Class observation report form with SLE components.

Interviews help to understand learners' behaviour, feelings, and interpretation of the

learning environment (Merriam & Grenier, 2019). Therefore, we conducted learner interviews

after classroom lessons in the second module (Week 10). The interview adopted a semi-

structured approach with a protocol (Table 3.6). The topics covered in the interview were based

on the engagement framework of Fredricks et al. (2004) and McCallum et al. (2015). Topics

for exploring learner engagement included (1) behavioural engagement (e.g., task participation

and completion), (2) emotional engagement (e.g., enjoyment or boredom), and (3) cognitive

engagement (e.g., investing effort in learning). All interviews were conducted and recorded in

Chinese by the researcher. Some transcripts were translated into English for reporting purposes.

The interviewees were invited to check all original transcriptions, and discrepancies were

corrected to ensure accuracy. Learners' participation in the survey and interview was voluntary,

and no incentive was offered. After completing the second module lessons, we received

responses for 49 surveys (GFC $n = 20$, NFC $n = 17$, GTC $n = 12$) and 26 learner interviews

(GFC $n = 7$, NFC $n = 11$, GTC $n = 8$).

Table 3.6. Sample questions of the semi-structured learner interview protocol.

Dependent Variable	Question	Citation Reference
Behavioural engagement	How did the classroom approach change the way you prepared for studying this module differently from other or previous classes you have attended?	Fredricks et al. (2004)
Emotional engagement	What did you find most/least interesting in your studying of this module?	MaCullum et al. (2015)
Cognitive engagement	Did you do anything extra that helped your learning when studying this module?	

3.3.4 Data Analysis

3.3.4.1 Quantitative Data Analysis

To determine the most appropriate statistical test for quantitative data analysis, quantitative data were first tested for normality (Field, 2013). A Kolmogorov–Smirnov test showed a significant deviation from normality for learner achievement (according to assignment marks) across the three classes (first module $p < 0.001$; second module $p = 0.017$). Therefore, non-parametric tests were used to analyse the quantitative data on learner achievement (Field, 2013).

The Kruskal–Wallis non-parametric test for multiple group comparisons was performed on the assignment marks from the first module, which was taught in traditional classrooms, to check the initial equivalence of the three experimental groups (i.e., GFC, NFC, and GTC). The results showed that the three experimental groups were statistically equivalent ($H = 0.256$, $p = 0.880$) for the first module. The assignment marks from the second module of the three experimental groups were then tested with the Kruskal–Wallis test at a significance level of 0.05. Multiple Mann–Whitney tests were conducted for post hoc pairwise comparisons when significant differences were found (Field, 2013). Bonferroni correction was applied to avoid Type I errors (Weisstein, 2004). Therefore, the post hoc analyses reported effects at a significance level of $0.05/3 = 0.0167$. The effect size (r) was then calculated using the following formula (Tomczak & Tomczak, 2014):

$$r = \frac{z}{\sqrt{N'}}$$

where z is the z-score, and N' is the number of participants in the two experimental groups in

each pairwise comparison.

3.3.4.2 Qualitative Data Analysis

The qualitative data were transcribed in Chinese and analysed thematically by organising the data into categories. Direct quotations from participant interviews were used to ensure data validity (Johnson, 1997). The qualitative analysis procedures followed the suggestion of Creswell et al. (2013). Coding started with the shortest interview transcripts using some exact wordings of the participants and concepts from the literature. All assigned codes were reviewed and grouped with redundant codes to produce a preliminary list of codes, which were then used to analyse the rest of the qualitative data. Exemplary quotes that clearly illustrated new emerging themes were identified and added to the list of codes, and similar codes were organised into subthemes.

Double-coding was adopted when data were descriptively and inferentially meaningful but not in neat or isolated units (Glesne, 2016; Saldaña, 2011). Thirty per cent of the qualitative data were double-coded by an independent coder, and the intercoder agreement rate was checked. Disagreements between the coders were resolved through discussion. The data were validated by member checking to avoid any misunderstanding or misinterpretation (Maxwell, 2013). Qualitative data were translated into English for reporting in this study.

Qualitative data from the written comments, feedback from learner surveys (Item 18),

teaching assistant interviews, class observation reports and teacher interviews were analysed with triangulation for comprehensive understanding and to better explain the quantitative results (Creswell et al., 2013; Flick, 2018).

3.4 Results

3.4.1. Learner Achievement

The Kruskal–Wallis test indicated a significant difference between the three classrooms regarding the assignment marks obtained in the second module ($H = 7.550$, $p = 0.023$). Figure 3.8 shows a boxplot of the results.
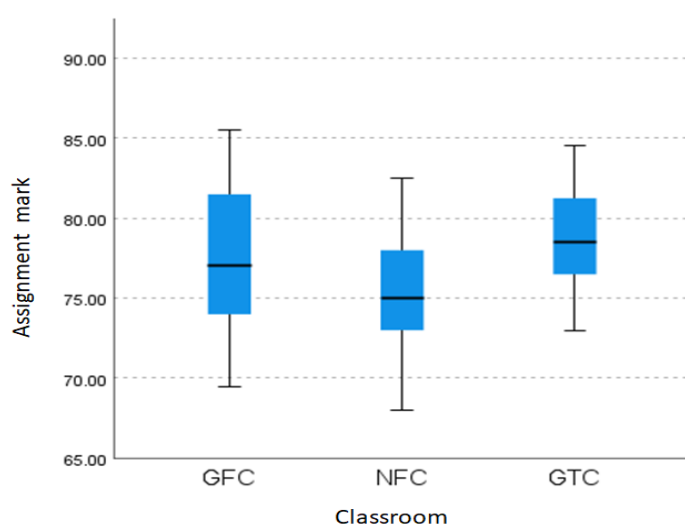
Figure 3.8. Boxplots of assignment marks from the second module by classroom.

Mann–Whitney tests for pairwise comparisons showed no statistically significant differences between GFC and GTC ($p = 0.199$) or between GFC and NFC ($p = 0.117$). However, the learners in GTC scored significantly higher assignment marks than those in NFC ($U = 112.00$, $z = -2.875$, $p = 0.004$) with an effect size $r = 0.410$. Table 3.7 shows the pairwise

comparison of assignment marks between NFC and GTC.

Table 3.7. Pairwise comparison of assignment marks between NFC and GTC for the second module.

Assignment Marks	*n*	Mean	SD	Mean Rank	Pairwise Comparison
NFC	24	75.44	3.73	17.17	GTC > NFC *
GTC	19	78.79	3.05	28.11	

* *p* < 0.0167 (Bonferroni correction).

Although the qualitative data from the interviews revealed several benefits of gamification for learning achievement, the learners trusted knowledge delivered by teachers more than knowledge received from their peers, regardless of whether their peers had more firsthand experience in specific business scenarios. Interviews with both learners and teaching assistants indicated that the knowledge learned from teachers was reflected more frequently in the learners' submissions of their assignments, which required them to apply the knowledge learned in the module to provide a solution to a real business problem in around 2000 words. Table 3.8 shows the major benefits of GTC identified from the learner interviews. These benefits included the generation of excitement and curiosity, and the promotion of interactions and discussions in the classroom. In contrast, the learners in NFC did not experience a sense of *'belonging'* (NFC-Learner 8) to the class. Keywords that occurred multiple times in the interviews of learners from NFC were *'boring/dry'* (NFC-Learners 1 and 7) and *'no interaction makes me sleepy/passive'* (NFC-Learners 8 and 10).

Table 3.8. Benefits of GTC.

Theme	Example Quote
Excitement/curiosity	'*Very excited and engaged*' (GTC-Learner 3)
Peer learning	'*Classmates encouraged each other to choose the difficult learning option*' (GTC-Learner 8)
Exchanges/interactions	'*More feedback from the teacher, enabled by the rhythm of the teaching process, made me more attentive*' (GTC-Learner 5)

3.4.2. Learner Engagement

The Kolmogorov–Smirnov test showed that the data from the learner surveys significantly deviated from normality ($p < 0.001$); therefore, nonparametric Kruskal–Wallis tests were performed. The difference between GFC and NFC was significant ($p = 0.014$) for perceived learning. Post hoc pairwise Mann–Whitney tests showed that the learners in GFC scored significantly higher than those in NFC $(U = 102, z = -2.448, p = 0.0140)$, with effect size $r = -0.402$. These results are shown in Table 3.9.

Table 3.9. Comparison between GFC and NFC for learner survey Item 2.

Item	Survey Question	Class	n	Mean	SD	Mean Rank	Pairwise Comparison
2	I learned more because of the classroom format.	GFC	20	4.80	0.41	22.40	GFC > NFC *
		NFC	17	4.35	0.61	15.00	

* $p < 0.0167$ (Bonferroni correction).

Class observation reports reflected that the learners in GFC engaged at the interactive dialoguing level during learning activities (Chi & Wylie, 2014). This shows that GFC was the

most engaging of the three classrooms and performed all five SLE components. Those in NFC engaged half their time at the active manipulation level and the other half at the constructive generating level. This reveals that NFC was the least engaging among the three classrooms. Gamification elevated the participation level of learners in GTC to constructive generating, which showed three out of the five SLE components, indicating that GTC was more engaging than NFC (Table 3.10).

Table 3.10. Level of difficulty and participation in in-class learning activities from class observation reports with SLE components. The order of the classrooms in terms of learner engagement and the number of SLE components performed was GFC > GTC > NFC.

Class room	Level of Difficulty	Level of Participation	SLE Components
GFC	Medium	Interactive dialoguing (100% *)	Active learning Independent learning Collaborative learning Renewing and relearning Transferability
NFC	Medium	Active manipulating (50% *)	Active learning Independent learning
		Constructive generating (50% *)	Active learning Independent learning Renewing and relearning
GTC	Medium	Constructive generating (100% *)	Active learning Independent learning Renewing and relearning

* % of the time learners engaged at the level of participation.

Keywords that occurred multiple times in learner interviews from the gamified classrooms were *'active participation'* (GFC-Learners 2 and 8), *'focused and engaged'* (GFC-Learner 7, GTC-Learner 3), and *'the class was interesting, inspired my thoughts and stimulated deep*

learning' (GFC-Learner 5). One point of contrast in the feedback between GFC and GTC related to peer-dependent vs. teacher-dependent learning:

GFC-Learner 2: '*The presence of such exceptional classmates made me more actively engaged (in learning)*'.

GTC-Learner 5: '*In the classroom, I followed the rhythm and pace of the teacher, who enabled me to focus during the interactive learning lesson'*.

The feedback from the interviews with those in NFC, in contrast, reflected that the learners faced certain obstacles to active participation:

NFC-Learner 1: '*I wish the teacher could control classmates that engaged too much in irrelevant discussions.'*

NFC-Learner 5: '*I am not very familiar (close) with the classmates, and the (learning) interactions and bonding between us were not strong'*.

In summary, there was a significant difference in learner achievement between GTC and NFC ($p = 0.004$). The learners in GTC scored significantly higher than those in NFC for learner achievement ($U = 112.00$, $z = -2.875$, $p = 0.004$), with effect size $r = 0.410$. Regarding learner engagement, the results of class observation reports and learner surveys indicated that the learners in GFC had the highest level of participation and perceived learning, and performed all five components of SLE.

3.5 Discussion

In this study, we compared the influence of flipped classrooms and gamification on learner achievement and engagement for SLE in the context of postgraduate business education during the COVID-19 pandemic. The findings are discussed in the following three subsections. First is the role of flipped classrooms and gamification during the COVID-19 pandemic. Second, teacher-dependency and learning interactions. Lastly, lessons were learned to further improve flipped classrooms and gamification pedagogical design for SLE in HEIs.

3.5.1 Role of Flipped Classroom and Gamification during COVID-19 Pandemic

Flipped classrooms were welcomed by learners (Li et al., 2020c) and helped to maintain the sustainability of learning programmes in higher education during COVID-19 lockdowns (Collado-Valero et al., 2021). However, learner motivation declines in the absence of learning interactions (Ahshan, 2021; Kormos & Csizer, 2014). Gamification promotes learning interactions and social networking (Hajarian & Diaz, 2021). The qualitative results of class observation reports from the teaching assistants on learner engagement concur with those of Lo and Hew (2020) that learners in gamified classrooms (GFC and GTC) exhibit a stronger sense of engagement, as evidenced by their level of participation during in-class learning activities. In the context of adult postgraduate business education, the quantitative results of the post-class assignment in our study showed that GTC offers advantages for learner

achievement and GFC for learner engagement, respectively. GFC improved learners' perceived learning and engagement, but there was no significant impact on learner achievement. Several other studies have found similar results, suggesting the need for further investigation (Loh & Teo, 2017; McLean et al., 2016; Smallhorn, 2017). Our results confirm the observation of Bredow et al. (2021) that the benefit of a simple flipped classroom (i.e., NFC) may not be apparent. According to McLean et al. (2016), one reason might be that flipped classrooms challenge the learners' perception of the teacher's role as a knowledge provider by playing the combined role of knowledge application and synthesis facilitators.

3.5.2 Teacher-Dependency and Learning Interactions

A prior study found that, despite the autonomy that the flipped classroom pedagogy affords to learners, in-class interactive learning was still preferred over pre-class self-directed study (Bishop & Verleger, 2013). Peer-to-teacher interaction and learner preference for teachers to play the role of authority for knowledge delivery are dominant themes in the Asian context (Van Sickle, 2016). In flipped classrooms, teacher roles change from being like those of sages to those of facilitators, thereby conflicting with existing expectations (Zheng et al., 2020). Like previously published findings of Zhao (2010), our results found better learning achievement in a traditional classroom approach supplemented by gamification (i.e., GTC), as teacher recognition and feedback in the form of game-design elements were valued more than

responses from peers (Hew, 2015). Such teacher dependency was also observed in previous studies (Long et al., 2016; Roorda et al., 2021; Vaziri et al., 2022). Teachers should introduce the importance and value of lesson content at the beginning of each lesson (Lo & Hew, 2019), offer a brief review of pre-class materials (Adams et al., 2016), and facilitate peer-to-teacher and peer-to-peer interactions (Akram et al., 2021).

In-class learning interactions play an important role in flipped classrooms (Lestari, 2021), and there is a need to explore this in further detail (Maciejewski, 2016). Learning interactions can be either peer-to-peer or peer-to-teacher interactions. Our interviews with the teaching assistants indicated that the learners were used to a teacher-dependent style of learning, which may impede peer-to-peer learning. Learners needed the teacher to motivate the discussion when the learners' participation waned. The following is a transcript from an interview with our experienced teaching assistant (JG):

'Although the flipped classroom and gamified classroom may be the trends in future education, our learners are relatively older adults, and the education model they experienced during their school ages was traditional. Many people are still inclined towards the traditional methods of education. We have to use different teaching modes according to the learners and their preferences and rely on teachers to facilitate changes'.

Therefore, to facilitate SLE in flipped classrooms, the learners' cultural background and learning styles, especially the type of schooling that the learners experienced, must be

considered. This is imperative if more instructional content is going to be imparted using the flipped classroom and gamification approaches during the COVID-19 pandemic (Collado-Valero et al., 2021).

3.5.3 Lessons Learned

The flipped classroom and gamification designs adopted in this study were theoretically grounded in SDT (Ryan & Deci, 2000). The three pedagogical interventions (GFC, NFC, and GTC) provided valuable insight into the practical application of the theories in the context of adult business education during the COVID-19 pandemic. Based on our findings, we provide three observations and recommendations for designing flipped classrooms and gamification for SLE.

First, gamification plays an important role in motivating adult learners to learn participation and engagement, which in turn promotes SLE (Karra et al., 2019). From the perspective of SDT, timely and evaluative feedback from teachers is vital to promoting learners' sense of engagement (Niemiec & Ryan, 2009). Second, teachers should facilitate learning interactions at the earliest stage of flipped classrooms, such as at the beginning of the pre-class learning stage. Similar inferences have also been made in other studies (Jensen et al., 2018; Van Sickle, 2016). Knowledge learned from pre-class materials must be recollected to set as the foundation of more advanced in-class learning (Yorganci, 2020). This is critical, especially

in a highly teacher-dependent learning culture. Teachers' early participation and facilitation in both pre-class and in-class lessons would trigger learners' curiosity and interest and stimulate initial discussions, leading to more learning participation (Ho et al., 2021). Last, although we used the same game-design elements in both GFC and GTC, learner achievement in the flipped GFC was lower than that of the traditional GTC. Our results resonate with the findings of Jensen et al. (Jensen, 2018) that adopting flipped classrooms to create more time for in-class learning may not be effective even with gamification. Teacher dependency and learning culture must be considered. Adult learners in our study benefitted more from teacher-led lectures (i.e., from the traditional GTC) than the two flipped classroom approaches (GFC and NFC). This mirrors the study of Magana et al. (2017).

Nonetheless, the flipped classroom is an effective pedagogical approach to ensuring the sustainability of educational programmes in HEIs during COVID-19 lockdowns (Collado-Valero et al., 2021). Pre-class self-study videos and materials ameliorate the anxiety of learners caused by academic uncertainty and interruptions in learning (Arribathi et al., 2021). For example, one learner from GTC remarked, '*if the school can provide pre-class videos, I can prepare in advance, integrate my previous knowledge and develop clarity on the areas in which I need to learn more (in the coming in-class lessons)*' (GTC-Learner 3). Therefore, a flipped classroom with gamification is a valuable pedagogical approach for the sustainability of higher business education, especially under the dynamic COVID-Zero strategy in China (Liu et al.,

2022). However, teachers cannot rely solely on flipped classrooms or gamification pedagogies. Indeed, the early presence of teachers along the entire learning journey, including in the pre-class stage, to facilitate peer-to-teacher and peer-to-peer facilitation is deemed necessary.

3.6. Conclusions and Recommendations for Future Study

This study compared learner achievement and engagement across three pedagogical approaches (i.e., GFC, NFC, and GTC). The learners in GTC performed the best in terms of learner achievement, whereas those in GFC reported the highest perceived learning and engagement for SLE. Qualitative findings from surveys and class observation reports reflected that gamification made the lessons more interesting and exciting, and promoted participation in in-class learning activities. Learners in GTC and GFC showed higher levels of participation. They performed more key components of SLE, which were the reasons for higher learner achievement and engagement compared to NFC.

We provided three recommendations based on the study. First, flipped classrooms can be leveraged to maintain the continuity and sustainability of educational programmes, especially under the uncertainty of lockdowns during the COVID-19 pandemic. Second, gamification plays a key role in improving learner achievement and should therefore be integrated into flipped classrooms with the consideration of the learning culture and styles of the learners. Third, teachers must facilitate and be involved in all stages of flipped classrooms, especially in

highly teacher-dependent learning cultures.

Notwithstanding the aforementioned contributions, there are certain limitations in the study. First, the sample sizes of the three classrooms were small, which reduces the generalisability of the results. Second, the study was conducted in a postgraduate adult business education setting and may not be equally applicable to other educational contexts. Third, the study duration was limited to 10 weeks owing to restrictions caused by the COVID-19 pandemic. Therefore, the findings must not be interpreted as establishing that any one of the pedagogical approaches is better than the others. Further studies are necessary to explore the differences between flipped classrooms with and without gamification in larger samples and across a longer duration.

Chapter Four

Study Two

Online Flipped and Gamification Classroom:

Risks and Opportunities for the Academic Achievement

of Adult Sustainable Learning during COVID-19 Pandemic

(Ng & Lo, 2022b)

4.1 Introduction

COVID-19 has posed considerable challenges to the sustainability of educational programmes (Yu et al., 2022). 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 pre-recorded online video lectures provided by teachers during the uncertain period of intermittent lockdowns, which enables learners to utilise asynchronous online self-study (Hays & Reinders, 2020). Advancements in information and communication technology (ICT), including digital devices, networks, and skills, have made such pedagogical approaches to online instruction feasible (Zuppo, 2012). 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 (Pérez-Jorge et al., 2020). Nevertheless, these approaches allowed China's HEIs to continue their educational programmes during the pandemic. Gamification, a relatively new

techno-pedagogy 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 (Deterding, 2014). These new pedagogical approaches not only promote quality education but also help sustain adult educational programmes amidst COVID-19 to yield economic and social benefits for the country (Ben-Eliyahu, 2021).

Online instructions are conducted in a virtual environment, and the instructors use various strategies different from those used in traditional face-to-face classes to convey knowledge and skills (Amiti, 2020). Hence, learners' and teachers' digital literacy and the online learning community have become more critical (Berry, 2019; Tomczyk & Fedeli, 2022). A recent review conducted by Amiti (2020) 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 pre-recorded 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 face-

to-face class attendance, as in traditional classes (Yang, 2020). 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 (Le, 2022).

Perera and Richardson (2010) found that learners had low academic achievement in online classes. Furthermore, Baxter and Hainey (2022) encountered contradictory opinions on learners' motivation in asynchronous and synchronous online classes. Xie et al. (2006) 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 (Ryan & Deci, 2020). From the perspective of SDT, gamification might promote academic achievement and participation levels in both online and face-to-face classes (Lo, 2022; Sailer & Sailer, 2021). Moreover, gamification may help to attract learners' attention and promote an interactive and enjoyable online learning experience (Zainuddin et al., 2021). 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), non-gamified 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 non-gamified environment?

4.2 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 educational programmes in detail.

4.2.1 Risks and Opportunities for Sustainable Adult Educational Programmes during the

Pandemic

The traditional face-to-face 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 educational programmes (Liu et al., 2022). 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 educational programmes in HEIs. There are two main online alternatives for the continuation of adult educational programmes (Amiti, 2020):

- Asynchronous online self-study provides pre-recorded 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 (Le, 2022). Due to this ability to enable more interactive learning activities, flipped classroom approaches may also promote learners' academic achievement and belongingness (Polat & Karabatak, 2022).

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. (2021) 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 (Yang, 2020). 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 (Berry, 2019).

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.

4.2.2 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 (Tomczyk, 2022). In a recent literature review on flipped classroom approaches, Divjak et al. (2022) 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 are inherently interested in learning and developing (Ryan, 2000). 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 (Niemiec & Ryan, 2009). ICT-enabled asynchronous, synchronous, and online flipped classroom approaches could support those intrinsic psychological needs (Sergis et al., 2018). Asynchronous pre-recorded video lectures promote learners' autonomy by allowing them to pursue self-directedness, 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 (Lo & Hew, 2020).

Pelikan et al. (2021) 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 educational programmes in HEIs during the pandemic (Chiu, 2022). 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 practice of applying game elements in nongame contexts (e.g., education) is known as gamification (Deterding, 2014). Thus, gamifying the synchronous online classroom learning activities, guided by the SDT, has the potential to promote learning outcomes (Lo & Hew, 2020).

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 (Abedini et al., 2021). 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) (Ryan & Deci, 2020), but also to external motivators (such as personal and career goals, including problem-solving skills, job promotion, and higher salaries) (Tough, 1985). 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 (Halpern & Tucker, 2015). 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 (Woo & Reeves, 2007).

4.2.3 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 (Bedrule-Grigoruţă & Rusu, 2014), and fully online instructional approaches have been envisioned as a new solution for sustainable adult education during the pandemic (OECD, 2021). ICT in education supports online self-directed study and collaborative class learning through the learning management system (LMS), 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 (Ma & Luo, 2022). 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 (Almalhy, 2021). However, model cases of the application of gamification in fully online instructional approaches in higher education for adult business programmes are still scarce (Urh et al., 2015).

Using the PBL game elements to motivate learners in a nongame environment has frequently been used in flipped classrooms of higher education during the pandemic (Deterding,

2018; Rincon-Flores & Santos-Guevara, 2021). Santos-Villalba et al. (2020) 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 (Hammill et al., 2021).

Adult learners find problem-based learning tasks, especially tasks relevant to their personal goals (e.g., career success), to be intrinsically motivating (Ashari et al., 2021). Gamification promotes learners' participation in learning activities, supports knowledge to be transferred to practice, and enhances academic achievement (Navarro-Espinosa, 2022). However, applying the online flipped and gamification classroom approaches to adult educational programmes is not without challenges (Batista et al., 2021; Bredow et al., 2021). 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.

4.3 Research Methods

The explanatory sequential design of the mixed methods approach was adopted, which included quantitative and qualitative research phases (Guetterman et al., 2019). 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.

4.3.1 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 educational 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) non-gamified 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 4.1. 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

pre-recorded 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 4.2.

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.
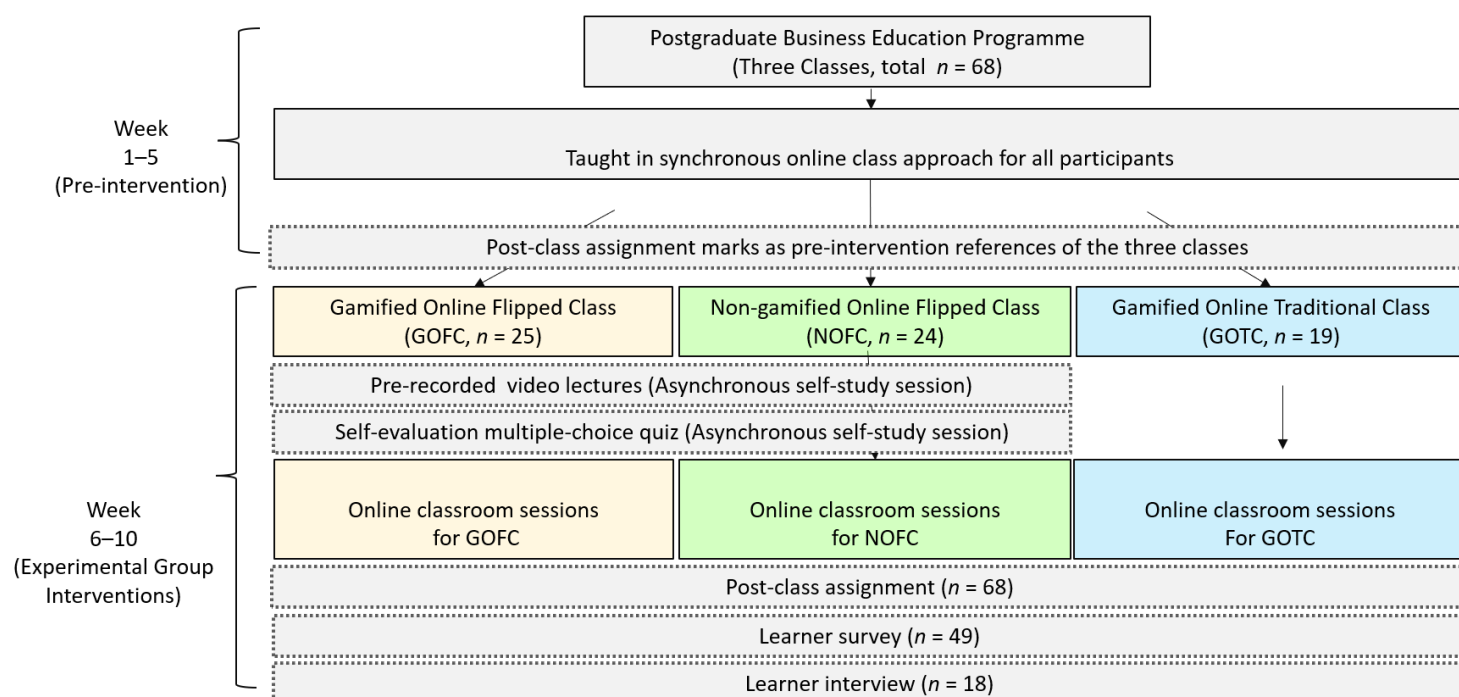
Figure 4.1. Learners and classroom sessions.
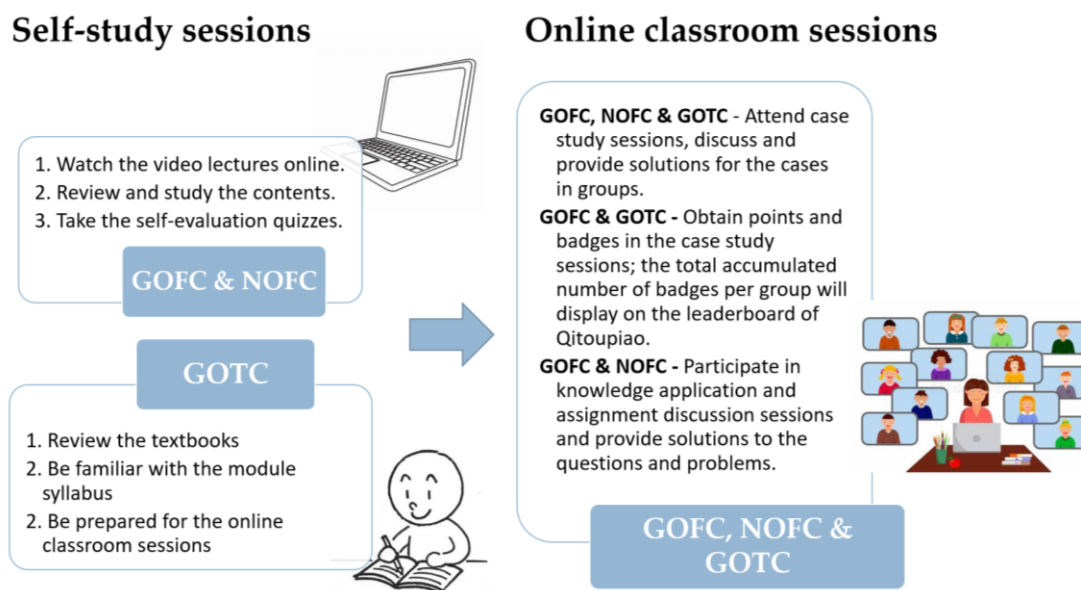
Figure 4.2. Guidelines and tasks for asynchronous self-study and synchronous online classroom sessions.

4.3.2 Research Design

Two modules were conducted in ten weeks. The first module lasted 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 4.1).

Table 4.1. The research design for addressing the research questions.

Experimental Approaches	Gamified Online Flipped Class (GOFC)	Non-gamified 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

4.3.2.1 The Class Rundown

Pre-recorded video lectures were provided for 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.

4.3.2.2 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 4.3).
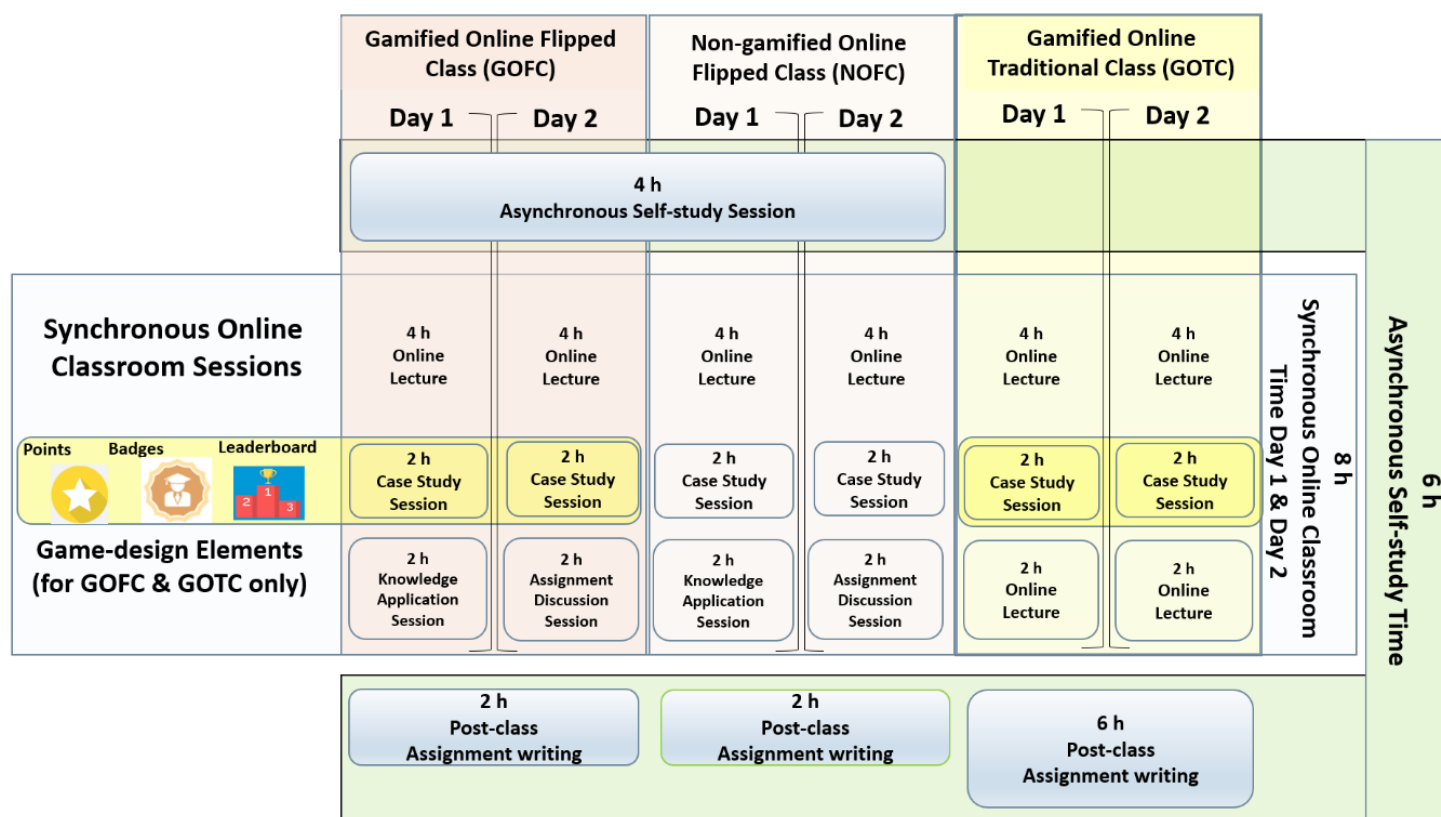
Figure 4.3. Online classroom session schedules.

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 4.4 shows the "Wheel of Emotion" case. The discussion results were presented at the end of the case study sessions.
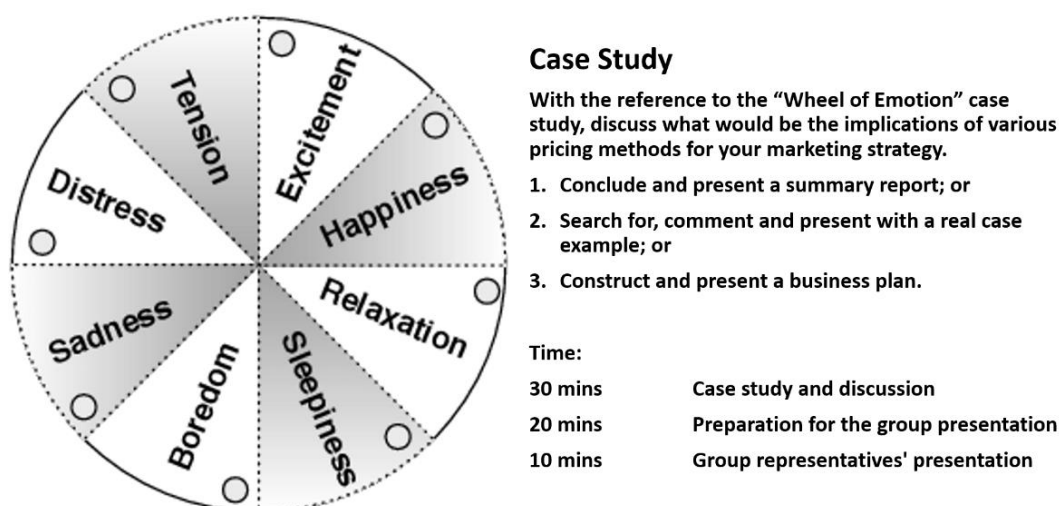
Figure 4.4. Example of a case study learning activity in the online classroom.

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 4.5). 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 4.6). 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, prompting 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.

Figure 4.5. 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 4.6. Example of an essay assignment question.

4.3.2.3 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 non-gamified 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 (Sailer et al., 2017). 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 4.7. Additionally, Table 4.2 below explains the characteristics and mechanisms of PBL (Sailer et al., 2017).

Figure 4.7. A screenshot of the Qitoupiao application.

Table 4.2. Application of PBL in gamified online classes (GOFC and GOTC).

Game	Purpose	Award

Element (RQ2)		
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 propose 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.

4.3.3 Data Collection

Data (both quantitative and qualitative) were collected (Table 4.3). 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 4.3. Data collection.

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

The individual essay assignments were marked 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 learning activities (Chi & Wylie, 2014). 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 (Al-Zahrani, 2015). The teaching assistants recorded the learners' participation levels in groups by checking the box that most closely described their observations (Figure 4.8).

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 ☐	Medium ☐	Hard ☐
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 ☐	Active manipulation ☐	Constructive generation ☐	Interactive dialoguing ☐
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 4.8. Class observation report form.

Interviews were conducted to understand the learners' self-described learning participation and experience (Table 4.4) 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 and three open questions (Table 4.4). The topics covered were based on works from Fredricks et al. (2004), Samuel (2021), and Sun and Rueda (2012), 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.

Table 4.4. 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?

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 $n = 7$).

4.3.4 Data Analysis

4.3.4.1 Quantitative Data

The individual assignment marks were analysed using the statistical package Social Science (SPSS Version 27). The data were tested for normality (Field, 2017). 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 (Field, 2017).

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 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) (Weisstein, 2004). The corresponding effect size (r) was calculated

(Sugathan & Jacob, 2021).

4.3.4.2 Qualitative Data

Class observations and interviews were coded, categorised, and analysed using the

procedures proposed by Creswell & Creswell (2018). 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 (Glesne, 2016). We followed the qualitative analysis

procedures suggested by Creswell & Creswell (2018). Initial disparities were discussed

between the teachers, and multiple reviews were conducted to rectify any misunderstanding or

misinterpretation (Maxwell, 2013).

Qualitative data included class observation reports, and one-third of the qualitative data

from interviews were picked randomly for double coding by independent coders (Flick, 2018).

The coding results were compared with Cohen's kappa for inter-rater reliability (IRR) using

SPSS (Version 27). Cohen's kappa was found to be 0.68, which is considered a substantial

agreement for IRR (Landis & Koch, 1977). The disagreements were resolved through

discussion.

Data from the interviews, learner feedback, teachers and teaching assistants, and class

observation reports were analysed with triangulation (Flick, 2018). This approach can

comprehensively understand and better explain the quantitative results.

4.4. Results

4.4.1. 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

4.9.
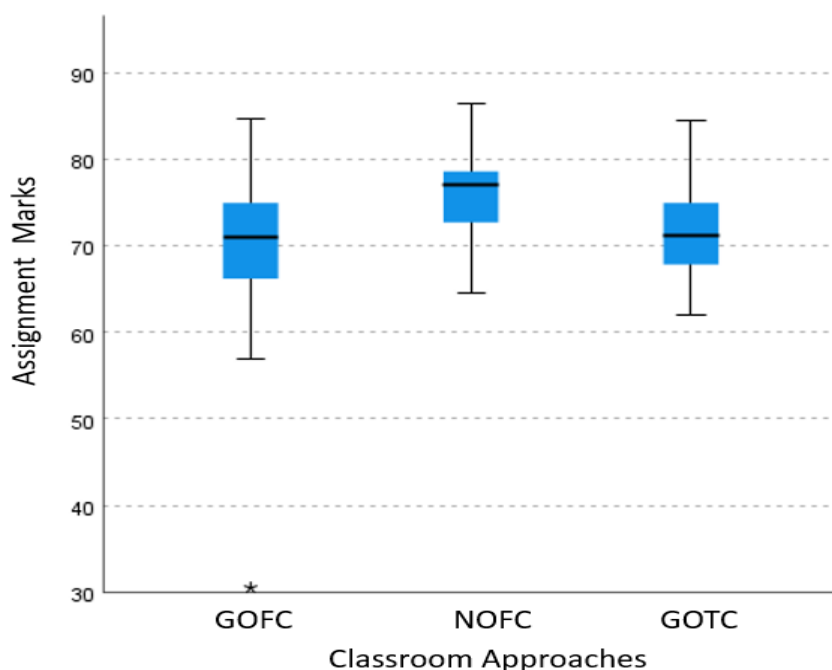
Figure 4.9. Boxplots of academic achievement results in the second module across the three classes.

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 4.5.

Table 4.5. 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	Pairwise Comparison

				Rank	
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 non-gamified NOFC among the three fully online classes. Contrary to the general expectation of proponents (Deterding, 2014), 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 non-flipped GOTC (RQ1; $p = 0.07$).

4.4.2 Explanation of Academic Achievement Results with Qualitative Data

The qualitative data from the interviews reflected the benefits of the non-gamified 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 4.6).

Table 4.6. Example quotes from learners about the gamified online classroom approaches (GOFC and GOTC).

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

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).

4.4.3 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 4.7).

Table 4.7. *P*articipation 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 4.8.

Table 4.8. 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 need more time to ask questions and understand what the teacher said in the online classroom sessions.'* (GOTC-Learner 2)	*'Teaching the same instructional contents online took much longer than face-to-face classrooms.'* (Teacher 2) *'I needed to speak slowly and elaborate more when teaching online.'* (Teacher 2)	*'There were often a few seconds delays in the communication between the learners and the teacher.'* (Teaching Assistant 2) *'The students' attention was short, and more breaks were needed in the online classroom sessions than in face-to-face classrooms.'* (Teaching Assistant 1)	The need for technological and technical support
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 "blacked out" from time to time due to network problems.'* (Teaching Assistant 3)	
Teaching	*'The teacher speaking*	*'I needed to handle both the*	*'The teachers often missed*	

Techniques	*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)	*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)	*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 face-to-face classrooms).'* (Teacher 3)	*'The students talked to the teachers but had fewer dialogues with their peers in the online discussion sessions than in face-to-face 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 were discovered.

4.5 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 non-gamified 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 non-gamified class (NOFC) (Table 4.7). We also found that more support is needed for such an abrupt pedagogical shift from a face-to-face 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 educational 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.

4.5.1 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 (2020). However, in the GOFC, neither academic achievement nor learning participation was significantly enhanced, in contrast to Lo (2022) and Hew et al. (2021).

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 (Halpern & Tucker, 2015). 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 (Deci & Ryan, 2012). 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 (2007) 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, teachers 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 must be avoided (Lu et al., 2022), for example, those caused by gamifying the classes in our study.

4.5.2. 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 educational programmes (Lo, 2022). 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 (Zainuddin et al., 2021).

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 (Urh et al., 2015). 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 (Tomczyk, 2022).

4.5.3. 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 (Baxter & Hainey, 2022). 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 that active participation, positive online learning interactions, and a sense of belonging among the learners through a learning community and study groups can help to ensure the sustainability of online learning (Berry, 2019; Xie et al., 2006). 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 (Berry, 2019) 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 (Roehling et al., 2017). 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 (Berry, 2019).

4.5.4 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 4.8). 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 (Lytle, 2009). Our findings coincide with the findings from Baxter and Hainey (2022).

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 (Sailer et al., 2017).

4.6 Conclusions

This study uncovered various risks and opportunities involved in adopting the online flipped and gamification classroom approaches for ensuring sustainable adult educational 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 educational programmes to relieve the anxiety of adult learners who wish to further their education. This opportunity is evidenced by our findings that the non-gamified 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 4.8) 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 face-to-face classrooms. The risks to sustainable adult education during the pandemic uncovered in our study were mainly caused by the direct transition from face-to-face to face-to-screen classroom approaches without providing teachers and learners with additional training and support (Zhang et al., 2020). 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 (Berry, 2019). HEIs should provide teachers and teaching assistants with professional technological and technical training to cope with the abrupt and unanticipated transition from face-to-face 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 (Liu et al., 2022)

4.7 Limitations

Nevertheless, we acknowledge that the research findings were from one institution (i.e., China Institute for Business) and that we 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.

Chapter Five

Study Three

Enhancing Online Instructional Approaches for Sustainable Business Education in the Current and Post-Pandemic Era: An Action Research Study of Student Engagement

(Ng & Lo, 2023)

5.1 Introduction

During the outbreak of the COVID-19 pandemic, higher education institutions (HEIs) in China moved their learning and teaching activities fully online, which affected more than 30 million students at 3,000 institutions in the main cities (Peters et al., 2022). During the campus closures, HEIs transformed their traditional instructional modes into more flexible online modes using advancements in information communication technologies (ICTs) (Divaharan & Chia, 2022; Han et al., 2021). Nevertheless, HEIs have shown a lack of proper planning and experience in designing fully online instructions during disease outbreaks (Hallgarten, 2020). Therefore, the shift from traditional to online instruction caused student disengagement and learning loss in actual practice during the COVID-19 pandemic (Kuhfeld et al., 2020). It is necessary to explore effective pedagogies in practice to sustain online educational programmes and mitigate the negative impact of campus closures. In particular, research is needed to help teachers understand how to increase their students' engagement and sustain their learning performance in online learning environments.

Despite the vast improvements in ICTs, multimedia, and social media platforms in recent years, HEIs still focused on traditional classroom lecturing approaches with limited online instruction experience before the onset of the pandemic (Zhu et al., 2022). Traditional classroom lecturing approaches are connected to a Chinese learning culture but result in low levels of student engagement (Guo et al., 2019). Under China's 'dynamic COVID-zero' and 'suspending classes without stopping learning' (SCWSL) policies, teachers were urged to organise flexible online instruction to sustain their HEIs' educational programmes (Zhang et al., 2020). However, adopting online education programmes in HEIs was challenging because of the teachers' limited experience, knowledge and skills in planning online instruction (Ashraf et al., 2017), which led to the reduced effectiveness of their online educational programme deliveries. Therefore, we need to understand the efficacy of existing online instruction of HEIs' educational programmes and how to improve in a fully online environment (Cao et al., 2021).

One of the flexible pedagogical approaches HEIs adopted before the COVID-19 pandemic was the flipped classroom approach. Students watched pre-recorded instructional videos online before attending their face-to-face class sessions (Alqarni, 2018). The flipped classroom approach supposedly creates more in-class time for collaborative learning activities to boost student engagement (Ozdamli & Asiksoy, 2016). Students watch the pre-recorded instructional videos online during the asynchronous self-study session before attending the synchronous class session (Rotellar & Cain, 2016). Flipped classrooms enable flexible learning with self-

study sessions and advanced learning with synchronous online class sessions (Roehling et al., 2017). Nonetheless, HEIs that adopted the flipped classroom approach in China experienced challenges, such as teachers' lack of professional training to record instructional videos with digital technologies (Ashraf et al., 2017).

Before going into details about the study, we provide an explanation of several terms involved in this study to facilitate readers' understanding. Sustainable learning refers to providing education with knowledge for maintaining learning in different circumstances, including normalcy or crisis Ben-Eliyahu. 2021) Techno-pedagogy is the combination of technology (e.g., ICT) with pedagogy which enables effective teaching and delivery of course materials (Gurukkal, 2021). Gamification is using game elements in non-game contexts (e.g., education) (Deterding, 2019). Lastly, the gamified flipped classroom approach means the application of game elements (e.g., points and leaderboard) into the flipped classroom approach (Zainuddin, 2018).

5.2 Materials and Methods

5.2.1 Research Design

Our overarching goal was to understand the efficacy of current pedagogies to establish a practical framework for designing new online techno-pedagogies in the present and post-COVID-19 era. The development of this framework will allow us to design new online

pedagogies not only as a contingency plan but also as a practical guide to support student engagement and sustain their learning performance in online learning environments. We examined the challenges the online pedagogical shift teachers, teaching assistants and students faced during the pandemic with dual-cycle action research. The action research approach enhances our understanding of the required interventions and brings critical knowledge for practical improvements (Wilfred & Kemmis, 2003). In addition, the action research approach avoids unfair treatment of students between the experiment groups (Lo, 2017). Thus, the following research questions (RQs) guided our study:

- *RQ1*. How is the efficacy of the current online pedagogy regarding student engagement and sustainable learning performance?

- *RQ2*. How can we improve the efficacy of online instruction using the new techno-pedagogy regarding student engagement and sustainable learning performance?

- *RQ3*. What is a practical framework for building new techno-pedagogies for the current and post-COVID-19 era?

5.2.1.1 Class and Module Arrangements

In our study, we conducted two action research cycles among the spring cohort of the post-graduate business management programme at the Institute of China Business, which began in May 2022. Three modules were taught from May to July 2022. Each module took one month

to complete, including 16 hours of synchronous online class sessions on two consecutive days on weekends (i.e., 8 hours each on Saturday and Sunday, respectively). Figure 5.1 shows the classroom arrangement of the first three modules in the spring cohort. Before starting the interventions in the first (June) and second (July) action research cycles, all students attended the first module (May) as usual in an online traditional lecturing format (i.e., online traditional classroom, OTC). The topics of the three modules were Theme Park Marketing, Sales Analysis, and Cloud-Based Marketing, respectively. All modules and teaching content were registered under the same qualification level in the qualification framework of education (i.e., Level 6) (Hong Kong SAR Government, 2020). Therefore, all knowledge, content, intellectual skills, and teaching processes were maintained consistently at the same level.
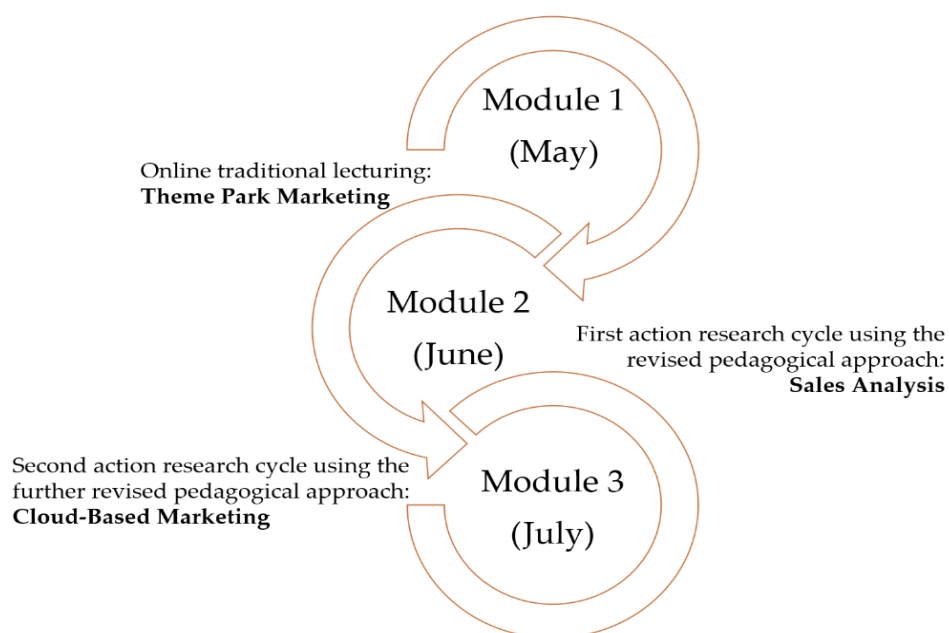
Figure 5.1. Class and module arrangements.

Each module included pre-class (Weeks 1–2), synchronous online class (Week 3), and

post-online class (Week 4) sessions (Figure 5.2). In the pre-class session, the teachers

encouraged the students to browse the online learning resources, including programme content,

during their flexible free time (Abeysekera & Dawson, 2015). The students then attended two

days of synchronous online class sessions (Week 3) and finished an individual essay

assignment (Week 4) to complete each module.
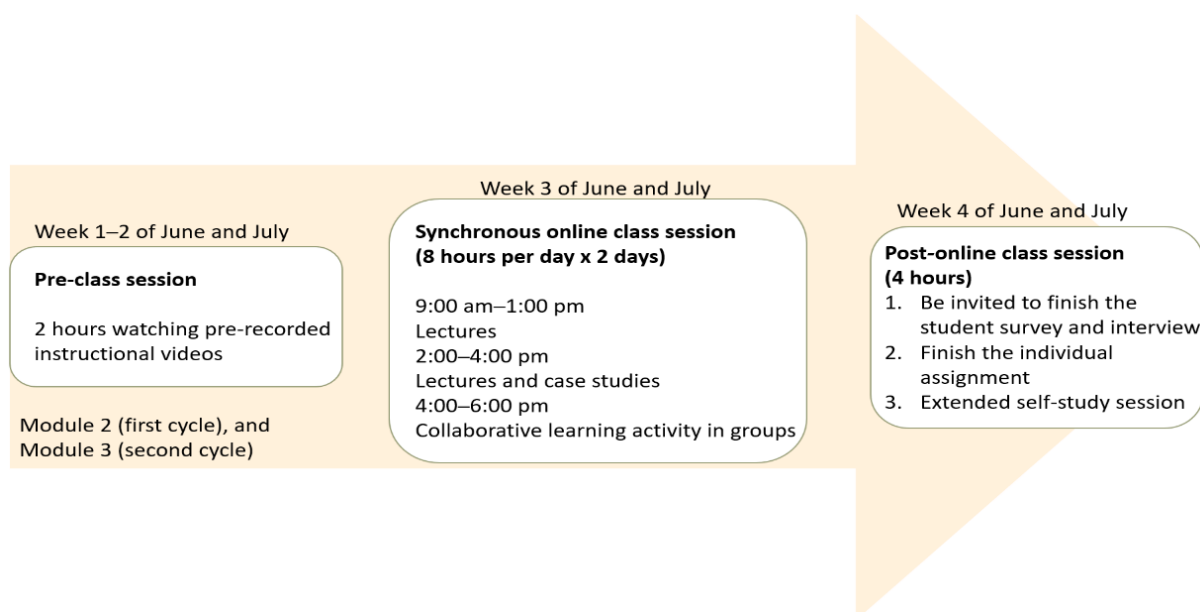
Figure 5.2. Rundown of class sessions for the two action research cycles.

5.2.1.2 Action Research Cycles and Interventions

This study aimed to assess current pedagogies and build a practical framework for

improving the planning and implementation of new online techno-pedagogies, focusing on

sustaining student engagement and learning performance. The learning gained through

observations and reflections during the previous cycle guided our design for the pedagogy in

the next cycle (McNiff, 2012). Four key stages comprised this cyclic research process (i.e.,

planning, action, observations, and reflections) (Figure 5.3). The first action research cycle

started in module 2 (June) using the revised pedagogy after reviewing the problems and issues

from the previous OTC practice. The second action research cycle was applied in module 3

(July) after evaluating the teaching review and reflection of the first cycle.

First cycle

Pre-intervention

Review the existing pedagogy

Review the existing practice and learning resources.

Explore new pedagogical designs.

1

Action Stage

Intervention

Implement the new pedagogy.

Note any problems and issues that arose in the implementation.

3

Reflection Stage

Data analysis

Evaluate the teaching reflection, data analysis of surveys, interviews and academic results.

Explore solutions to address the problems and issues.

5

Identify problems & brainstorm solutions.

Communicate, discuss and design the action plan with teachers, teaching assistants and students.

Prepare instructional content, student survey and interview protocols.

2

Observation and Data collection

Collect data from student surveys, class observation reports and interviews.

4

Plan Stage

Observation Stage

Second cycle

Preparation

Review the pedagogy of the previous cycle

Teacher reflection

Peer observation and class observation report.

Student survey and interview.

6

Action Stage

Re-act

Re-implement the new pedagogy.

Note any problems and issues that arose in the implementation.

8

Reflection Stage

Post-intervention report

Data analysis and writing up the final report.

10

Re-plan

Plan the new instructional pedagogy and teaching resources.

7

Re-observe

Collect student surveys, class observation reports and interviews.

9

Plan Stage

Observation Stage

Figure 5.3. Overview of the two action research cycles and interventions.

5.2.2 Participants

Seventy-eight students (mean age = 35 years; 72% women) participated in the pre-intervention stage (i.e., OTC). However, two students withdrew from our post-graduate business management programme for personal reasons. Therefore, 76 students (mean age = 33 years; 74% women) participated in the first and second action research cycles. Three teachers and three teaching assistants participated in both action research cycles. Before the first action research cycle began, the teacher-researcher led and initiated the review of teaching materials and feedback from students and teaching assistants with the other two teachers (Figure 5.3, Stages 1–2). The three teaching assistants were briefed on how to deliver the revised pedagogies before starting the action research cycles. The guidelines and instructions for the new pedagogies were given to all students in advance through the learning management system (LMS). The teachers and teaching assistants met online to reflect, exchange, and review their class observations from the first cycle (Figure 5.3, Stage 5). All actionable insights and items for improvement were included in the revision to the pedagogy for starting the second action research cycle (Figure 5.3, Stage 8).

5.2.3. Data Collection and Analysis

This study adopted a mixed methods approach with quantitative and qualitative analyses. All data were collected after each synchronous online class session before the start of the next

cycle. We analysed these data to propose a practical framework for devising new online techno-

pedagogies during and after pandemics.

5.2.3.1 Quantitative Data

The quantitative data sources included student surveys and learning performance results.

We evaluated student engagement using a 20-minute survey comprising 18 questions

(Appendix 1), with a 5-level Likert scale ranging from 5 'Strongly agree', 4 'Agree', 3

'Neutral', 2 'Disagree', to 1 'Strongly disagree'. We included an open-ended question as the

last item (i.e., Q18) to allow the students to share their thoughts and suggestions for

improvement (Table 5.1).

Table 5.1. Sample items from the student survey questionnaire.

Aspect	Sample Question	Supporting Citation
Perceived learning (Q1–3)	I learnt more because of the online class format (Q2	Ng & Lo (2022b)
Behavioural engagement (Q4–8)	I paid attention to my studies (Q7)	Lo & Hew (2020)
Emotional engagement (Q9–13)	I felt interested when we worked on something in class (Q10)	Skinner et al. (2008)
Cognitive engagement (items 14–17)	I made a lot of effort (Q15)	Chi & Wylie (2014

Marks from the individual essay assignment served as quantitative data for the learning

performance results. The academic committee assessed and approved the assignment questions,

and the teachers strictly marked these assignments following the HEI's marking schemes and

rubrics. An external academic examiner appointed by the institute reviewed 30% of the

assignments and grades. Any discrepancies were resolved through discussion during regular academic committee meetings.

In answering *RQ1* (i.e., the efficacy of the OTC pedagogy) and *RQ2* (i.e., ways to improve the efficacy of online instruction using new techno-pedagogies), we analysed the quantitative data using Statistical Package Social Science software (version 28; IBM SPSS, Armonk, NY, USA). We used a *t*-test to evaluate and compare the students' engagement survey responses and checked the results of Cronbach's alpha reliability analyses (Field, 2017). We used the institute's annual monitoring report (AMR) as a benchmark for evaluating student learning performance results in the three modules because the AMR is a standard reference for student learning performance. Assignment marks with a B grade or higher indicate that students have demonstrated a good understanding and ability to use the knowledge and concepts they learnt during the lessons.

5.2.3.2 Qualitative Data

The qualitative data sources included teacher and student interviews, class observation reports and teacher reflections. The interviews were guided by the semi-structured protocol focused on the challenges, problems, benefits, and solutions for online pedagogies (Alqarni, 2018) (Table 5.2).

Table 5.2. Sample items from the semi-structured protocol for teacher and student interviews.

Aspect	Sample Question
Challenge	• Compared with previous classes, what do you think of the new class approach, especially any challenges for your teaching/learning?
Problem	• Did you identify any questions and problems when attending the new class arrangement? Please illustrate your answer with some examples.
Benefit	• If the HEI reopens after the COVID-19 pandemic, do you think your teaching/learning approach will change? Please explain your answer using some examples. • Do you think you will make any changes to your teaching/learning approaches using different technologies after the pandemic? If yes, please illustrate what they are and how to use them with some examples.
Solution	• How did you overcome the difficulties in your teaching/learning? Can you illustrate your strategy for overcoming these difficulties with some examples?

The student's participation level in the learning activities reflected their engagement. According to Al-Zahrani (2015), student participation levels can be ranged from the least engaged passive receiving to students who perform active manipulation, constructive generation, and the most engaged interactive dialoguing. The teaching assistants observed and recorded the students' levels of participation in their activity groups during the synchronous online class sessions by checking boxes in their class observation report forms (Figure 5.4).

Level of participation in the synchronous online class session. (Please check one of the following four descriptions that most closely matches your observation)			
Passive receiving ☐	Active manipulation ☐	Constructive generation ☐	Interactive dialoguing ☐
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 5.4. Class observation report forms for recording student participation levels during synchronous online class sessions.

5.2.3.3 Qualitative Content Analyses

To answer *RQ3* (i.e., a practical framework for building new techno-pedagogies), we conducted qualitative content analyses (QCAs) using the data obtained from the responses in teacher and student interviews, class observation reports and teacher reflections (Kuckartz & Mcwhertor, 2014). According to Kuckartz and Mcwhertor (2014) and Saldaña (Saldana, 2021), thematic categorisation and subcategories are crucial for effective QCAs because they are the building blocks of the theories that researchers will develop. Therefore, the data were first transcribed into Chinese, and we conducted QCAs accordingly by following the steps (Creswell & Creswell, 2018):

1. Concept-driven: We derived themes and subcategories from the literature on the current state of research and the RQs.

2. Data-driven: We completed a stage-by-stage procedure by opening and developing top- and sub-level codes until achieving saturation and continuously organising and systematising the formed codes at different levels with the new incoming data.

3. Mixed: We took these concept-driven themes and subcategories and subsequently coded all data accordingly with new generations of specific themes and subcategories when needed.

According to the findings, the teacher-researcher processed data analysis and identified the core themes and new subcategories. The teachers examined the supporting evidence from class artefacts (e.g., student group presentations and virtual classroom posts) and recordings of online class sessions. The creation of themes, subcategories and data coding took place in cycles (Creswell & Creswell, 2018). The RQs played a significant role in guiding and providing perspectives for text coding (Thyer, 2012). We coded the data from the second action research cycle using the corresponding themes and subcategories from the first cycle. We only created new themes and subcategories when necessary and with the coders' agreement (i.e., between the teachers). Two teachers collaborated on the transcription of the interviews in Chinese. Some data were translated into English for reporting purposes. Any divergent opinions regarding the themes and subcategories were resolved by the teacher-researcher and teachers who discussed these discrepancies to achieve consensus during the coding meetings.

5.3 Results

5.3.1 Overview of the Two Action Research Cycles

Action research studies search for concrete, actionable items that can improve real-world practices (Guy et al., 2020). Therefore, the teaching team (i.e., the teacher-researcher, two teachers and three teaching assistants) met online in the last week of each module (i.e., Week 4) for a dialogue-based discussion of the key findings and potential remedies for the next action research cycle. The key finding from the pre-intervention OTC module was that the students were disengaged, a common finding in traditional teacher-centric didactic online instruction with a lecturing style (Humphries & Clark, 2021). Following the literature (Lo, 2017) and an agreement between the teaching team, the online flipped classroom (OFC) approach was used as an actionable item for the first action research cycle.

Although the students were given a clear briefing about the benefit of online in-class collaborative learning activities before starting the OFC, they were reluctant to participate in the online in-class learning activities. This reluctance resulted in inadequate student interactions to achieve collaborative learning. We found that the students lacked learning motivation in the first cycle; therefore, the gamified flipped classroom (OGC) approach was used as the actionable item and remedy for the second action research cycle (Sailer et al., 2017) (Table 5.3).

Table 5.3. Overview of the findings from the two action research cycles.

Stage	First Action Research Cycle (OFC)	Second Action Research Cycle (OGC)
Pre-class session	• A low number of students watched the pre-class instructional videos (27 out of 78 students, 35%) • The teaching assistants suggested that teachers record a short briefing video to introduce the importance and significance of the instructional videos	• More students watched the pre-class instructional videos (61 out of 76 students, 80%) • The pre-recorded videos did not replay smoothly online
Online class session	• Passive receiving without displaying reactions or giving feedback, low participation level and engagement • Dull and silent class • Most students' cameras were turned off, and feeling alone without belonging to the class • The teacher-researcher suggested using game elements to motivate student engagement	• Asking questions and queries • Improved participation levels in the collaborative learning activities • More discussion and voicing out new thoughts and ideas • Feeling supported and not studying alone (i.e., studying in groups with peers) • Most students' cameras were turned on
Post-online class session	• No connections with the institute or classmates until the next module • No questions were asked before attending the synchronous online class sessions • The teacher assistants asked to use a social media platform (e.g., WeChat) to improve communication with the students because they did not respond to LMS messages	• More active exchanges in the WeChat class groups after the online class sessions • The teaching assistants received pre-class questions and enquiries from students • A learning community and study groups were established for the students with the support of teaching assistants
Key challenges	• The students were inattentive and disengaged during the lessons • The students were passive, and many did not participate in collaborative learning activities	• Collaboration and simultaneous competition between students during their learning activities observed

Screenshot examples of the online class sessions		
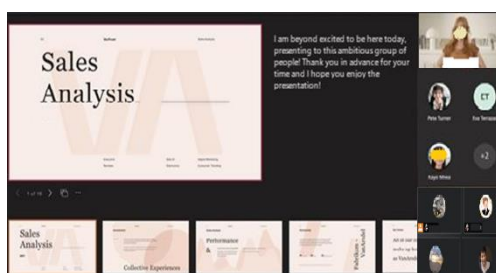
5.3.2 Implementation Improvement After the Two Action Research Cycles
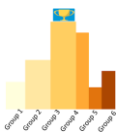
During the first and second action research cycles, 2 hours of pre-recorded instructional videos (four 30-minute videos) were provided online in the pre-class self-study session. We designed 2 hours of in-class collaborative learning activities to improve student engagement during the synchronous online class sessions. We attempted to introduce gamification to motivate student learning after reviewing the feedback from the first cycle (OFC) and with reference to academic research. Gamification is a theory-driven innovative techno-pedagogy (Huang & Hew, 2018; Subhash & Cudney, 2018), that has the potential to promote learning motivation and engagement in business management education together with the flipped classroom approach (Dichev et al., 2020; Silva et al., 2019).

Hence, we used the OGC as the revised pedagogy in the second action research cycle. In the OGC, we applied game elements during the students' collaborative learning activities: namely, points and leaderboards with specific purposes. We used these game elements to further motivate student engagement and sustain their learning performance (Sailer et al., 2017). These points and leaderboards did not count towards students' academic results to avoid distractions in their online learning (Ng & Lo, 2022a). Table 5.4 presents the game elements

and their applications.

Table 5.4. Application of game elements in the OGC.

Game Element	Purpose	Award Criteria
Point	Granular feedback to encourage participation in learning tasks and activities	Award to activity groups in the collaborative learning activity session, encouraging innovative ideas and solutions. One point is given to one innovative idea or solution.
Leaderboard	Encourages intragroup collaborative learning and healthy intergroup competition between the activity groups when learners try to obtain more points for a prominent position on the leaderboard	All activity groups were ranked on the leaderboard based on the total number of points accumulated in each online class session.

The institute's LMS did not support a gamification function. Therefore, we used Qitoupiao, a local online learning application (Figure 5.5). In addition, it has a unique gamification function that can be set in the leaderboard display to show each group's real-time accumulation of points. This function successfully increased the student groups' excitement and competitive learning behaviour (Muijs & Rumyantseva, 2014).
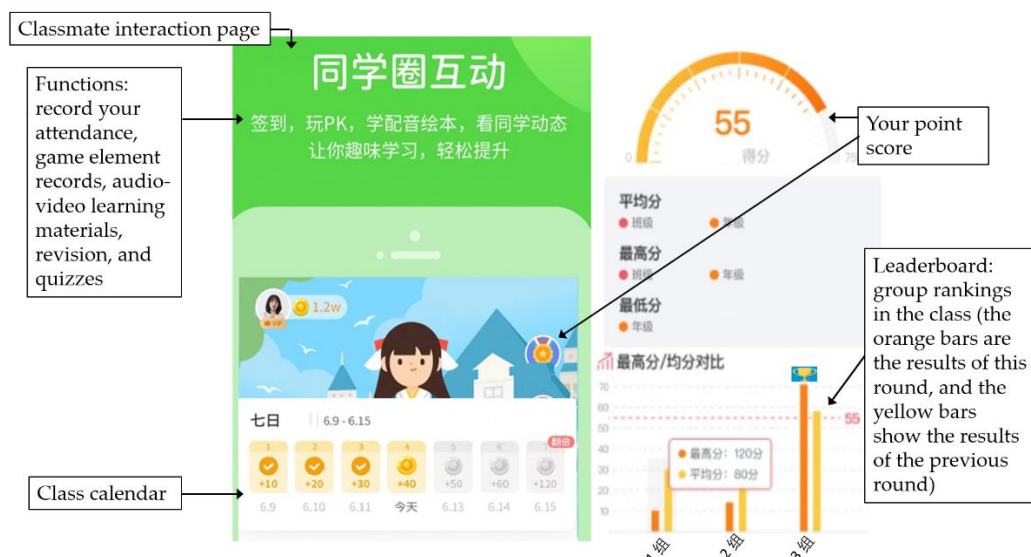
Figure 5.5. A screenshot of the Qitoupiao application.

5.3.3 Quantitative Results

We analysed the students' survey responses from the two action research cycles (OFC, *n* = 76; OGC, *n* = 76). Cronbach's alpha for the OFC and OGC responses was .85 and .90, respectively, indicating the good reliability of the questionnaires (Field, 2017). Among the 17 survey items, there was a significant difference in five items (Table 5.5), indicating an improvement in student engagement in the second cycle (OGC).

Table 5.5. Student engagement survey questionnaire response of OFC and OGC.

Survey Item	Survey Question	OFC Mean (SD)	OGC Mean (SD)	*t*-Value	*p*-Value
Perceived learning	Q2. I learnt more because of the classroom format	3.53 (.77)	4.67 (.53)	10.63	< .001
Behavioural engagement	Q7. I paid attention to my studies	4.22 (.51)	4.47 (.64)	2.67	< .001
Emotional engagement	Q9. I felt good when I studied	3.89 (.60)	4.53 (.64)	6.36	< .005
	Q10. I felt interested when we worked on something in class	3.92 (.54)	4.54 (.58)	6.82	< .001
Cognitive engagement	Q15. I made a lot of effort	3.96 (.53)	4.50 (.55)	6.16	< .001

We used the institute's AMR to monitor the student learning performance based on the benchmark for quality teaching and learning (i.e., ≥ 80% of the total student assignments with a B grade or above). As shown in Table 5.6, the percentages of assignment marks with B a grade or above for OTC (pre-intervention), OFC (the first cycle) and OGC (the second cycle) all kept on above 80%. That is, the student learning performance in the three modules was sustained without learning loss throughout the action research.

Table 5.6. Student learning performance in the two action research cycles.

Class	N	Grade B or Higher (Merit)	Grade B or Lower (Pass)
OTC	78	82.0%	18.0%
OFC	76	81.6%	18.4%
OGC	76	82.8%	17.2%

In summary, our quantitative data analyses showed that the OGC in the second cycle promoted the students' perceived learning and behavioural, emotional, and cognitive engagement. Simultaneously, learning performance was sustained.

5.3.4 Qualitative Results

The class observation reports showed that the students were primarily passive receivers in the pre-intervention (OTC) and the first cycle (OFC) modules. In contrast, the OGC module in the second cycle improved their participation levels from passive receiving to constructive generation. The teachers also noted that the students asked more questions and provided more

innovative ideas during collaborative learning activity sessions. We also performed a frequency count of the themes in our qualitative analysis to obtain an overall picture of the participant's responses. These frequencies consolidated the insights from a total of 386 quotes from the two cycles that reflected the challenges, problems, benefits, and solutions during the fully online instruction (Table 5.7).

Table 5.7. Themes and subcategories from our qualitative data analyses.

Concept Theme	Subcategory	Response Sample	Key Component	Improvement Aspect
Flexibility (65 quotes, 17%)	Adapting to the switch between online and offline classrooms	'The students could switch to online learning during the campus lockdown' (T-1) 'The flexible online and offline classroom arrangements were great and helpful for our class management' (TA-1) 'It was important to allow us to continue our studies, even during the pandemic lockdowns. We could have online resources to prepare ourselves while waiting to attend the online classes or campus classes when our campus was allowed to open' (S-13)	Online and offline learning	Technical network and online support
All-in-inclusive (108 quotes, 28%)	Inability to capture the students' attention and participation in the lessons for long hours of online class sessions	'Unlike traditional classroom instruction, it was not possible to approach and observe the students on the learning platform, especially when they all turned off their cameras even after asking them to turn on' (T-1) 'The students would only start discussing topics when the teacher entered the virtual subgroup chatrooms' (TA-3) 'I saw one of my classmates still eating snacks while the teacher asked him to answer a question' (S-15)	Asynchronous self-study and synchronous online class session	Gamifying the classes

	Lacking interactions, exchanges and sharing experiences throughout the learning process	'I very often received no responses when I asked questions during the online class sessions' (T-2) 'The online class sessions were very dull with a slow teaching pace because our teacher often asked questions and waited for answers' (S-15)	Real-time communication and fewer delays	Technical networks and online support
	Difficulties in monitoring and managing the students' learning progress	'I was unable to identify and track my student's understanding of the instructional content because seeing them on screen was different from face-to-face teaching' (T-3) 'I had to remind the students to submit their homework on time in the LMS repeatedly because I never received any of their replies' (TA-2) 'I might finish my homework and assignments on time if I knew how my classmates were progressing' (S-7)	LMS and social media platforms (e.g., Qitoupiao, WeChat)	Learning community and study groups
	Feeling lonely and helpless in their learning and studies	'Help and assistance was not immediately available when I experienced problems, questions and uncertainties in my study' (S-17)		
Coopetitive learning (89 quotes, 23%)	Learning from teachers and classmates (Collaborative learning)	'As a teacher, I must organise more class activities, especially for online classes' (T-3) 'The students in online classes were not as active during exchanges as in traditional face-to-face classrooms' (TA-2) 'I was not interested in taking part in the class activities, especially for online classes, because it was not like being in a real classroom' (S-18)	Game elements (i.e., points and leaderboard) were used as granular and accumulated feedback to motivate students' learning interactions and collaborations	Gamification and motivation

	'The students worked hard in learning but were less willing to share their experiences in online class sessions' (T-1)	Leaderboard rankings promoted healthy intragroup collaborative and intergroup competitive learning	Collaborative and competitive learning
Pursuing better learning performance than other classmates in the class (Competitive learning)	'The students always wanted to win against each other but were not always willing to share and help each other' (TA-2)		
	'I was afraid that my experience and knowledge were not as good as my classmates' own experiences and expertise (S-13)		
Technical support (39 quotes, 10%)	'It was the first time I had to instruct in front of a computer screen. I was struggling and felt helpless when I had problems using the online applications' (T-2)	Professional training for online instruction	Technical support and professional training
	'I provided pre-recorded instructional videos and put them on the LMS, but I felt that that the instructional contents should be presented differently online than in traditional classrooms' (T-3)	Smooth video streaming and live broadcasting	
The need for help and support in using distinct functions in the online instruction platform	'I cannot get used to the technical stuff, such as how to reset hanging videos' (TA-1)	Desktop and mobile compatibility	
	'There were too many disconnections, and I needed to log in repeatedly, which was so distracting and annoying' (S-7 and S-12)	Network and connection	
Difficulties in planning and integrating multimedia resources into online teaching practice	'It was new to me to use multimedia and digital applications to teach the classes, especially in the online class sessions' (T-2 and T-3)	Technical support and training (i.e., skills and techniques in using technologies)	

Sustainable learning (85 quotes, 22%)	Continue the educational progress during pandemic lockdowns and after synchronous online class sessions	'The classes could still progress, although more slowly, which is better than completely halting all classes during city lockdowns' (T-1) 'If all the classes stopped for months, there would be great pressure to rearrange class timetables after reopening of the campus' (TA-3) 'I could continue my study during the home confinement and the uncertain period following campus lockdowns' (S-12)	Student connection and learning continuity	Establishment of a learning community and study groups
	The pedagogy should be sustained and welcomed by the participants	'The most important consideration of online pedagogies should be how well the students like to use it to learn over the long time' (T-2) 'Face-to-face interaction (further explained as personal presence) is very important for online class sessions because many students turned on their camera but were not listening' (TA-3) 'I did not have the face-to-face feeling of on-site presence as learning in the traditional classroom after the lessons moved online' (S-7)	Creation of more immersive and participative learning spaces	Immersive VR applications

Notes: T = Teachers, TA = Teaching assistants, S = Students, VR = Virtual reality.

Since gamification was the actionable item and remedy for the second cycle, the teacher-researcher revisited the students who did not appreciate the online class in the first cycle (i.e., OFC). Their response and feedback were as follows: 'We were more willing to turn on our cameras and worked on the group tasks assigned in the class exercise like playing team competitions' (S-15) and 'We don't want to lose and look down upon from other groups, so we work hard with the classmates in our own group' (S-13).

5.4 Discussion

We conducted our study in response to the call for new pedagogical possibilities to mitigate the potential impact of HEI campus closures on the sustainability of their educational programmes (Peters et al., 2022). Our two main concerns were student disengagement and learning losses (Kuhfeld et al., 2020). The two cycles of this action research study explored the challenges, problems, benefits, and solutions for innovative online pedagogies with particular attention to student engagement and learning performance. We obtained significant insights from the two action research cycles involving three pedagogical approaches (i.e., OTC, OFC and OGC).

Based on the feedback and observations during each cycle, we added new thinking and improvements to the next action research cycle; that is, OFC and OGC were added to the first and second cycles, respectively. Quay et al. (Quay et al., 2020) emphasised that 'the ways of doing are ways of knowing' (p. 110); thus, the results of our action research study disclosed the importance of flexibility, all-in-inclusive, coopetitive learning, technical support, and sustainable learning (F.A.C.T.S.) framework in fully online learning environments. Coopetition is a noteworthy finding in our results. As noted by the teaching assistants, the gamification application displayed two rounds of group rankings in the leaderboard (i.e., Day-1 and Day-2), motivating more exchanges and discussion within the group. The teachers also reflected that the students gave more new ideas and solutions in the learning activities to get more points in the OGC. Intra-group collaboration was promoted, and at the same time, students also exhibited

the desire to win over other groups (inter-group competition). Muijs and Rumyantseva (2013) also observed these co-opetition behaviours in educational settings; that is, students compete with their peers while learning collaboratively. Moreover, the results indicated the need for an immersive and participative learning space which can provide face-to-face, on-site interactive online learning experiences.

5.4.1 Efficacy of Current Online Pedagogical Approaches (RQ1)

Considering the first RQ, we found that moving traditional lectures online (i.e., OTC) was the most readily available approach to facilitate flexible learning during campus closures. However, as observed by Cao et al. (2020), OTC provided a poor learning experience and caused student disengagement. Moreover, the teaching assistants reported that the OTC and OFC modules led to dull classes, and almost all students turned their cameras off in online class sessions. In contrast to the proponents of OFC (Al-Zahrani, 2015), our observation of flipped classes did not show any improvement in the student's participation level. Another recent study obtained similar findings (Ng & Lo, 2022b). Furthermore, our results showed that the students' inadequate learning motivation caused their disengagement in the first cycle (OFC), also noted by Lo (2022). As mentioned by Peters et al. (2022), one of the reasons leading to student disengagement is that they are not naturally motivated by online pedagogies.

5.4.2 Efficacy Improvement of Online Pedagogical Approaches (RQ2)

We added game elements to the second cycle (OGC), and more exchanges and discussions were observed. In addition, more students turned on their cameras than in the earlier modules (Table 5.3). The game elements worked to support teachers' granular feedback (e.g., points) and promote coopetitive learning (e.g., leaderboards) (Ng & Lo, 2022a), which both helped to motivate student engagement and increased their levels of participation in the learning activities (Ng & Lo, 2022b). During the OGC module, the students showed significant improvements in their perceived learning and behavioural, emotional, and cognitive engagement. The study results showed that the efficacy of the online pedagogical approach regarding student engagement improved when using the OGC pedagogy. In addition, gamification promoted all-in-inclusive participation, including teachers (e.g., giving granular feedback as points to students), students (e.g., being motivated to provide more new ideas and solutions for teachers' points), and teaching assistants (e.g., running and displaying the gamification application). These supported the sustainability of educational programmes in online learning environments (Ng & Lo, 2022a).

Following these significant improvements, technical problems also emerged (e.g., network or system issues, poor video broadcasts, weak online instruction skills and techniques). Ashraf (2017) observed that shifting from traditional pedagogical approaches to online instruction is not as easy as we think because all sorts of technical problems may happen. The

feedback from the teachers and teaching assistants in the two action research cycles also reflected the need for professional training among the teaching team to build their digital competence and online teaching skill sets (Ng & Lo, 2022b).

5.4.3 Practical Framework for Online Pedagogical Approaches (RQ3)

Our study identified five themes and corresponding subcategories (Figure 5.6). The most mentioned theme was all-in-inclusive because the students were eager to express their thoughts and looked for the teachers' authoritative input, especially when motivated by game elements (i.e., points and leaderboard). The students also missed the on-site face-to-face feeling of presence with their classmates and teacher, such as in the traditional classroom learning before the pandemic (Lo & Hew, 2022). The second most quoted theme was coopetitive learning because the adult learners were experienced practitioners and found it valuable to learn from each other, especially in the practical application of their acquired knowledge (Ng & Lo, 2022b). Simultaneously, these students regarded their class peers as competitors for academic results (Ng & Lo, 2022a). As observed by Muijs and Rumyantseva (2013), the teachers and teaching assistants found that the students wanted to win over each other during the group discussion and presentations.
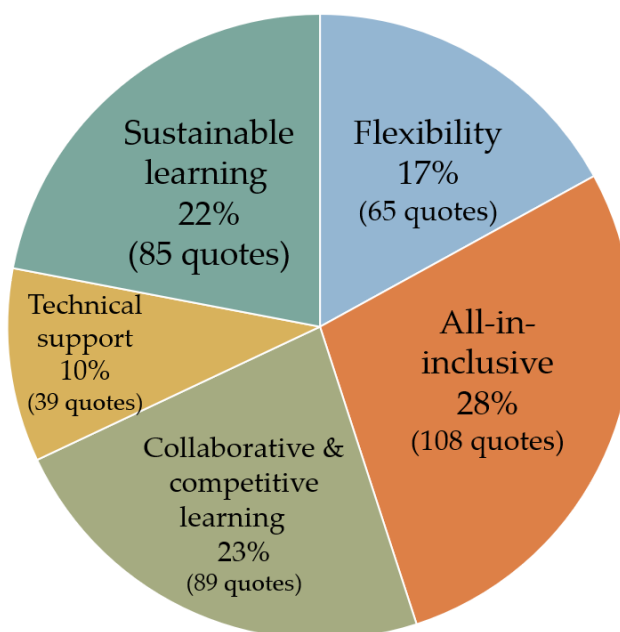
Figure 5.6. The five major quoted themes (F.A.C.T.S.) and their respective percentages.

The third most quoted theme was sustainable learning. The students wanted to continue their learning after each synchronous online class session. The students wanted to keep communicating and studying with their peers. Therefore, we set up a learning community and study groups using social media platforms (Ng & Lo, 2022b). Flexibility was the fourth most quoted theme. Students understandably benefit from online learning resources during prolonged campus closures because they allow them to self-study in their flexible personal time (Quay et al., 2020). Finally, all participants (i.e., teachers, teaching assistants and students) mentioned the need for technical support. Online instruction would be impossible without using hardware and software applications. Teachers must prepare much more digital instruction and videos than traditional instruction. In addition, they must have the appropriate skill sets to manage different applications and media while teaching online. All participants were annoyed

by the frequent interruptions due to issues like network connections, delays, and blackouts (Lo & Hew, 2022).

Following the emergence of new variants of COVID-19, HEIs must explore innovative and viable techno-pedagogies that can promote student engagement and sustain learning performance in online learning environments (Lo & Hew, 2022). We propose a practical F.A.C.T.S. framework based on our study results to help HEIs develop new online techno-pedagogies. With reference to the F.A.C.T.S. framework and recent research (Radianti et al., 2020), we plan to introduce more interactive, immersive, and participative techno-pedagogies, such as incorporating VR in the next action research cycle (Figure 5.7).
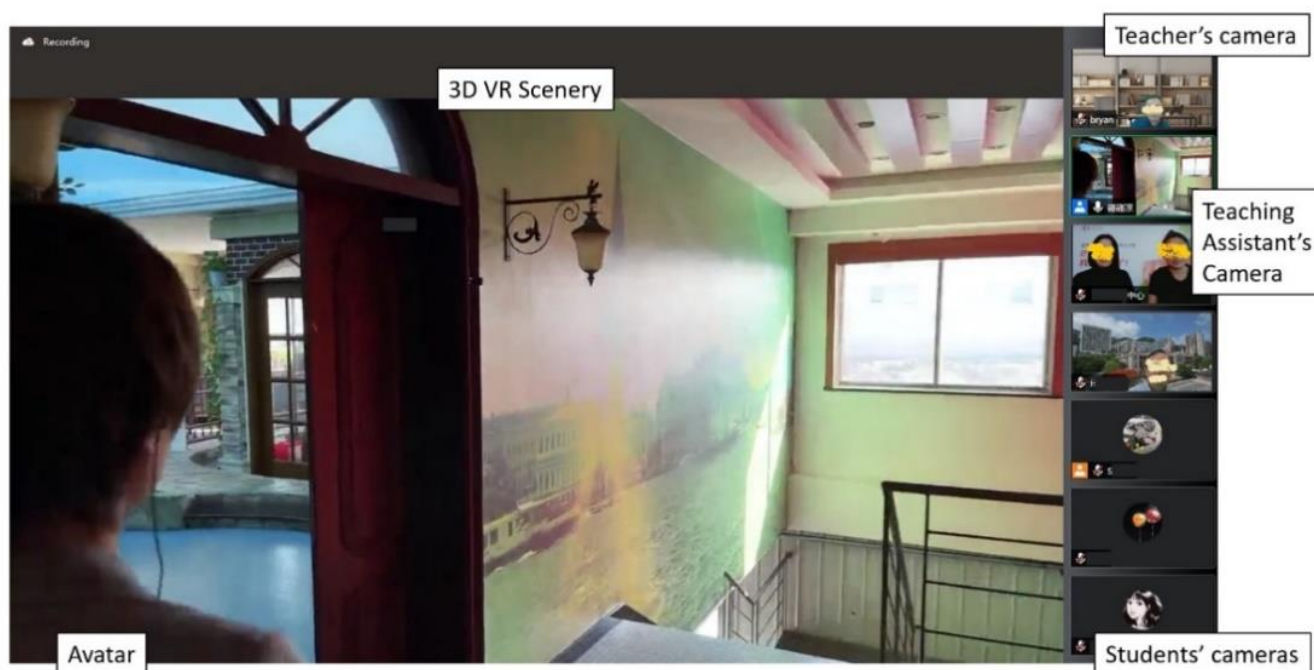
Figure 5.7. Online VR pedagogical approach using the F.A.C.T.S. framework.

5.5 Conclusions and Limitations

Various sectors of society were involved in fighting the outbreak of the COVID-19

pandemic, and teachers were no exception (Zhu et al., 2022). Local HEIs commonly moved their traditional lectures online (i.e., OTC) and used flipped classrooms (i.e., OFC) (Guo et al., 2019). Despite their various challenges and problems, we also observed benefits and solutions for improving the efficacy of fully online pedagogies (Zhu et al., 2022). Our results showed that student engagement improved significantly in the second action research cycle by using the OGC pedagogical approach, and their learning performance could be sustained by fully online pedagogies during the COVID-19 pandemic.

This study explores a practical framework (F.A.C.T.S.) to guide HEIs' development of the most appropriate online techno-pedagogies. However, this study was conducted with students from one discipline (i.e., business management) in one HEI in China. Therefore, our results might not be generalisable. Although they produced insights into improving the efficacy of online pedagogies, the student's perceptions of learning and engagement were subjective. Further studies with a larger sample are required to strengthen the scientific aspect. Furthermore, this study and the suggested F.A.C.T.S. framework focus on pedagogy and learning with an attempt to incorporate gamification Researchers can testify other options (e.g., personalisation and VR application) to increase student engagement (Radianti et al., 2020). Finally, HEIs must consider their funding and budget constraints in the development of engaging online techno-pedagogies (Petersen et al., 2022).

Chapter Six

Overall Discussion and Concluding Remarks

The discussion will present the key findings and learning of the three studies for a total of 212 student participants in a period of 32 weeks from November 2021 to July 2022. The research project witnessed the drastic changes in the instructional environments during the COVID-19 pandemic and its impacts on the continuity of HEI adult business education programmes in China. The participants experienced issues of instructional continuity (i.e., Study One), instructional re-design (i.e., Study Two), and, lastly, technology-led pedagogical transformation (i.e., Study Three). Therefore, the results of the research project gave us authentic pedagogical insights that would be valuable to contribute to the pedagogical improvement of HEIs in facing the ever-changing learning environment.

The overarching goal of the research project was to find out the most effective pedagogy in this techno-pedagogical evolution caused by the COVID-19 pandemic. An effective pedagogy would be one that promotes learning engagement and prevents learning performance loss (Kuhfeld et al., 2020). Meanwhile, students' engagement reflects their motivation which is important to the sustainability of learning (Deci & Ryan, 2012).

This chapter discusses the results gained from the three studies of the research project. The effects of gamification and flipped classroom approaches focusing on learning outcomes (i.e., learning engagement and performance) will be discussed first, followed by the

implications of the findings, and lastly, the limitations and future research.

6.1 Effects of Gamification and Flipped Classroom: Findings from the Three Studies

In this section, the discussion starts with the key findings and learning from the three studies. The discussion focuses on the effects of techno-pedagogies (i.e., gamification and flipped classroom) on learning engagement and performance under three different instruction environments. In Study One, the instruction environment was almost the same as in the pre-COVID-19 era but with some delays due to temporary campus lockdowns. In that stage, pedagogical alternative options were adopted by the teachers simply for the purpose of contingency for the continuity of the education programmes during the lockdowns. In Study Two, all classes and instruction were fully online due to the total lockdown of the city for more than two months. Therefore, the instruction environment for the second study was amid COVID-19, with the most severe impact of the pandemic on the continuity of education programmes. Therefore, techno-pedagogies were re-design for effective instruction fully online. For Study Three, the city and campus re-open once if the lockdowns were lifted, but the time and period were all uncertain. HEIs and teachers needed to transform their instruction in preparing such a new norm. Instructional approach re-design with techno-pedagogies could support whatever and whenever face-to-face or fully online instructions could be possible.

Hence, Study Three was done in such an environment that normal face-to-face classrooms

might resume but would have unexpected sudden lockdowns and uncertainty of the time and period for re-opening or vice versa. The environment led to a techno-pedagogical transformation for HEIs and teachers facing the pseudo-post-COVID era (Oded & Oded, 2022). Lastly, a practical framework was proposed after learning from the three studies. It is predicted that the emergence of new technologies and hence the techno-pedagogies will continue to evolve. We need a practical framework established from empirical research (Studies One and Two) that is based on theory (i.e., SDT) and principles (i.e., adult learning principles) to support the instructional needs in the ever-changing pseudo- and post-COVID era (Lo et al., 2018; Pierre et al., 2020).

6.1.1 Instructional Continuity: the effects of Techno-pedagogies on Face-to-face and Online Instruction Environment (Study One)

Instructional continuity was the key issue faced by HEIs and teachers in Study One. New instructional approaches are mainly used as contingency alternatives due to the temporary closure of the campus. The effects of techno-pedagogies (i.e., gamified and flipped classroom approaches) on student learning engagement and performance under three experimental groups, namely GFC, NFC and GTC (Table 6.1), were examined. Study One was an empirical study grounded in SDT.

Table 6.1. Experimental design of Study One.

Experimental Groups and Approaches	Experimental Group 1: Gamified Flipped Classroom (GFC)	Experimental Group 2: Non-Gamified Flipped Classroom (NFC)	Experimental Group 3: Gamified Traditional Classroom (GTC)	Research Question and Group Comparisons
Flipped classroom	Yes	Yes	No	RQ1: GFC and GTC
Gamified classroom	Yes	No	Yes	RQ2: GFC and NFC

For Study One, face-to-face classroom teaching and learning were still possible and allowed, though occasionally interrupted by short periods of campus closures. The frequent interruptions from the pandemic impeded students' learning motivation (Navarro-Espinosa et al., 2022). Based on SDT, gamification and flipped classrooms can be the tools to sustain learning motivation. The students' learning engagement and participation levels in the collaborative learning activities of the face-to-face classroom could reflect the motivational effect of the corresponding pedagogies (Azevedo, 2015). Therefore, student engagement surveys, class observation and learning performance using individual assignment marks are the appropriate measuring tools to evaluate the efficacy of the pedagogical interventions.

The results showed that gamification (GFC and GTC) significantly enhanced learning engagement and performance more than non-gamified counterparts (NFC). In which GFC provided more in-class time for collaborative learning activities. Our results supported gamification as an effective pedagogical approach to sustain the continuity of educational programmes in HEIs during COVID-19 lockdowns (Collado-Valero et al., 2021). Gamified flipped classrooms provided pre-class self-study videos and materials to ameliorate students' anxiety during academic uncertainty (Arribathi et al., 2021).

The key learning from Study One was the need for continuity and sustainability for HEIs

education programmes during the pandemic. It was the first study of this research project in the earliest stage before the heavy implementation of the COVID-19 confinements. Students were allowed to recover face-to-face classroom learning when the infected cases were cleared in the city. Gamified flipped classrooms helped to maintain the continuation and sustainability of the learning programmes during the COVID-19 lockdowns (Collado-Valero et al., 2021). However, motivation declines in the absence of learning interactions (Ahshan, 2021). Gamification promotes collaborative learning interactions and motivates learning outcomes (Sailer & Sailer, 2021). The results of the first study concurred with Lo and Hew's findings (2021). Students in gamified classrooms (GFC and GTC) exhibit a stronger sense of engagement, as evidenced by their level of participation observed in the class observation reports during in-class collaborative learning activities. In the context of adult postgraduate business education, the learning performance reflected in the individual assignment marks showed that GTC promoted advancement for learning performance. The results of Study One echoed the observation of Bredow et al. (2021) that there may not have an apparent improvement in learning performance in flipped classroom approaches (i.e., GFC and NFC). McLean et al. (2016) explained that one of the reasons is that the teacher's role in flipped classes shifted from an authority of knowledge (as in traditional classes) to a combined role of knowledge delivery, co-synthesis and facilitation in flipped classes.

Grounded in SDT, three observations and recommendations for re-designing of

gamification and flipped classrooms. First, gamification plays an important role in motivation and learning engagement, promoting the continuity of education programmes (Bräuer & Mazarakis, 2022). It is because timely and evaluative feedback from teachers by means of game elements was vital to promoting learning engagement (Lo & Hew, 2020). This is important, especially in a highly teacher-dependent learning culture; game element applications from teachers trigger learning discussions, leading to higher participation levels in learning activities (Rajput, 2022). Although the same game-design elements were applied in GFC and GTC, learning performance was higher in traditional GTC. The results resonated with the findings of Jensen et al. (2018) that adopting flipped classrooms to create more time for in-class learning may not be effective per se, especially in a strong teacher-dependency learning culture. Adult learners in our study benefitted more from the teacher-led gamified classroom approach (i.e., the traditional GTC) than the two flipped classrooms (GFC and NFC). This mirrors the study of Magana et al. (2018).

6.1.2 Instructional Re-design: the Effects of Techno-pedagogies on a Fully Online Instruction Environment (Study Two)

In the second study, the gamification and flipped classroom pedagogies were re-designed and further tested in a fully online instructional environment due to the total closure of the campus (Table 6.2).

Table 6.2. Experimental design of Study Two.

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

Contrary to the expectations of gamification proponents, the students of Study Two in the non-gamified online flipped class (NOFC) significantly outperformed the learning engagement and performance than those of the two gamified online classes (GOFC and GOTC). In other words, gamified classes (GOFC and GOTC) did not exhibit an improved learning engagement and performance than those in the non-gamified class (NOFC), as expected, in a fully online instructional environment.

Based on the literature, GOFC, with both game elements and flipped classrooms, fulfilled the need for autonomy (self-study sessions) and relatedness (synchronous online class sessions). Taking advantage of mixed methods research, the qualitative data of Study Two helped us to understand and explain the unexpected quantitative results (Tashakkori & Creswell, 2007). The qualitative data from the interviews supported the advantages of the non-gamified online flipped classroom approach (NOFC) in a fully online environment. For example, NOFC provided "flexible time management" for self-study during the home confinement (NOFC Student 1) and "pre-class self-study materials allow me to prepare better before attending the online classroom sessions" (NOFC-Student 5). On the contrary, student interviews of gamified online classrooms (GOFC and GOTC) revealed more drawbacks than benefits in a fully online

instructional environment, such as frequent distractions and wastage of time for gamification. The teaching assistants noted frequent delays in awarding points and badges. The teacher was busy with online teaching, and the students were trying hard to keep the attention of prolonged online instructions. Moreover, the students did not have time to watch the leaderboard often as they had to focus on computer screens for the lessons.

Another unexpected finding in this study was that the students in the NOFC mostly engaged in constructive generation (i.e., the second most engaging in participation levels). In contrast, students in the GOFC and GOTC engaged in active manipulation (i.e., less engaging than in NOFC) (Al-Zahrani, 2015). The participation levels indicated that NOFC was the most engaged class among the three classes, as opposed to the findings of Lo (2022) and Hew et al. (2021). Gamified classroom approaches (i.e., GOFC and GOTC) did not elevate the participation levels of learning engagement in the fully online environment. Instead, students in the NOFC had more time to ask questions and participate in knowledge application discussions without too many distractions and interference from gamification. The results were consistent with the study of Amiti (2020). Moreover, studies also found that students in fully online gamified classes had lower learning performance same as our findings (Baxter & Hainey, 2022; Perera & Richardson, 2010).

The findings of Study Two did not show the motivational effect of gamification for adult learners in a fully online instructional environment as we expected. The feedback from the

students of these two gamified online classes was worth considering while designing fully online classroom approaches in the future. The first pertained to the motivators of adult learners, which were more potent for job-related factors (Halpern & Tucker, 2015). The second pertained to the challenges of implementing gamification in a fully online environment which caused disturbance and interruptions in the learning progress (Ng & Lo, 2022b). Although SDT states that people engaged in activities that satisfy specific intrinsic psychological needs (i.e., relatedness, autonomy, and competence), adult learners were more responsive to extrinsic motivators such as job-related motivational factors (Chukwuedo et al., 2021). These factors could be either extrinsic (e.g., those that influence their promotion and increase in salary) or intrinsic (e.g., self-esteem and peer competition) (Muijs & Rumyantseva, 2013).

Moreover, a recent study pointed out that adult learners tended to apply for education programmes with clear objectives, such as strengthening their knowledge and skills for career promotion, unlike undergraduates, who mainly focused on the quest for knowledge acquisition (Eripuddin & Jufrizal, 2021). Therefore, teachers need to consider providing an environment that can facilitate self-directed, collaborative, at the same time, competitive learning for adults. As such, adult learners could assume accountability for their own enhancement of knowledge and professional skills. In addition, unnecessary and frequent disruptions and interference during the learning process must be avoided, such as those caused by intensive gamification (Lu et al., 2022).

6.1.3 Technology-led Transformation: Techno-pedagogies for Changing Instruction Environment (Study Three)

The third study aimed to find out the most appropriate pedagogy in practice to sustain the HEIs education programmes for adult learners in the current and post-COVID-19 era. During the outbreak of COVID-19, educators together with various sectors of society, were involved in fighting the pandemic (Kuhfeld et al., 2020). HEIs are responsible for assisting adult learners in overcoming barriers and interruptions by providing quality education, which is essential for the country's SDGs (Zhang et al., 2020). The best way to know is in the way of doing and practising. Therefore, action research was adopted for the third study (Quay et al., 2020). The action research approach could enhance understanding of the required interventions and bring critical knowledge for practical improvements (Newsome et al., 1988). Thus, the study focused on the efficacy of the current pedagogy in practice, pedagogical improvement and further exploration of new pedagogic possibilities. Moreover, the action research approach avoided potential bias and unfair treatment of students compared to the different experimental groups (Lo, 2017).

Action research studies searched for concrete and actionable items that could help improve real practices (Guy et al., 2020). The key finding from the pre-intervention OTC module was the students' disengagement during online instructional sessions. It was a common

experience in traditional teacher-centric online instruction with a didactic lecturing style (Humphries & Clark, 2021). The online flipped classroom (OFC) approach was used as an actionable item for the first action research cycle. However, students were reluctant to participate in online learning activities. This led to inadequate interaction for collaborative learning. The students lacked learning motivation to participate in the learning activities; henceforth, the gamified flipped classroom (OGC) approach was applied as the actionable item for the second action research cycle, which emphasised coopetitive learning (Liu et al., 2020; Sailer et al., 2017).

With the key learning from the second study, the third study simplified the gamification and only applied points and a leaderboard to avoid the frequency of interruption and distraction (Ng & Lo, 2022b). The results showed that the efficacy of the online pedagogy improved with the combination of gamification and flipped classroom (i.e., OGC). In addition, gamification promoted all-in-inclusive participation, including teachers (e.g., giving granular feedback using points to students), students (e.g., being motivated for more new ideas and solutions), and teaching assistants (e.g., operating and displaying the leaderboard rankings). All-in-inclusive supported the sustainability and continuity of HEIs educational programmes (Ng & Lo, 2022a). Simplified gamification was an effective pedagogy for learning engagement (e.g., participation level at constructive generation), although the contribution to cognitive learning performance (i.e., academic achievement or marks) was still somewhat unclear, especially in

the fully online learning environment (Sailer & Homner, 2020). The third study benchmarked the AMR for learning outcomes in preventing learning performance loss, as it commonly happened in fully online classes. The results indicated that the learning performance was sustained without significant performance loss throughout the study.

Following the pedagogical improvements in practice regarding learning engagement and performance, technical problems emerged (e.g., system and network, video broadcasts, online instruction skills and techniques issues). Ashraf (2017) noted that the shift from traditional pedagogical approaches to online instruction was more challenging than we thought because all sorts of technical problems might happen. The feedback from teachers and teaching assistants in the two action research cycles also reflected factors such as professional and technical training to strengthen their digital competence and online teaching skills (Ng & Lo, 2022b). The third study also identified factors that facilitate learning achievement and engagement for building a practical framework for further pedagogical re-design and transformation.

The development of the practical framework allowed HEIs to design more innovative pedagogies not only for contingency plans in facing the COVID-19 pandemic but also as a guide to incorporate more advanced techno-pedagogies for the future (Lo & Hew, 2022). Patton and Owens (2023) emphasised that a practical framework with essential factors that promoted adult learning was the key to fostering success. The five essential factor categories concluded

from the 386 quotes of all participants (i.e., students, teachers and teaching assistants) were

flexibility, all-in-inclusive, coopetitive learning, technical support and sustainable learning

(F.A.C.T.S). The findings of the research and the F.A.C.T.S. framework provided insights for

future research on leveraging gamification and flipped learning in the "post-pandemic" higher

education context.

6.2 Implications of the Findings

The COVID-19 pandemic has dramatically accelerated the integration of ICT for effective

instruction (Oded & Oded, 2022). Teachers were pushed to utilise ICT as the abrupt moving of

instruction online due to the temporary (Study One), persistent (Study Two) and occasional

(Study Three) city lockdowns under the SCWSL policy (Zhang et al., 2020). HEs, teachers and

students were facing various types and levels of uncertainty. Online traditional, flipped,

gamified and gamified flipped classrooms were the most available instructional approaches

during the pandemic (Li et al., 2020a; Lo & Hew, 2020; Zhu et al., 2022). However, the

integration of technology with pedagogy (i.e., techno-pedagogy) should be purposeful and

well-designed, which could benefit the students for better learning outcomes (i.e., learning

engagement and performance) (Terada, 2020). Terada (2020) points out that teachers should

seek out new techno-pedagogical approaches for a considerable positive impact on student

learning outcomes. The following two sections will discuss the theoretical and practical

implications of the findings from the three studies.

6.2.1 Theoretical Implications

There was a lack of research on how the playfulness of gamification and intrinsic psychological needs (i.e., autonomy, competence, and relatedness) were applied to adult learning (Alamri et al., 2020; Zainuddin et al., 2023). Therefore, one of the purposes of this research project was to evaluate how those SDT-supported techno-pedagogies applied to adult learners in different instruction environments. Explanatory sequential mixed method (Study One and Study Two) and action research (Study Three) were used. By collecting quantitative and qualitative data, the investigation started with how the applications of those techno-pedagogies affected learning engagement and performance.

Pedagogy with adult learning principles was the foundation of instructional approaches for student learning in higher education. Malcolm Knowles' adult learning principles were based on six assumptions of adult learners: (1) self-directedness, (2) need to know, (3) use of experience in learning, (4) readiness to learn, (5) orientation to learning, (6) internal motivation (Forrest & Peterson, 2006). The underpinning idea of adult learning principles was that adults and children were different in learning. Since adult learning principles were often criticised as an atheoretical model based on observation and experience rather than logically postulated, Davenport and Davenport (1985) suggested having empirical studies to resolve the critics. SDT

supported adult learning principles for the point as adults were motivated by internal urges (i.e., intrinsic psychological needs) (Deci, 2012). However, SDT conflicted with adult learning principles in another aspect that adults responded to both internal (e.g., the quest for knowledge, self-esteem, and self-enhancement) and external urges (e.g., job promotions, higher salaries, and quality of life) (Knowles, 2002).

Adult learners were very different from undergraduate students; they joined educational programmes with the purpose of fulfilling their life and career plans (Aristovnik et al., 2020). It was well aware that we needed real-life-orientated practical case studies and problem-solving sessions, and educational programme design should encourage students to learn from each other (Eripuddin & Jufrizal, 2021). Their time was precious, and the dropout rate was high if they were not engaged in the educational programme. Park and Choi (2009) pointed out that a lack of learning motivation might be the reason for not being engaged, which caused higher dropouts for adult learners. Nevertheless, motivation was the prerequisite to sustainable learning according to SDT (Deci & Ryan, 2012) and adult learning principles (Pew, 2007), especially during the COVID-19 pandemic, which interrupted many students' study and life planning (Chiu, 2021). The preference for motivation depends on who is going to be motivated. Moreover, knowing what they should be learned, how they learn and when they learn could mean the success or failure of higher education (Connor, 1997).

From the results of the first two studies, gamified and flipped classroom approaches based

on SDT did not have a consistently positive impact on learning engagement and performance as expected. Recent research also found the same contradictory results (Baxter & Hainey, 2022). Xie et al. (2006) found that learning performance was related to the motivation for learning. Hew et al. (2021) pointed out that flipped classroom approach requires students' self-regulation to arrange their pre-class time to complete the online instructional videos before attending the class sessions. Research showed that students expressed a lack of interest in participating in gamification, and non-utilitarian game elements might not drive their motivation as we expected (Bai et al., 2020; Huang & Hew, 2018). Obviously, the intrinsic psychological needs fulfilment of SDT might not be enough to fully explain adult learning motivation (Alamri et al., 2020).

Hence, adult learning principles were further emphasised in Study Two. Adult learning principles or adult learning principles stated that adult learners attempted new learning for a personal rise or career promotion rather than knowledge acquisition (Knowles, 2002; Pew, 2007). In other words, adult learners learn for self-enhancement. Self-enhancement in Asian culture includes self-criticism (implicit) and self-peer comparison (explicit). In this regard, Chinese students behaved low in explicit self-enhancement but high in implicit self-enhancement in the classes; that is, Chinese students would deemphasise explicitly the positivity of the self in the class when situationally prompted to behave modestly (Heine, 2005). However, they would capitalise on their implicit self-enhancement when situationally induced

(Cai et al., 2010). Therefore, a coopetitive learning environment by showing two rounds of the group rankings in the same leaderboard chart was adopted in Study Three. Coopetition impacted learning performance by creating an intra-group collaborative (explicit self-enhancement) but inter-group competitive (implicit self-enhancement) learning situation, promoting both explicit and implicit self-enhancement in the environment (Liu et al., 2020). In such an environment, the students were more likely to share their knowledge and real-life experiences within their group. In addition, the inter-group competition would promote new knowledge creation when they wanted to win the competition by contributing more new ideas and solutions in their group (Fu et al., 2009).

Moreover, teaching adult learners is challenging because teachers must work hard to restore their knowledge and motivate them to engage in learning activities (Burns, 2021). Pedagogy must be tactfully implemented for adult learners, as reported from research that adults were not interested and hence motivated by traditional teaching approaches (Brunton & Buckley, 2020). Halpern and Tucker (2015) and Hays (2015) recommended that tactical pedagogy leverage adult learners' experience and knowledge for peer learning. Study Three incorporated tactical coopetitive pedagogy with adult learning principles to explore more understanding of the theory-driven gamified and flipped classroom approaches on learning engagement and performance. The results of Study Three indicated that the gamified flipped classroom approach (OGC) with tactical coopetitive pedagogy significantly improved learning

engagement and sustained learning performance (Table 6.3).

Berry and Dienes (1991) regarded learning as knowing something with its essence or nature unmediated by personal interpretation or distortion. On the other hand, learning was also an objective perception of the world, which enabled the students to subjectively construct meaningful interpretations and experiences of the knowledge and the truth of what they were learning (Pratt, 1993). In this regard, the argument of Berry and Dienes (1991) stands more toward pedagogy and Pratt (1993) is on the adult learning principles side. Moreover, both of them probably missed the sociological perspectives of adults as they were also influenced by the economic, political, cultural and historical contexts of learning (Podeschi & Pearson, 1986). Therefore, adult learning principles contribute to different aspects of adult learners who demand authoritative knowledge from teachers and experience exchanges with peers. They are motivated by both intrinsic and extrinsic factors. They learnt and competed with peers at the same time. Coopetitive learning resulted in Study Three mirrored this fact in real practice (Ng & Lo, 2023).

When we approach the issue of student learning motivation, difficulty arises when any specific pedagogical methods and practices are applied in a dynamic learning environment. Instruction under the shadow of the COVID-19 pandemic is one example. Situational and unexpected uncertainties may undermine the entire process of student motivation and hence their learning behaviour (Pew, 2007; Pedrosa et al., 2020). Adult learning and SDT are the

foundational principles and theory of student motivation in higher education. However, many factors, such as social cultures and authority of knowledge, influence students' learning behaviours and outcomes. HEIs and teachers need a practical framework instead of any rigid theories in facing the challenges from multiple and varied instructional situations (Pew, 2007)

6.2.2 Practical Implications

We all want the COVID-19 pandemic to end and never come back, but new variants continue to emerge. It was in the pseudo-post-COVID-19 era for Study Three, and the pandemic is not yet over us at the moment. In this respect, HEIs and teachers have to keep on searching for effective techno-pedagogies. Considering these, we need a practical framework to guide our continuous search for innovative and effective techno-pedagogies even in the post-COVID-19 era. A practical framework concerning motivational theory and principles (i.e., pedagogy and adult learning principles) based on the 386 quotes from the qualitative content analysis. The aim is to foster student-centric instruction, enable independent and collaborative learning, and enhance learning interactions between students and teachers. The framework disclosed the importance of flexibility (F), all-in-inclusive (A), coopetitive learning (C), technical support (T) and sustainable learning (S).

The F.A.C.T.S. practical framework is drawn on participatory action research (i.e., Study Three), which consists of five essentials for a successful techno-pedagogy to support SDT and

adult learning principles. Research on adult education, online learning and techno-pedagogies braced our findings and the framework as followings:

1. Flexibility (F): this is a key aspiration of autonomy as a learning environment provides flexible non-bounded self-study sessions to encourage students' self-regulation and authorship of their own learning (Parnell & Procter, 2011). Promoting self-regulation, self-directed and authorship of one's own learning should be the foundations for adult education (Elias & Merriam, 2005).

2. All-in-inclusive (A): research has demonstrated that relatedness perceptions and social factors contributing to feelings of belongings mediated self-enhancement by providing enjoyment which reduced the worry of the students (Cox et al., 2009). This phenomenon is founded in both Western and Asian cultures (Cai et al., 2010).

3. Coopetitive learning (C): Coopetition significantly impacts performance through sharing knowledge and experience, based on the research of 230 Chinese business enterprises (Avotra et al., 2022). Students enrolled in business education programmes need to have the paradigm shift from knowledge transfer to competence development with coopetitive learning (Bratianu et al., 2020).

4. Technical support (T): technology adoption promotes the values of e-learning and online instruction (Mehta et al., 2019). Technical support is needed to enhance teachers' and students' digital knowledge, experience and competence (Tomczyk,

2022).

5. Sustainable learning (S): effective education of HEIs should be aware of the need to sustain students' knowledge progression into society and their real-life living (Rovio-Johansson, 2016). Motivated by social relatedness, online social network, study groups, and learning communities promote off-the-class continuous learning (Berry, 2019; Koibichuk et al., 2022).

The F.A.C.T.S. framework is not a methodological framework intended to judge or describe any techno-technology developed. Instead, it is a practical framework to link teaching and learning considerations with the goal of enhancing learning engagement and sustaining learning performance in practice (Ng & Lo, 2023). A practical framework provides more value than a pure methodological framework, as the latter is primarily like a descriptive checklist (Hubbard, 2019). Most importantly, the framework helps with learning sustainability, reducing dropout rates and learning performance loss (Ng & Lo, 2023).

The COVID-19 pandemic may be the worst, and it can be the best time for every teacher to actively think and examine innovative ways to improve the quality of higher education with advanced technologies. The techno-pedagogical evolution will never stop, just like the emergence of new variants of COVID-19. The fundamental contribution of this research project is providing a practical framework that can represent guidelines for HEIs and teachers in facing the ever-changing online and face-to-face learning environments. Attempting to

implement the F.A.C.T.S. framework in practice can strengthen teachers' ICT and digital

competencies and sustain real-life learning. Table 6.3 summarises the key findings and

learnings from the three studies of the research project.

Table 6.3 A summary of the key learning from the three studies of the research project.

	Study One	Study Two	Study Three
Evolution stage	Instructional continuity	Instructional re-design	Technology-led transformation
Result	Gamification (GFC & GTC) improved learning engagement Non-flipped GTC improved learning performance	Non-gamified (NOFC) outperformed in both learning engagement and performance	Gamified flipped classroom (OGC) was the techno-pedagogical choice for efficacy in promoting learning engagement and sustain learning performance
Key finding	Gamification (GFC and GTC) was an effective pedagogical approach to motivate and sustain the continuity of educational programmes	Gamification (GOFC and GOTC) did not motivate learning engagement and performance as expected	Disengagement due to lacking motivation was commonly found in non-gamified fully online classrooms (OTC & OFC)
Insight	Teachers' role in flipped classrooms shifted from the authority of knowledge to knowledge delivery, co-synthesis and facilitation, which did not fit well in the Chinese learning culture	Frequent distractions and interference from gamification impeded learning in fully online instructional environment Both learning engagement and performance decreased in fully online instruction Adults were motivated by both intrinsic and extrinsic motivators	Sustainability of learning engagement and performance was the key challenge for fully online instruction in uncertainty in a pseudo-post-COVID era Coopetitive learning promoted both explicit (intra-group collaborative learning) and implicit (inter-group competitive learning) for self-enhancement
Contribution	Techno-pedagogies help for instructional continuity as a contingency plan	Techno-pedagogy re-design based on motivation theory and principles need to be tested in real practice	A practical framework of F.A.C.T.S. is proposed for designing future innovative techno-pedagogies

The results from three studies of the research reflected the necessity of a practical

framework for educators. Such a practical framework should be comprehensive enough to

cover all essential elements of techno-pedagogical practice, including but not exclusive to

gamification and flipped classrooms. With the insights from the literature review, the F.A.C.T.S.

also concurred with recent research. Flexibility (A) promotes self-direct learning, authorship

and educational autonomy (Parnell & Procter, 2011). All-in-inclusive (A) and sustainability (S)

are interrelated. The COVID-19 pandemic and unavoidable interruptions to regular schooling

impact the sustainability of learning and education programmes. The development of new techno-pedagogies is trying to mitigate the interruptions and resume the progression of education programmes. Park & Kim (2021) pointed out that the interactions between learners and teachers (all-in-inclusive, A) are a necessity in promoting sustainable learning (S) in techno-pedagogy. Collaboration and competition (C) co-existence is not just common in a business environment but also in education. Results from Wu et al. (2017) also found that both collaborative and competitive learning occurred in mobile-computer-supported techno-pedagogy. Finally, technical support (T) is important for techno-pedagogy. The quality of the information system and technically supportive environment positively impact the perceived learning effectiveness and learner engagement (Panigrahi et al., 2020);

6.3 Limitations

Several limitations commonly shared in the three studies should be reported here. First, given the unbalanced composition of participants in the gender of the three studies (67-74% female students), which might have a different likeness to the enjoyment of gamification (Kim, 2015). Second, given the cultural orientations, the collectivism of the Chinese students might affect the expression and response differently from the Western counterparts for the relatedness, autonomy, and competence promoted in the gamified and flipped classroom (Lee & Wohn, 2012). On the contrary, all participants in the three studies were local Chinese students, and

research showed that their culture would exhibit greater effort and performance by using coopetition mechanisms (Wu et al., 2017). Third, the research did not evaluate students' emotional aspects in detail during the COVID-19 pandemic, which may influence their learning behaviour and performance. Last, but not least, all participants in the three studies were working business executives with strong personal and career objectives to attend the educational programmes. Therefore, the results of pedagogical and andragogical approaches might not be generalisable to other educational programmes, like those for undergraduates (Reischmann, 2017).

6.4 Future Research

For effective teaching and learning, teachers nowadays need to have the knowledge of what to teach (i.e., content), how to teach (i.e., pedagogy) and the tool (i.e., technology) that could best support our instructions (Oded & Oded, 2022). New technologies will replace prior tools, for example, virtual reality (VR), augmented reality (AR), and holograms, which offer improvement and enhancement to our instructional practice and students' learning experiences (Peters et al., 2022). The new immersive and interactive technologies can enable more pedagogical possibilities so that teaching and learning are no longer bounded by the walls of the classroom and location (Petersen et al., 2022).

It is important to highlight that the integration of technology and pedagogy could be used

both face-to-face, face-to-face, and online to create a flexible, engaging, collaborative and interactive instructional environment for effective learning. Three directions of future research are hence suggested. First, how can rewards be used in gamification to enhance the positive effects on learning engagement? Although points, badges and leaderboards (PBL) are the most commonly used reward elements in gamified classrooms, the rules for PBL application have not been well studied (Hamari, 2017). For example, the delays in awarding points and badges in Study Two hindered the positive effect on learning engagement (Ng & Lo, 2022b). The rules of how and when the PBL are released in the gamified classroom are crucial for the success of gamification design. Should these rules be applied differently in online, face-to-face, flipped, and non-flipped classrooms? Should their release be in a fixed and expected or unexpected way? Future research can explore which conditions can better motivate learning engagement and performance for adult learners.

Second, how can incentives be used in a flipped classroom to enhance learning performance? Case studies and problem-solving-based learning were the key drives to promote learning engagement and performance in a flipped classroom for adult learners, which were also applied in the three studies of this research project (Hsia et al., 2021). With the advancement of immersive and interactive techno-pedagogies, teachers and students have the opportunity to extend their learning out of the classroom to support sustainable learning (Ben-Eliyahu, 2021). Study group and learning community were the initial attempts in Study Two,

further incorporated into the F.A.C.T.S. framework in Study Three. Future research is needed

to explore how the integration of social, multimedia and immersive applications with techno-

pedagogy to afford sustainable learning even after classes (Berry, 2019; Oded & Oded, 2022).

Third, how to design new techno-pedagogy that could better enhance learning efficacy?

In this research project, gamification and flipped classroom were the two techno-pedagogies

used for the three studies. All findings were grounded in self-determination and adult learning

theories with the application of game elements and problem-solving-based learning. With the

emergence of new technologies, such as virtual reality (VR), augmented reality (AR), and

holograms, their application and adaptation in classrooms have already started in science,

engineering and medical education. However, the research on their educational effects is

limited, and gaps exist in effectiveness constructs that can measure learning outcomes (Yoo et

al., 2022). Hence, it is suggested to have future research on the efficacy of these new techno-

pedagogies in various education fields, including business education.

6.5 Conclusion

As a result of the COVID-19 pandemic, there has been a large-scale pedagogical transition

from face-to-face to fully online instruction. Over time, the transition will lead to an

instructional transformation of business schools of HEIs. There were three phases of techno-

pedagogical evolution: instructional continuity, instructional re-design, and technology-led

pedagogical transformation (Krishnamurthy, 2020). The three studies of this research project

reflected these three phases of transformation.

In Study One, instructional continuity and sustainability were the immediate challenges and problems to be overcome by the teachers. The advancement of ICT benefited the transition from face-to-face classrooms to flipped classroom approaches as the solution. Supported by SDT, flipped classroom approach satisfied the needs of autonomy (e.g., watching the pre-recorded instructional videos in self-study with flexible time), competence (e.g., more in-class time for problem-solving learning activities), and relatedness (e.g., case studies in groups). A further experimental study for instructional re-design was done in Study Two. Fully online instructions with three designs: gamified online flipped classroom (GOFC), non-gamified online flipped classroom (NOFC), and gamified online traditional classroom (GOTC), were evaluated for their influence on learning engagement and performance. The results of Study Two showed that students in NOFC exhibited the highest levels of learning engagement and performance. Due to frequent interruption and distraction, gamification for fully online instructions did not significantly enhance learning engagement and performance.

Study Three focused on in-depth understanding of how technology-led pedagogical evolution impacted learning outcomes. Before such evolution transformed into having more immersive and interactive techno-pedagogies, we needed to have a complete understanding of what and how those new techno-pedagogies work or not work (Govindarajan & Srivastava, 2020). Finally, a practical framework consolidated five important elements, which were

flexibility, all-in-inclusive, coopetitive learning, technical support and sustainable learning (F.A.C.T.S.) was proposed. Guided by the framework, gamified flipped classrooms (OGC) worked well to improve learning engagement and sustain learning performance in practice.

The future new normal will include using technology-led pedagogical innovation to enable instruction for enhancing learning engagement and performance (Krishnamurthy, 2020). HEIs and teachers have to take the COVID-19 experience as a breakthrough opportunity for pedagogical transformation to provide the conditions in which students can learn instead of being taught, as stated by Albert Einstein (Goel, 2010). As the teacher-research in this research project and also one of devoted adult educators, we must understand the contextual nature of the instructional situations. Such situations vary with students' voluntariness of learning participation, learning culture, and general personal goals to take part in the education programmes. Pratt (1993) shared the same point of view after reviewing the studies of the 1980s to 1990s relevant to the effectiveness of pedagogies for adult education.

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Appendices

Appendix 1

Student Survey Questionnaire for Learning Engagement

Instructions:

In order to understand learner perceptions of teaching and learning, please fill in the best answer for each of the following questions. There is no right or wrong answer. Please rate each item on the scale provided to indicate your agreement for items 1-17.

Survey items	5.Strongly Agree	4.Agree	3.Neutral	2.Disagree	1.Strongly Disagree
Programme evaluation 1. I found the programme to be a good learning experience. 2. I learned more because of the classroom format. 3. Classmates' comments were useful to me.					
Behavioural engagement 4. I tried hard to do well in my studies. 5. In my studies, I worked as hard as I could. 6. I participated in class activities and discussions. 7. I paid attention to my studies. 8. When I studied. I listened very carefully.					
Emotional engagement 9. When I studied, I felt good. 10. When we worked on something in class, I felt interested. 11. The class was fun. 12. I enjoyed learning new things. 13. When we worked on something in class, I got involved.					

Cognitive engagement					
14. I was engaged with the topic at hand.					
15. I put in a lot of effort.					
16. I wish we could continue with the work for a while.					
17. I was so involved that I forgot everything around me.					

18. Would you like to add anything else (e.g., thoughts, suggestions) about your experience?

Appendix 2

Student Interview Protocol

Introduction:

- Explain the purpose and nature of the study to the interviewees.
- Give assurance that they will remain anonymous.
- Indicate that they may find some of the questions difficult to answer, but there is no right or wrong answer. We are only interested in their opinions and personal experiences.
- Remind them that they are free to interrupt and ask for clarification from the interviewer.
- Ask permission to record the interview and explain that it is only for research purposes.

Guiding questions:

1. How do you feel about participating in this course?
   (a) Can you describe or give examples of how you feel?
   (b) Do you like this kind of learning, i.e., pre-class video lectures and in-class small-group learning activities?
2. What do you think are the differences between traditional classes and this course?
   (a) How do you compare traditional teaching and this course regarding your learning experience?
   (b) Do you appreciate the differences? Why?
3. Describe, if any, the changes you have made with your knowledge and learning after joining this course.
4. How did you experience the video lecture, including the short videos and online quizzes, in your learning?
   (a) Did you watch the lecture video straight through, speed up, skip or pause to review certain sections only? Why?
   (b) How long did you spend on watching the video and completing the online quiz, respectively?
5. How did you interact with your group members in class?

      (a)   Can you describe or give examples of your participation?

      (b)   Were peers from the same group and other groups helpful to your learning? Why?

6.   What is your opinion on this course, such as the pre-class lecture videos, in-class activities, online learning materials, and etc.?

      (a)   Did you have any difficulty learning in this course?

      (b)   If there is another module similar to this course, will you join the course? Why?

Appendix 3

Teacher Interview Protocol

Part 1: For all classes (traditional, gamified, flipped, online and face-to-face classes)

Describe how the designed learning activities were implemented:

(a) How well were the learning objectives achieved or not achieved?

(b) In what ways did the learning activities contribute to the learning objectives achieved?

(c) What issues were encountered in the learning activities? How to deal with it?

(d) What was your role in general through the class? How did the role shift?

(e) How did the specific technologies (if any) support or work against the implementation of learning activities?

Part 2: For flipped classes (online pre-class and face-to-face flipped class, and fully online flipped classes)

Describe how students engaged in the learning activities:

(a) What were the students' behaviour and attitude toward the learning activities in the flipped classroom?

(b) What were the particular instances related to student participation and engagement that caused concern?

(c) How did students use technologies like Moodle and view pre-class instructional videos?

Part 3: For Gamified classes (gamified flipped and non-flipped, face-to-face and fully online classes)

Describe the learning activities in the following context:

(a) What issues and changes were expected (i.e., how were learning objectives impacted or changed)?

(b) What instructional strategies that differed from before were introduced to the class?

(c) What technologies were employed to support implementing the instructional strategies? How were the technologies integrated with the learning activities?

Part 4: Further improvement and additional comments (traditional, gamified, flipped, online and face-to-face classes)

(a) Are there any areas that have to be modified in future implementation?
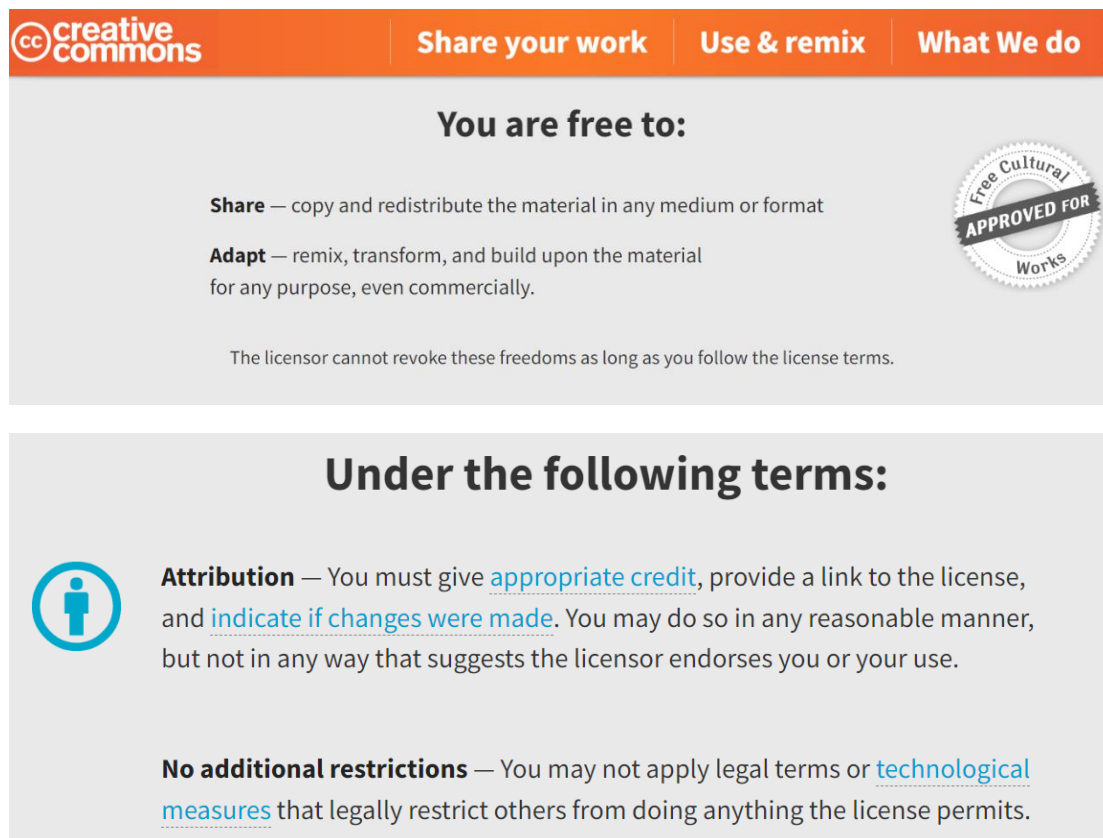
☐ Pre-class instructor-related activities (e.g., video production, gamifying the course, learning management system)

☐ Pre-class student-related activities (e.g., doing online exercises, online discussion, completing content notes)

☐ In-class instructor-related activities (e.g., task design, individual assistance)

☐ In-class student-related activities (e.g., peer interaction, group discussion)

(b) Other additional comments or thoughts about the classes.

Appendix 4

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