Teachers' Intention to Use Gamification for Motivating School Students' Learning in a Second-tier City of China

by

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A Thesis submitted

The Education University of Hong Kong

in Partial Fulfillment of the Requirement for

the Degree of Doctor of Education

December 2023

Statement of Originality

I, HUANG, Haoyi, hereby declare that I am the sole author of the thesis and the material presented in this thesis is my original work except those indicated in the acknowledgement. I further declare that I have followed the University's policies and regulations on Academic Honesty, Copyright and Plagiarism in writing the thesis and no material in this thesis has been submitted for a degree in this or other universities.

Abstract

In today's digital environment, gamification has become a satisfactory method for promoting certain behaviours and enhancing motivation and engagement. Though it is most often used in marketing tactics, it is increasingly being used in education, assisting instructors in attaining their goals while also responding to changing student requirements. In recent years, gamification, as an innovative teaching method, has also attracted much attention in China. With the further promotion of educational reforms, teachers are the change agents of reforms, and their cognition, attitude, and behaviour determine the effectiveness of educational reforms. To know more about teachers' intention to use gamification, the Theory of Planned Behaviour (TPB) was used for testing what factors affect their intention. For testing the TPB model, this study took the teachers of schools in Huizhou as a sample. This research collected data through a questionnaire survey and in-depth interviews for analysis and discussion. By collecting 152 questionnaires from primary and secondary school teachers and in-depth interviews with 22 teachers, this study confirmed that attitudes toward using gamification, subjective norms and perceived behavioural control affect teachers' intention of using gamification for teaching through the mediator commitment. This finding provides a more comprehensive model and perspective to understand teachers' use of gamification. Moreover, it gives a reference for related research on the implementation of gamification among teachers in second and even third-tier cities.

Keywords: teacher, intention, gamification, TPB, students' learning

Acknowledgments

This research and dissertation were completed under the guidance of my principle supervisor Professor Christina Yu, my associate supervisor Dr. Tan Weiqiang , and my former supervisor Dr. Eddie Cheng. First, I would like to express my gratitude to my supervisor, Professor Yu. Her rigorous scientific attitude and work style of striving for perfection deeply infected and inspired me. Here, I would like to extend my most sincere thanks and high respect to Professor Yu. In addition, I would like to thank my parents who worked so hard to raised me and my elder brother. Without their great support and help, I would not have been able to continue my studies until now. My brother Haoming Huang is an excellent middle school Geography teacher, and he has always influenced me with his example of hard work and dedication to teaching. He is a role model for me who continues to inspire me. I would also like to thank my family, friends and classmates who provided me with encouragement, they are Sammy, Hongyun, Megan, Lei, Simon, Sisi, Xiaohe, Yilin, Lishan, Zhixin, Shuhua, Xiuli, Shuzhen, Phoebe, and Xingxing. It is because of your help and support that I have been able to overcome every difficulty and confusion until the thesis has been successfully completed. There are many people who have helped me, and I cannot list them all, so I can only express my thanks again.

"Learn to be a teacher and act as a model for the world". This is the school motto of my alma mater, and I also aspire to be a good college teacher in the future. Obtaining a doctorate is the first step, and there is still a long way to go. I will keep in mind Professor Yu's teachings and all the knowledge and experience I have learned at

The Education University of Hong Kong over the years, and continue to work hard to be a good teacher for lifelong learning. Thank you all again!

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List of Abbreviations

ANOVA	Analysis of Variance
AT	Attitudes toward gamification
COM	Commitment to using gamification
CR	Composite reliability
EdUHK	The Education University of Hong Kong
FCVIF	Full collinearity VIF
GBL	Game-based learning
GOF	Goodness of fit
GS	Graduate School
ICT	Information and Communication Technology
INT	Intention to use gamification
IT	Information Technology
LMS	Learning management system
LVs	Latent variables
PA	Physical activity
PBC	Perceived behavioural control
PLS	Partial least squares
SDT	Self-determination theory
SEBD	Social, emotional, and behavioural difficulties
SEM	Structural equation modelling
SN	Subjective norms
TPB	The theory of planned behaviour
UAE	United Arab Emirates

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Chapter 1: Introduction

This chapter will give an introduction to this study, including the theoretical background and theoretical framework behind this study, the formulation of the research questions and objectives, the significance and explanation of the research gaps it fills, and the key terms of this study.

1.1 Background

In China, people have long been realising the importance of being competent in learning, while most parents and schools take competence in learning as the major advantage for children and students in their future lives. However, traditional exam-oriented education is deeply entrenched in fundamental education in China (Kirkpatrick & Zang, 2011). In such a teacher-led learning approach, the emphasis is placed on the role and competence of the teacher in classroom teaching. One of the major concerns is whether students feel boring in the learning process (Deng et al., 2020).

Since the 2010s, China underwent the new curriculum reform. Education researchers have started implementing innovative teaching methods, which refer to student-centred teaching and learning in classrooms. The National Medium and Long-term Plan for Education Reform and Development (2010–2020) stated that “by 2020, China will have become a country with power of human resources in a learning society by building a powerful, vibrant, and modern education system, which can provide equal educational opportunities, quality education resources, and life-long education for every single citizen”. This implies that it is essential to use innovative methods to teach.

Moreover, the existing literature has stated the importance of innovative teaching methods in improving the effectiveness of students' learning and enhancing their learning motivation (Deng et al., 2020; Wang & Zheng, 2021). Furthermore, in February 2019, China's Education Modernization 2035 issued by the Central Committee of the Communist Party of China and the State Council proposed that "to strengthen the cultivation of students' practical ability, cooperation ability and innovation ability" and "innovate talent training methods, primary and secondary school teachers should use innovative teaching methods to improve students' innovative ability and cultivate their talents". Based on these official instructions on education, it can be seen that innovative teaching methods are a trend that needs to be started gradually and needs to be deepened (Ni, 2020). The new curriculum reform has been carried out nationwide, putting forward higher requirements for teachers' teaching activities from all aspects. In the new curriculum reform attempt, the mode of teacher-student dialogue and cooperation has gradually replaced the indoctrination teaching dominated by teachers in the past. The new curriculum reform requires students to actively participate in the classroom, explore their own methods of learning knowledge, and the classroom atmosphere is also required to become lively (Ning, 2014). Furthermore, the main objective of the new curriculum reform is to raise all students' overall quality and support their holistic and lifelong development, and the realisation of this goal must be accomplished through effective classroom teaching. Therefore, classroom teaching reform is the key to a new round of curriculum reform (Yang, 2010).

Following the ideological guidelines of the new curriculum reform, teachers should focus more on developing students' critical thinking skills and stimulating students' enthusiasm for learning by actively applying various innovative teaching methods. Moreover, teachers also need to innovate the teaching mode to comprehensively improve the quality and efficiency of teaching in primary and secondary schools (Chen, 2020; Liu, 2020). Additionally, China's fundamental education system irrationally distributes educational resources. To achieve a reasonable distribution of educational resources, it is necessary to share the existing educational resources to the extent possible, for example, to strengthen inter-school exchanges and cooperation, and to allow more students to use the Internet, modern educational equipment, and innovative teaching methods to enjoy high-quality educational resources. Meanwhile, the demand for new skills in the 21st century lays out additional specifications for the talent training paradigm. The creative application of multimedia technology in education and modifications to the learning environment and teaching concepts in the new era have made the “student-centred” teaching practice a new concept that conforms to the current knowledge society (Yang, 2021).

Furthermore, the new curriculum reform mandates that teachers manage the relationship between transferring knowledge and developing abilities through creative teaching methods and actively engage and grow with students during the teaching process, not only allowing students to learn knowledge but also helping students develop students’ independence and autonomy (Ding, 2011). However, in the current teaching practice, many Chinese primary school teachers lack control over their

students' actual learning needs and interests while also failing to fully acknowledge the dominant role that students play in the learning process, which makes some teachers in the teaching process. Teaching is purely based on the teacher's personal understanding, lacking the motivation to stimulate students' learning, and being accustomed to using traditional teaching methods cannot stimulate students' interest in learning. In addition, some teachers lack the guidance of students in the process of teaching, so students lack the enthusiasm to participate in teaching activities, and cannot promote students learning well (Jiang, 2022). Additionally, during the actual teaching process, too much emphasis is placed on the form of teaching, and there is a lack of accurate comprehension of the subject matter being taught. Some teachers simply transform the knowledge in the textbook into the content of the courseware, and the classroom is still mainly based on their own teaching (Liu, 2021). This kind of teaching form is relatively simple, mainly based on examination-oriented education. Most of the students accept knowledge passively, their participation in the classroom is not high, they are easily bored, and teachers cannot well mobilise the enthusiasm of the students (Ding, 2021; Jiang, 2022).

In this curriculum reform, innovative teaching methods are used to motivate students' learning, and teachers are the most influential designers and implementers. However, in many cases, teachers still use traditional methods for teaching. For example, in Shandong, although many pilot schools have carried out student-centred learning activities that pay more attention to learning inquiry, many teachers still focus on instructional approaches (Shan, 2011). Moreover, since examinations still play a

primary role in primary and secondary education, despite many efforts to promote student-centered learning, the results are still not ideal (Alexander, 2023; You, 2019). Wang (2022) claimed that in the Biology classes in secondary schools in Hebei Province, teachers have made efforts to abandon the concept of 'teachers as the main body of classes', and to change the traditional teaching mode, aiming to gradually build a student-centred class based on the situation of students. However, they still encountered a lot of difficulties, such as not being able to communicate well with students and not being able to systematically integrate into classes, etc. In Changde, Hunan Province, the majority of physical education instruction at the school is conducted in accordance with the requirements of the teachers (Bai et al., 2014). Although the physical education activities are carried out based on the particular circumstances of the school, the students are not put in the centre to think about the problem, so the students have been in the teacher's arrangement. Therefore, students do not have the idea of learning sports by themselves, and they cannot develop their sports personalities (Liu, 2019). In addition, Li (2021) found that in light of the recent curriculum reform, although teachers provide students with opportunities to participate in classroom learning, teachers only teach fixed courses and provide students with very limited space for choice and control. Furthermore, while teachers allow students to learn independently outside the classroom, teachers still teach in a very passive, communication-based way in the classroom.

Such evidence shows that teachers play a vital role in deciding whether they would adopt innovative teaching methods. Without their willingness to use new ways

of teaching and learning, it is difficult to achieve curriculum reform. Innovating teaching methods and strategies to promote student learning is integral to the new curriculum reform (Zhang, 2020). Among many innovative teaching methods that can motivate students to learn, such as digital game-based learning, mobile learning, and the use of Information and Communication Technology (ICT). Moreover, Wake and Wasson (2011) investigated how students in groups created location-based mobile apps to aid student-centred historical learning. In the context of social science education, Shih et al. (2010) developed a mobile learning platform for scaffolding students during inquiry-based learning. Moreover, Reid (2002) asserts that ICT enables students to gain a deeper understanding of subjects by allowing them to go beyond the technical aspects of the course material. These years, gamification has recently been applied in teaching and learning. Gamification is regarded as the use of digital game mechanics in a non-gaming environment (Kapp, 2012). The goal is to draw in students, encourage engagement, improve learning, and facilitate problem-solving (Kapp, 2012). Although games have been widely used in classrooms for facilitating students' learning (Prensky, 2003), the conception of gamification is still in its infancy in teaching and learning process (Surendeleg et al., 2014). Moreover, employing gamification for teaching is not simply confined to the external form of games. Teachers can use game elements, game design, or game concepts in some teaching and management activities to stimulate students' learning motivation. Effective gamification, according to Werbach (2013), does not include putting goals and rewards on top of information; rather, it entails adopting a game thinking attitude in order to integrate game elements into learning in

a systematic manner. Effective games have an impact on both psychology and technology in ways that can be utilised outside of gaming situations. More than just a badge system and leaderboards, game thinking necessitates a full comprehension of design principles and motivation (Werbach, 2013). Gamification teaching is mainly based on game elements. Games designed by combining teaching content and knowledge points are regarded as gamification tasks. In a task-driven teaching environment, game elements such as competition, collaboration, challenge, and feedback are used to design learning activities as gamification teaching.

To create a relaxed and pleasant classroom atmosphere to mobilise students' interest in learning, stimulate learning motivation, and effectively promote the realisation of teaching goals and teaching significance (Li, 2020), in recent years, gamification has gained popularity in China as an innovative teaching method. In December 2002, the Future Education Center of South China Normal University, Aldall Software Co., Ltd., and the Xian Virtual Teaching and Research Center jointly established the "Ao Xian Gamification Research Center", which is the first domestic research team to study gamification for teaching. The gamification for teaching and educational games developed by it implement the concept of "happy learning, healthy growth" and has successively launched three series (teacher version, home version, and campus version) of gamification teaching platforms (Peng & Wang, 2020). In Suzhou City, Zhejiang Province, many primary school English teachers have begun to combine game elements with innovative teaching methods in their classrooms, especially for primary school students, who are naughty and have difficulty concentrating. Teachers

use innovative teaching methods through gamification to increase the way that instructors and students interact and support students in developing a stronger desire to learn (Shi, 2014).

1.2 Context of this study

Based on the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area" announced by the State Council of China in 2019 (xinhuanet.com), the Guangdong-Hong Kong-Macao Greater Bay Area includes the Hong Kong Special Administrative Region, the Macao Special Administrative Region and Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan City, Jiangmen City, and Zhaoqing City which are in Guangdong Province. Huizhou is one of the cities in the Greater Bay Area. In addition, the Guangdong-Hong Kong-Macao Greater Bay Area plays an essential strategic role in the country's overall development. The four central cities of Hong Kong, Macao, Guangzhou, and Shenzhen in the Bay Area serve as the core engines of regional growth. Huizhou is also in the second or third tier in the Guangdong-Hong Kong-Macao Greater Bay Area. At the same time, Huizhou is also a moderately developing city in the Pearl River Delta Economic Zone.

Moreover, the New First-tier Cities Research Institute released the 2023 city business charm rankings for 30 second-tier cities in China (maigoo.com), including Huizhou. Compared with nearby first-tier cities such as Guangzhou and Shenzhen, Huizhou, as a second-tier city, has poor economic development, unbalanced educational development, and a relative lack of educational resources (Shi & Liu, 2015).

Therefore, this study selected Huizhou as the research area, aiming to provide a reference for other 29 second-tier cities such as Wuxi, Xiamen, Fuzhou, Jinan, Shenyang, Nanning, Nanchang, Changzhou, Nantong, Zhuhai, Taiyuan, Zhongshan, etc. It could also show reference information to the primary and secondary education systems in 51 third-tier cities.

In addition, this study chose schools in Huicheng District of Huizhou City as the research objects because Huicheng District is the core area of Huizhou City (9ikipedia.org, 2023) and is more representative. At the time of this study, there were 75 middle schools, 39 primary schools, and 30 nine-year schools (i.e., primary school to middle school) in public schools in Huicheng District, Huizhou City (9ikiped.gov.cn, 2003).

1.3 Research gap

Presently, the research content on the combination of the theory of planned behaviour (TPB) and the field of education in China is gradually increasing, and the relevant studies have mainly focused on higher education, educational management, and student and teacher behaviour. Meanwhile, the education sector has also become interested in gamification as a cutting-edge teaching technique. It's becoming common practice to incorporate gamification into classroom instruction (Zhang et al., 2020). Moreover, the gamification learning method has also been applied to many fields, such as human resources training (Dong et al., 2019). Numerous studies have examined the roles that educational games play from various angles, including helping students

develop their cognitive abilities (Shang et al., 2014), igniting their interest in learning (Huang & Huang, 2015; Ou, 2014), and encouraging learning participation (Sedano et al., 2014; Shang et al., 2008), few studies have investigated teachers' use of gamification in teaching through TPB. Furthermore, the concept of teaching commitment is rarely discussed in the existing literature. Comparable terms have drawn the interest of researchers even though they are used sparingly. For example, Celep (2020) pointed out that the physical and psychological occupied level of a teacher in his or her daily life is defined as a commitment to teaching work.

As the designers and organisers of gamification teaching activities, teachers play a pivotal role in the development of gamification teaching practice. Behavioural intention is an intrinsic part of gamification of teachers' practice, while practice is the expression of specific behavioural intention, and the two are inseparable. And using gamification to teach has become a trend in school education in mainland China (Li et al., 2017; Zhang et al., 2016). However, there are very few research studies on teachers' behavioural intentions using gamification, so it was deemed necessary to conduct in-depth research on teachers' intentions to use gamification to teach. And this will be helpful for improving teachers' quality and promoting teachers' teaching in the post-epidemic era. Additionally, it might also bring different changes to students' classroom learning. Moreover, based on TPB theory, this study adds commitment as an intermediary variable, constructs an expanded model of TPB, and provides a richer explanation for in-depth exploration of the influencing factors of teachers' use of gamification. It is of positive significance to promote the use of gamification by primary

and secondary school teachers in second-tier cities and to expand the use of innovative teaching methods. It is also conducive to deepening that teachers should use more innovative teaching methods to create a student-centred classroom, which is the content of the curriculum reform advocated by the country. Therefore, this study fills in this research gap by examining teachers' intention to use gamification for teaching. By knowing what factors affect teachers' intention to use gamification for teaching, more strategies can be used to enable this cost-effective method to be used by those schools with fewer resources, especially second-tier schools in non-first-tier cities.

1.4 Research framework

This study utilised the TPB to examine the variables that influence teachers' intention to use gamification for teaching. TPB has been extensively utilised in the study of intention and behaviour. According to Cooper et al. (2016), educational research can use TPB to understand better why teachers or students act in specific ways. Regarding the definitions of the two key terms TPB and gamification, they will be briefly introduced next. Using behavioural intention to explain human behaviour, Ajzen (1991, 2002) proposed a theoretical model, TPB. It believes that behavioural attitudes, subjective norms, and perceived behavioural control are determined by behavioural intentions and the three prerequisites for behaviour. Additionally, gamification is the process of applying elements of game design to non-gaming contexts (Deterding et al., 2011). It can be a helpful tool to increase people's motivation and engagement in various

unpleasant tasks and activities. Its use is not limited to any field and is present in various settings, including teaching and learning (Lee & Hammer, 2011).

As stated previously, teachers determine what teaching methods to be used in classrooms. Thus, their perceptions toward a particular method would affect their intention to use it because their preferences or level of efficacy with the teaching method are influenced by these perceptions, which significantly influence their intentional behaviour (Khudhair, 2016). After choosing the favourable teaching method, teachers can use it to affect students' learning motives, which in turn affect students' learning performance (Hardré & Sullivan, 2009).

Moreover, research on teachers' intention to use teaching methods does not lack. For example, Nor and Ologbo (2016) found that perceived difficulties, attitude, perceived utility, perceived simplicity of usage, and association to job contribute to teachers' intentions to use the computer for teaching. In addition, Belgheis and Kamalludeen (2018) explored some mathematics teachers' intention of using GeoGebra for teaching mathematics in the classroom in Malaysia. Additionally, Cheng (2016) found that in-service teachers' attitudes are essential for enhancing their intentions to use what they learned during their training on the job. Furthermore, teachers' attitudes and behaviour toward students with SEBD (social, emotional, and behavioural difficulties) were investigated using TPB in a study. The study found that when working with children with SEBD, teachers with higher levels of perceived behavioural control (teaching self-efficacy) and more positive beliefs have a stronger behavioural intention to use inclusive practices (Kate & Lisa, 2013). Moreover, based

on TPB, combined with the policy background of college teaching reform and the current situation of teaching reform, Shi et al. (2020) explored the influencing factors and mechanism of college teachers' teaching reform behaviour intention and provided a theoretical reference for teachers' teaching reform and educational career development (Shi et al., 2020). Xie et al. (2022) adopted TPB and established a relationship model between the teaching tendency of the human-land coordination view and the teaching behavioural intention of the man-land coordination view by analysing the influencing factors of the teaching tendency of the geography teacher's view of human-land coordination. Through the evaluation of the teaching behaviour of the human-land coordination view, the teaching tendency of the human-land coordination view, and the level of various influencing factors in a sample of 60 geographically distributed geography teachers, it is confirmed that the teaching tendency of the geography teacher's human-land coordination view is influenced by the attitude of the human-land coordination view of teaching, subjective norm and perceived behaviour control, and directly affect the teaching behaviour of geography teachers' view of man-land coordination (Xie et al., 2022). Moreover, Hong and Zhao et al. (2021) investigated the behavioural intentions of primary and secondary English teachers in online teaching using a questionnaire survey based on TPB, and related influencing factors. Their research shows that when teachers have a positive attitude towards online teaching and perceive that the difficulty of online teaching is not high, their online teaching behaviour intention is stronger (Hong et al., 2021). Using TPB as the research framework, Teo and Lee (2010) investigated the self-reported intentions of pre-service

teachers to use technology. The findings demonstrated that perceived behavioural control did not significantly predict behavioural intention to use technology. Subjective norms and attitudes regarding its application greatly influenced behavioural intention. According to this study, roughly 40% of the variance in behavioural intention to use technology was explained by the three TPB explanatory variables (Teo & Lee, 2010). In a similar vein, teachers' intention to use gamification for teaching has been worth exploring.

By knowing what factors affect teachers' intention to use new teaching methods, schools can find ways to motivate them to use gamification for facilitating students' learning. Based on the above studies, it is easy to see that the TPB theory has many essential applications for studying behavioural intention. Furthermore, this study also has wanted to draw attention to commitment and whether it could influence teachers' use of gamification. Since commitment is essential to the success of a long-term relationship (Dwyer et al., 1987; Morgan & Hunt, 1994). Moreover, some research has revealed that commitment and intention may be related. By examining all of the psychological TPB's postulated processes—attitude, subjective norm, and perceived behavioural control—as mediators between commitment and change support intentions, Anne et al. (2018) expanded on the critical research conducted by Peccei et al. (2011). Straatmann and Warendorf (2017) found that organizational commitment is positively correlated with support-change intentions in line with the TPB . Its effects are also mediated by attitudes toward change, subjective norms, and perceived behavioural control. Therefore, this study also used this theory to analyse the influencing factors of

teachers' behavioural intention using gamification teaching, and also pay attention to the role of commitment.

1.5 Research questions

By exploring the factors that influence teachers' use of gamification, this study aimed to understand the factors that influence teachers' intention to use gamification for teaching and its specific effects and to explore the role of commitment. The following research questions were proposed based on TPB:

1. Based on the TPB model, what factors influence teachers' intention to use gamification for teaching?

2. Does commitment mediate the relationship between the three antecedents (i.e., attitudes, subjective norms, and perceived behavioural control) and intentions?

3. What are the specific manifestations of each influencing factor on teachers' intention to use gamification for teaching by referring to the TPB model?

1.6 Research objectives

Teachers play a crucial role in the advancement of gamification teaching practice as the coordinators of gamification teaching activities. The gamification of instructors' practices is inextricably linked to behavioural intention, which is a fundamental component of it. Practice is the manifestation of a particular behavioural intention. In mainland China, employing gamification to teach has also become more popular (Li et al., 2017; Zhang et al., 2016). It is vital to do in-depth research on

instructors' intents to utilise gamification to teach because there is little information available on their behavioural intentions. And in the post-epidemic period, this will be beneficial for enhancing teachers' quality and promoting teachers' teaching. Also, it might affect how students learn in the classroom in different ways.

Moreover, based on TPB theory, this study expands the TPB model, including commitment as an intermediary variable, and offers a fuller justification for a detailed investigation of the elements that influence teachers' usage of gamification. Promoting the use of gamification by primary and secondary school teachers in second-tier cities and expanding the use of cutting-edge teaching techniques are important steps in the right direction. It is also conducive to deepening that teachers should use more innovative teaching methods to create a student-centred classroom, which is the goal of the curriculum reform the nation is supporting; it is also beneficial to ensure that teachers employ more creative teaching methods.

This study has aimed to provide helpful guidance for school teachers and schools by exploring the factors that affect teachers' use of gamification in teaching. Teachers' understanding of gamification can be improved by understanding the intentions that influence teacher use. Schools can promote the broader use of gamification to facilitate and motivate students to learn. By examining the role of commitment in explaining teachers' intentions in using gamification, it expands the practical significance of TPB, and can also provide teachers with more comprehensive recommendations for its use.

1.7 Significance of the research

This study used the TPB model to study school teachers' intention to use gamification for teaching. On the theoretical level, it has expanded the theoretical significance of TPB. Moreover, from the perspective of TPB, this study has explored the mechanism of interaction between influencing factors and teachers' intention to use gamification. It has investigated the role of commitment to using gamification for teaching in explaining teachers' intention to use gamification, which has further enriched teachers' use of gamification for teaching and other related research content to provide a theoretical basis for teachers to use gamification as an innovative teaching method. At the practical level, using questionnaires to analyse the generation mode of teachers' intentions to use gamification from the three dimensions of teachers' attitudes, subjective norms, and perceived behavioural control provides more explicit guidance for prompting teachers' use of gamification for teaching.

Based on the results of the questionnaire survey, in-depth interviews were conducted to obtain teachers' attitudes and opinions on the use of gamification in teaching to understand the influencing factors of teachers' intention to use gamification in teaching in a more comprehensive and in-depth manner, which is of guiding significance for schools to promote teachers' use of gamification in teaching, to contribute to enriching the teaching methods of primary and secondary schools, and also to provide some enlightenment and new ideas for front-line teachers to use gamification for teaching.

Chapter 2: Literature Review

Chapter Two is mainly divided into six parts. The first section provides relevant background information on gamification, including a definition and a comparison of similar and confusing concepts to gamification. The second part introduces the advantages and disadvantages of gamification, the use conditions in education, and the use of gamification in mainland China. Since motivation is an essential factor in gamification, the third section explores gamification and student motivation. Moreover, it presents self-determination theory, a fundamental tenet that supports gamification. Then, the fourth part shows the view of the TPB, the most commonly used model to influence teachers' teaching intention. The model has been extended by adding the factor of commitment. Furthermore, the sixth part concludes the research gap, research questions, and significance in more detail.

2.1 Gamification

2.1.1 Definition of gamification

"Gamification" was coined in 2002 (Marczewski, 2012) and first appeared in educational technology research in 2008. (Deterding et al., 2011). ccording to Marczewski (2013), gamification uses metaphors, elements, and ideas from games in non-gaming contexts to influence user commitment, motivation, and behaviour. The application of elements of game design to non-gaming contexts is known as gamification (Deterding et al., 2011). It can be a valuable tool to boost people's motivation and engagement in doing different, usually unappealing, tasks and activities.

Its application is not restricted to any area and can be found in many contexts, such as education (Lee & Hammer, 2011), the promotion of environmental sensitivity (Inbar et al., 2011; Robert et al., 2011), or the enhancement of senior citizens' well-being (Baldauf, Matthias, et al., 2011). Gamification is employed in a variety of settings, including promoting good health, boosting productivity, organisational growth, the educational sector, and building brand loyalty, among others (Barata et al., 2017). Additionally, gamification can gather user information so that salesmen can see what the user prefers (Nelson, 2005). Users who become dissatisfied with a particular game's key feature will stop playing it, which prevents the growth of a positive brand attitude and gaming skills (Kwak et al., 2012; Xi & Hamari, 2020). According to Huotari and Hamari (2012), gamification is a technique that involves incorporating (motivational) affordances into services to promote game-like experiences and enhance behavioural outcomes. In their definition of the term, Huotari and Hamari (2012) emphasize how gamification functions to evoke the same psychological sensations that games (usually) do.

2.1.2 The conditions of using gamification

Various elements have been employed in gamification to increase user engagement (Barata et al., 2013; Kapp, 2012). Some examples of these components are tasks and challenges, points, levels, badges, and ranking. Educational institutions are drawn to the gamification of education, in which instructors create gamified learning environments to improve student engagement and learning outcomes (Berkling &

Thomas, 2013). In view of the potential of gamification, the key factors of gamification design are discussed below based on Table 1.

Table 1

Key criteria for gamification (Based on Kapp, 2012)

Object	Description
Users are all participants	Employees or clients (for companies), students (for educational institutions)
Challenges/tasks	Students perform and progress toward defined objectives
Points	Accumulated as a result of executing tasks
Levels	Students pass depending on the points
Badges	Serve as rewards for completing actions
Ranking	Based on students' achievements

As shown in Table 1, five aspects of gamification design elements used in education and learning are discussed below:

1. Challenges/tasks

There are two main ways to create challenges or tasks in gamification, one is to give users or students clear goals to implement, and the other is to use time pressure. Taking the challenge or task of designing gamification for users in information systems as an example, by giving users objectives to complete and paying them when they succeed, challenging activities in information systems serve to lead users (Bunchball,

Inc., 2010). They help users structure tasks and offer them a sense of progress toward a goal (Bunchball & Inc, 2010; Korn, 2012). Clear goals must be established and communicated to create demanding working conditions (Passos et al., 2011). Setting specific goals helps users perform better since they feel satisfied when they accomplish them (Bandura, 1993).

2. Points

The point system functions as a barometer for achievement or performance. These points can serve as rewards, a form of investment to advance goals or gauge one's current status. Points can take many forms, varying from game to game.

3. Levels

For players to feel like they are progressing, level systems are employed in various game designs. First levels usually require less effort and less time, while advanced levels require more work and abilities. Leveling may not increase or improve students' learning capacities, even though levels and stages are a popular and well-liked gamification concept that rewards task or assignment completion (Goehle, 2013).

4. Badges

Badges are recognized as an indication of accomplishment when a task is completed or a goal is reached. Using badges is an excellent way to get students interested in completing their homework and keep them motivated.

5. Ranking/Leaderboards

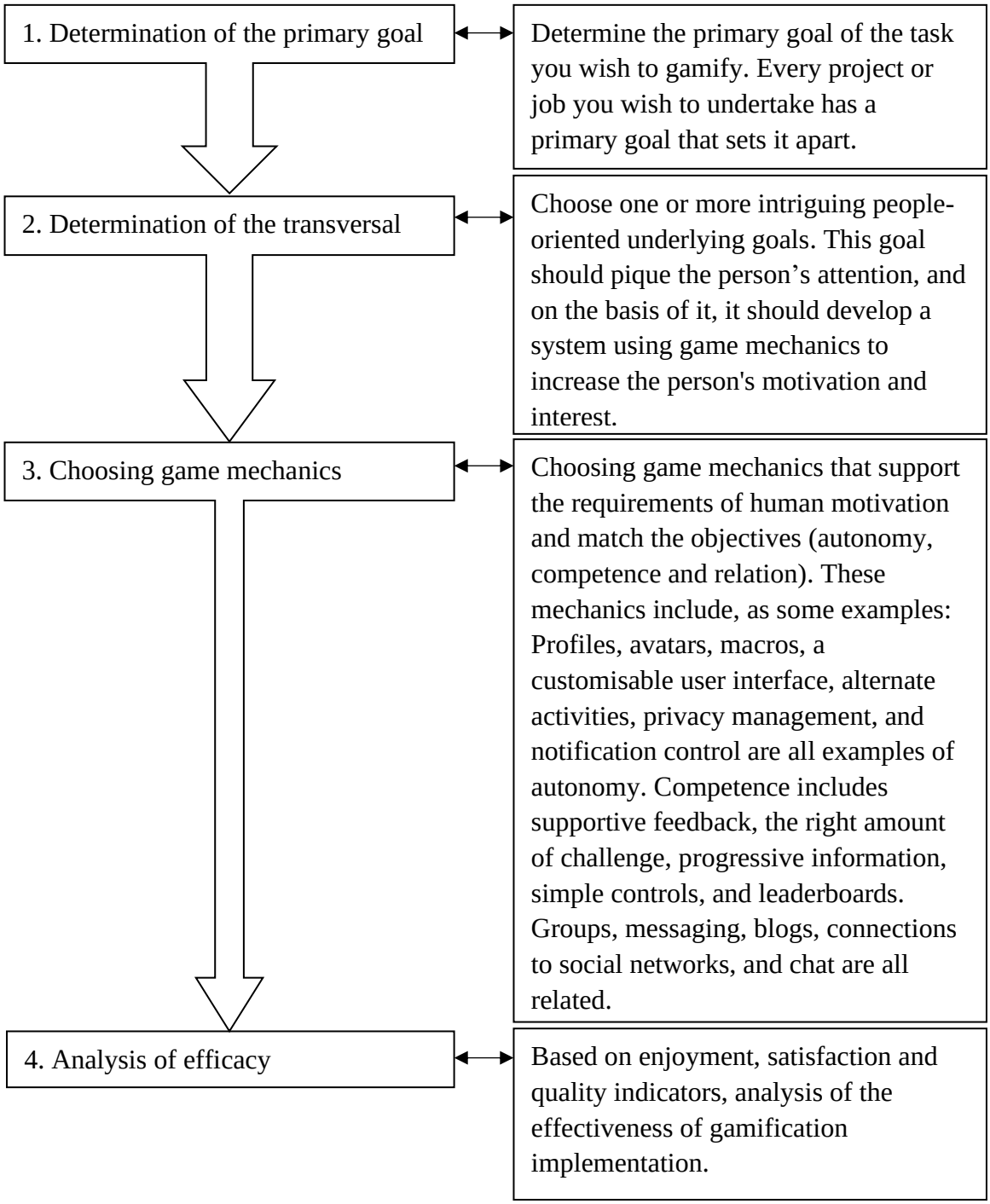
The goal of a leaderboard is to maintain student interest and motivate them to move their names up in honor of their achievements. Students are encouraged to feel

competitive by using leaderboards. A leaderboard displays the overall scores as well as the current standings of the top scorers. Usually, leaderboards only display the top 5 or 10 scorers to keep lower-ranked scorers from becoming demotivated. O'Donovon et al. (2013) claim that leaderboards are the best tool for inspiring students.Generally speaking, an effective gamification process can be described as an iterative series of actions that can be repeated for each of the objectives or duties that specify the particular business model where you wish to implement the gamification process.

The following activities are suggested by Aparicio et al. (2012) to create an effective gamification process:

Figure 1

Gamification in an efficient process



Note. The description was based on Aparicio et al. (2012).

Regarding the creation of an effective gamification process, Aparicio et al. (2012) pointed out that there are four main stages, the first is to determine the main goals, then to determine the horizontal goals and select gamification elements, and finally to analyse the gamification implementation effectiveness. The details of each stage are as follows:

1. Identifying the primary goal:

   Decide what the primary goal of the task is that you want to gamify. Every project or job you wish to undertake usually has a main goal that sets it apart from the others.

2. Finding the transversal goal:

   It requires identifying one or more interesting underlying goals. This goal should pique the person's attention, and based on it and develop a system using game mechanics to increase the person's motivation and interest.

3. Choose game mechanisms:

   Choosing game mechanics means satisfying the requirements of human motivation and complementing the aims of the game (autonomy, competence, and relation). These mechanics include, in some instances: Independence, skill, and relation. Consider profiles, avatars, macros, a customised user interface, alternate activities, privacy management, and notification control as a few examples of these mechanisms. Competence includes positive criticism, a task that's just right,

progressive information, easy controls, and leaderboards. Groups, texting, blogs, social network links, and chat are interconnected.

4. Analysis of effectiveness:

Gamification deployment success measured by customer satisfaction, quality indicators, and enjoyment. For instance, Sánchez (2010) tested users by having them fill out questionnaires, trying users using particular metrics, or having experts undertake a heuristic review of the gamified procedures and the used game mechanic.

The following were the additional educational milestones for students in a gamified curriculum that were determined for the experimental group while taking into account gamification principles.

Table 2

Principles of using gamification in education (Yildirim, 2016)

Nature	Description
Realisation	Recognises that the lesson is actually a game and completes the chores to win the game. Recognises the structure for advancement and complies with the conditions
Cooperation	Works well with friends both in and out of the classroom.
Competition	Performs better in a friendly competitive setting.
Observation	Is aware of the requirements for earning points and uses that information to do so.
Application	Understands the requirements for gaining experience points, and applies what they have learned to gain.
Analysation	Is aware of the requirements for levelling up and uses that information to advance. Is aware of the requirements for earning badges and uses that information to actually gain badges.
Evaluation	Is aware of what a leaderboard is and strives to go up in the league.

Note. The information was based on Yildirim (2016).

The fundamental goal of gamification in the educational process is to maintain students' attention, encourage their learning to continue, and motivate them to complete learning objectives (Borys & Laskowski, 2013). The proper assignment structure enables students to gauge their possibilities of completing their learning objectives. Moreover, breaking challenging jobs into more straightforward and accessible sub-tasks helps people manage more complicated, complex tasks.

1. Realisation

The structure of a course must be altered when gamification is used. For example, teachers, students, the learning environment, and content need to be changed to meet the demands of a new approach to education.

2. Cooperation

By establishing common objectives and incentives, gamification fosters cooperation among players (Johnson & Johnson, 1989; Tauer & Harackiewicz, 2004). Game players are known to be motivated by belonging to a team and working towards shared goals (Dindar & Akbulut, 2014, 2015). Players experience great joy when they successfully work together to overcome obstacles (Rigby & Ryan, 2011). Moreover, working together increases the group's social ties and encourages social interaction among its members (Deci & Ryan, 2000). Meaningful relationships and a shared goal are essential ways to increase motivation and engagement in cooperative gamification implementations (Hamari et al., 2014; Morschheuser et al., 2019).

3. Competition

Gamification's most popular strategy has been to incite competitiveness among users by presenting social comparisons between them (Morschheuser et al., 2019). For instance, some gamification applications have included leaderboards so that users can assess how they compare to other users' performance (de-Marcos et al., 2014). Thus, the competition encourages players to become experts by evaluating their skills through direct comparisons (Morschheuser et al., 2019). The competition also fosters the thrill of outperforming competitors (Dindar & Akbulut, 2014).

4. Observation/Application

Within the gamification environment, various activities might result in the accumulation of points.

5. Evaluation

Based on its definition, a leaderboard is a "visual display that ranks players based on their achievement" (Christy & Fox, 2014). In order to increase engagement through social comparisons, leaderboards are a popular gamification strategy (Jia et al., 2017). Zichermann et. al. (2011) provided a summary of many methods for presenting leaderboards in gamified apps, such as placing the user in the middle of a "no-disincentive" leaderboard or employing a multilayered leaderboard when there is an unlimited number of participants.

Additionally, based on Kapp (2012), there are three core components of the definition of gamification.

1. Motivate action. A process called motivation energises and provides behaviour and actions with a direction, purpose, or meaning. The challenge should not be too difficult or too easy for people to be motivated. Gamification's key component is encouraging engagement in a task or activity.

2. Promote learning. Since many gamification components are founded on educational psychology and are methods that instructional designers, instructors, and professors have long utilised, they can be used to enhance learning. The mainstays of many educational practitioners have included things like allocating points to exercises, giving constructive criticism, and promoting teamwork on projects. The distinction is that gamification adds a new layer of appeal and combines those components into a fun gaming environment that inspires and informs learners.

3. Deal with issues. Gamification provides a great deal of potential for problem-solving. Because games are cooperative, more than one person may work together to solve a problem. Many people are motivated to exert themselves to win games because of their intense competition.

2.2 Gamification vs Game-based learning vs Games

Over the past 10 years, games have grown and are now used as a learning medium to educate students in many different disciplines (Karagiorgas & Niemann, 2017). The education community has begun to explore the effectiveness of games as a learning tool, thus, creating three different ways of using games for education: serious games, game-based learning, and gamification. These three concepts look similar

because they are all related to games, but they are not the same. Since it is easy to confuse these three concepts, there is a detailed discussion below.

2.2.1 Games

Serious games, according to Clark Act (1970), are good teaching and training tools for students of all ages in many contexts because they are extremely motivated and because they communicate the concepts and facts of many disciplines very effectively.

Real-world processes or occurrences are simulated in serious games with the goal of other organisations. In historically non-game areas like training, product design, sales, and marketing, serious games encourage the transfer and cross-fertilisation of game development knowledge and practices (Noemí & Máximo, 2014). Serious games may be amusing, but their primary objective is to instruct or educate players. They may also serve marketing or advertising objectives. Such content includes serious games that serve as educational games. Serious games are video games or interactive programmes that serve both as entertainment and as teaching tools in fields like marketing, education, and health (Sara, 2017). Games that may entertain players while also educating them are referred to as "edutainment". Other names for these games include "serious games". So-called "educational games" resemble serious games in certain ways. The goal of both kinds of games is to help their participants advance their knowledge and abilities. Serious games can be distinguished from instructional games, though, because they are made to resemble popular videogames rather than their

counterparts (Stege et al., 2011). Unlike instructional games, which have a stated educational component, serious games' gameplay naturally contains educational elements (Johnson et al., 2005). According to Winn (2009), serious games can be played as entertainment but were created with purposes other than pure amusement in mind.

Furthermore, one reason serious games are considered beneficial for education could be that students are often motivated to play them (Stege et al., 2011). Svinicki (1999) showed that traditional teaching methods fail to motivate students. It is a well-known fact that motivated children learn faster. Winn (2009) provided evidence of using games to engage students and encourage active learning. Virvou and Manos (2005) found that some challenging students could pay attention better when they played educational games.

2.2.2 Game-based learning

"A branch of serious games that deals with applications that have defined learning outcomes" is how game-based learning (GBL) is defined (en.wikipedia.org). Others believe that serious games and game-based learning are essentially the same (Corti, 2006). A general definition of game-based learning is an educational framework that motivates students through games or game-related elements (Prensky, 2003; Van Eck, 2006). Games have demonstrated their high motivational impact and established their standing as one of the daily activities of youth. Utilising the game's motivational potential for learning could lead to revolutionary advancements in student

accomplishment (McGonigal, 2011; Tobias et al., 2014, pp. 485-503). Corti (2006) asserts that training projects and activities could benefit from GBL's motivation, role-playing, involvement, and repeatability. GBL is defined as an environment where game content and gameplay enhance the acquisition of knowledge and skills and where game activities involve problem-solving spaces and challenges that give players/learners a sense of accomplishment (Kirriemuir & McFarlane, 2004; McFarlane et al., 2002; Prensky, 2001).

2.2.3 Gamification vs Game-based learning

Gamification and game-based learning (GBL) has been used extensively in educational processes, primarily in elementary school; university education has seen fewer instances of its use (Zabala-Vargas et al., 2021). The idea of gamification has gained much popularity recently. It can be summed up as the application of game design elements to other contexts (Deterding et al., 2011). Gamification in the educational space has sparked a lot of attention among academics and researchers (Zabala-Vargas et al., 2021). While GBL uses a game as a component of the learning process, gamification transforms the learning process as a whole into a game (Al-Azawi et al., 2016).

Gamification and game-based learning are two different concepts that Kim et al. (2009) attempted to differentiate. They claim that in “game-based learning”, students reach their learning objectives through participating in games. Playing video games typically plays a big part in the learning process when people learn through them.

Gamification, however, completely occurs outside of the set of games (Codish & Ravid, 2014). When gamification and game-based learning are compared, it can be said that while with gamification a non-game-oriented environment is transformed into a game environment using game principles and game components, game-based learning is intended to teach any subject as a whole or as a module entirely through games. By incorporating points, badges, level points, experience points, and other incentives into the classroom, gamification improves the existing instructional structure in the field of education (Bozkurt & Genç-Kumtepe, 2014).

2.2.4 Gamification vs Games

It is easy to get confused between games and gamification. Games consist of a system or place with participants, an abstraction of reality, a challenge, rules, interaction, feedback, a measurable conclusion, and emotional response (Kapp, 2012), while gamification is the process of incorporating game elements, design, principles, and game-playing methods into the material to increase motivation, engagement, learning, and problem-solving (Deterding et al., 2011; Erenli, 2013; Kapp, 2012; Simões et al., 2013). Gamification, however, completely occurs outside of the set of games. In other words, even with gamification, games cannot take the place of actual learning. It aids in making learning a more active activity and concentrates more on conquering learning challenges over time (Codish & Ravid, 2014). Therefore, gamification is not about games (both online and offline), but the elements and principles of games that can help motivate students to learn specific tasks (Van Grove,

2011; Werbach & Hunter, 2015). Gamification is able to be used to engage personnel in tasks (Reeves & Read, 2009), foster teamwork (McGonigal, 2011), and boost motivation (Zichermann & Linder, 2013). These game-like elements are also named game mechanics in a non-game environment. Game principles involve self-elements and social-elements. The specifics of self-elements are points, achievement badges, rewards, challenges and levels/stages. Additionally, social-elements are related to student cooperation or competition, which is the public display of student achievements, such as student rankings or leaderboards (Huang & Soman, 2013).

Gamification makes learning a game from beginning to end. In order to better engage and motivate students, it applies game features and game dynamics to already-existing learning curricula. Because it transforms the entire learning process into a game, gamification differs from learning-based games (Al-Azawi et al., 2016). Gamification is the implementation of a learning philosophy in applications other than games, while game-based learning is often characterised as achieving open or covered learning in-game contexts (Bozkurt & Genç-Kumtepe, 2014).

Obviously, gamification has similarities and differences with games and game-based learning, so it is easy to confuse the three concepts. To make it clearer, the three concepts were compared in terms of several aspects mainly based on the work by Measles and Abudawood (2015), Al-Azawi et al. (2016), and Çeker and Özdamlı, (2017) (see Table 3).

Table 3

Comparison between gamification, games, and game-based learning

	Gamification	Games	Game-based learning
Definition	Gamification is the notion of adding game principles and elements in a non-game context for achieving the pre-set goals. It can be used for educational or non-educational purposes.	Educational games are made to assist learners learn a certain subject and conceptions from entertaining activities with certain rules.	By incorporating pleasure into the learning process, game-based learning aims to increase student participation in learning while playing and to make learning more exciting.
Content	Progressing to different task levels Ranking Badges Scores Competition	Create structured activities Learning Problem-solving Enjoyment	1. Motivation 2. Useful action 3. Particular timing 4. Story and emotive 5. Game difficulties and aims
Difficulty level	Usually easy to implement	Easy to difficult in implementation	Generally altered to fit the game's plot and scenes
Cost	Less expensive	More expensive	Expensive
Major goal	For motivating learning (i.e., motivation oriented)	For teaching the basic and certain subjects (i.e., teaching-oriented)	helps students focus more intently on learning topics and learn the material more quickly
Functions	Increased motivation and engagement Increased interaction with the teachers or students Better learning experience/ environment Instant feedback for students	Develop students' motor skills Focus and memory Increased creativity of students	1. Strengthens a child's memory 2. Fluency in Computer and Simulation 3. Facilitates Quick Strategic Thought and Problem-Solving 4. Establishes Hand-Eye Coordination 5. Skill-Building
Learning tools involved	Do not involve any specific tools	May involve toys, software, electronic devices, etc.	Often using computers
Biggest differences	It is an entertaining activity with certain rules that need to be followed	It is turning the learning process as a whole into a game	It is using a game as part of the learning process

Note. The table was made based on Measles and Abudawood (2015), Al-Azawi et al. (2016), and Çeker and Özdamlı (2017).

2.3 Gamification in education

Incorporating game aspects into a learning experience to make it more engaging and appealing is referred to as gamification in education (Muntean, 2011). Some studies have shown that students are less involved in accumulating knowledge (Bauer, 2021; Cheng & Lu, 2013). Using gamification can better adapt to learners' different learning styles, provide more flexible learning methods, and increase learning participation (Mohamad et al., 2018). Gamification may help facilitate the learning of boring and uninteresting concepts and knowledge through the provision of challenges that stimulate timely feedback and achievements (Kapp, 2012). Due to its potential to increase student engagement, gamification can be helpful in education. It is nothing new in the field of education that many teachers struggle with issues relating to student involvement and interest. The employment of motivational techniques was one of several solutions that educators have attempted in the past. The intervention's impact, however, was only felt for a brief time. Due to its entertaining and lighthearted nature, gamification can be a valuable strategy to address student involvement and classroom engagement issues (Kim et al., 2018). Game mechanics and learning processes are related, claim Perrotta et al. (2013). According to Faiella and Ricciardi (2015), there are several reasons why they believe that gamification of learning is intrinsically motivating: it is fun because students can see the immediate results of their efforts; it is authentic because fantasy provides a compelling environment in which students can practice skills without fear of failing in real life; and it fosters self-reliance because

feedback can help students facilitate and improve performance. In addition, some researchers stated that gamification might positively influence performance, productivity, and user engagement. In other words, by using gamification to help students learn, students can combine their learning materials with game elements to improve themselves and achieve good grades (Simões et al., 2013). Ibhadode (2019) pointed out that gamification is a cost-effective tool that makes learning more interesting. Even though many studies have argued that gamification teaching, similar to game-based teaching, is the potential to help students' learning process, the employing of gamification in teaching is still not widely used in the classrooms of primary and secondary schools in China. From the teacher's perspective, the delivery of knowledge is more important than supplementary classroom activities (Gao & Watkins, 2002). Same as educational games, using gamification for teaching in the classroom means that more new tasks need to be undertaken. It might also be related to teachers' familiarity with games, technical ability, and specific gamification teaching strategies, which directly affect teachers' grasp of the teaching process and teaching effectiveness (Shang et al., 2012). Additionally, teachers must prepare a great deal to use gamification in the classroom. For instance, it is crucial to define the learning objectives, grasp the subject matter of the teaching materials, and grasp the fundamental concepts to comprehend the students' level of physical and mental development, activity characteristics, and hobbies. This will enable the students to arrange the activities more methodically (Jong & Shang, 2015). Therefore, employing gamification for teaching cannot be carried out on a large scale.

2.3.1 Gamification for teaching

Gamification is a form of encouragement and incentive, Maiga and Emanuel (2019) described the benefits of applying it for teaching. The fields of education, learning, and evaluation all use this methodology (Borge et al., 2014). Gamification is a simple and effective way to enhance learning (Al-azawi & Al-blushi, 2016). Gamification aims to increase students' motivation and engagement as well as their courage to take part in different activities and have fun (Wójcik, 2013). Many foreign scholars have conducted empirical research on the application of gamification teaching in primary school mathematics. For example, Cun-ha et al. (2018) upgraded a specific elementary school mathematics classroom through careful design and carried out gamification teaching with the cooperation of specialised experimental staff. Undoubtedly, this math class and the subsequent classes have achieved ideal experimental results: the children are highly motivated and engaged in a pleasant and lively environment and develop knowledge, emotion, cooperation, and communication skills. Furthermore, in designing gamification teaching, Fiona Nah (2014) and other academics proposed several game conditions or game factors, such as stages, levels, badges, leaderboards, prizes, progress, plot, interactions, and feedback.

According to a systematic mapping study on gamification, which was conducted to understand the trends in the research field (Kasurinen & Knutas, 2018), gamification allowed for the automation of teaching, which is one of the main benefits

of gamification for the future of education because it eliminates many of the tasks that would otherwise be completed by the teacher (Maiga & Emanuel, 2019).

Hoe (2015) claims that through the game explicitly designed for educational purposes, students can learn new information, hone existing skills, and develop positive character traits through gamified learning activities. Gamification of educational activities is, in other words, a student-centred process (Dicheva et al., 2015). It has been used at every educational level, from elementary school to college (Vlachopoulos & Makri, 2017). Wang and He (2021) make recommendations for undergraduate students' PI (Physical Internet) learning while searching for the best pedagogical practices and procedures for students to learn PI. The authors discovered that gamification of instruction will increase participants' levels of satisfaction and knowledge retention. Additionally, the results of the logistics testing have increased greatly as a result of the teaching of gamification and the experience with the flow (Wang et al., 2022, Wang et al., 2017). In addition, gamification is a cutting-edge instructional approach and a better response to students who are not engaged in-class activities. The excessive use of mobile devices during lectures and other typical ALS (Active Learning Strategy) (such as case studies and group discussions) should be prevented by incorporating instructional card/board (tangible) game elements into the university curriculum (Weerasinghe, 2017). According to Carrillo et al. (2019), new laboratory procedures were created for pre-service instructors using the gamification methodology. The overall goals were to eradicate negative stereotypes, phobias, and rejection of science,

encourage students to acquire science concepts and procedures, give them real-world examples, and provide them with gamification experience.

2.3.2 Gamification in China's education

An increasing number of empirical studies on the application of gamification have started in China due to its ongoing popularization and usage in education. For instance, gamification in education is using game elements to encourage pupils to enjoy learning. A project aims to use mobile technology to gamify Portuguese learning for Chinese learners. A leaderboard, progression, and gamification components inspire and drive students to perform better. An assessment survey was carried out to confirm the success of language learning and confidence building for novices (Chan et al., 2021).

In traditional classroom teaching, passive acceptance of learning and rote memorisation should be emphasised more. Some researchers believe that students can experience the joy of learning by actively participating in the learning process and having ample opportunities to practice and exercise to achieve that joy (Ren, 2022; Yang, 2019; Zhou, 2020). To foster student exploration of the ability to process information and then exercise students' innovative consciousness and ability to solve analytical problems. Following this teaching reform concept, Ren (2022) took the teaching content of "Combustion and Fire Extinguishing" of the People's Education Edition as an example and adopted gamification in the teaching score ranking method, allowing students to compete in groups to complete chemical experiments in chemistry class.

The use of gamification and social rewards can boost engagement and boost the efficacy of web-based physical activity (PA) programmes. Drawing from WeChat, the most popular social media platform in China, Mo et al. (2019) created a PA intervention for this study that incorporates gamification and social incentives. The results show that a WeChat-based intervention incorporating social incentives and gaming could significantly improve Chinese undergraduate students' related social cognition and subjectively measured PA, suggesting that this approach holds promise for addressing the issue of youths' inadequate PA (Mo et al., 2019). According to Xu et. al. (2020), gamification helps people achieve their psychological demands and increases their sense of enjoyment, which in turn influences consumers' intentions to make online purchases. Chinese upper vocational school students currently behave passively in class and rely excessively on their phones. As a result, the teaching organisation's structure needs to be readjusted immediately (Wang et al., 2017). However, the gamification of teaching reform in colleges has only been covered in a small number of research studies. There are serious structural issues in higher vocational education in China at the moment, including the high percentage of theoretical courses, the difficulty of textbooks, the emphasis on knowledge memory rather than comprehension, the focus on operation over practical thinking, and the absence of practical project support during course development (Wang et al., 2017). It is crucial to change how the curriculum is organised, up the amount of gamified and experiential learning, and encourage kids to accept and even positively explore knowledge through games. One effective solution to this issue is to increase the

proportion of teaching that is both gamified and experienced. However, the gamification of teaching reform in colleges has only been covered in a small number of research (Cheong et al., 2013; Wang et al., 2017). Wang and et al. (2017) showed that gamification of teaching reform produces excellent results, confirming the need for teachers to pay attention to systemisation, gamification, and immersion of teaching design as well as to the method's appeal and acceptance. This study proposed a game-driven curriculum design model and applied it to Shijiazhuang Posts and Telecommunications Technical College's teaching reform practice. Gamification of teaching reform achieves special effects, according to the results. All evaluation indices improve yearly as students actively participate in classroom activities. Among the findings are the need for teachers to ensure their teaching method is attractive and acceptable by systemising, gamified, and immersing themselves in the process. Moreover, Tan (2015) advocated that gamification, the use of game aspects in a non-game environment, be incorporated into mobile apps in order to reach purposeful objectives through engagement and enjoyable experience. Furthermore, he used a cutting-edge mobile app design approach to release the potential for gamification in tourism, specifically in boosting cultural experiences. Xiao and Shang (2015) found that the game mechanism of gamification that runs through the course design is suitable for courses with relatively abstract teaching objectives, few classroom teaching links, and low enthusiasm for students to learn. Using the game mechanism of gamification teaching can stimulate students' competition and cooperation, and enhance their learning motivation. The specific design methods include setting up a point system

throughout the classroom and awarding honorary titles according to students' classroom performance. For example, the idiom review class in traditional Chinese classes mostly adopts the teaching methods of dictation and dictation, which not only makes students less motivated to learn but also obliterates their creativity in idiom learning and application. The Chinese class "Idiom Review for Grades 1 to 3" uses gamification teaching breaks through the traditional teaching method, and uses the points system and reward system to allow students to learn idioms in a pleasant game atmosphere, and to train students' creative thinking (Wang & Li, 2021).

2.3.3 Drawbacks of gamification

Gamification does not always motivate or assist learners (Haaranen et al., 2014; Whitton, 2012). Actually, "gaming amusement characteristics may divert the player from the academic substance of the game and limit the players' attempts to assimilate the material more deeply" (Mayer & Johnson, 2010, p. 248). It is crucial to ensure that the addition of competition through gamification does not promote students' carelessness and demotivate them (Charles et al., 2011; Dominguez et al., 2013; Glover, 2013; Haaranen et al., 2014; Whitton, 2012). According to Haaranen et al. (2014), some students strongly oppose the use of badges in college courses. Because of this, Haaranen et al. (2014) suggested incorporating controls into gamification systems that would let users disable features like badges. Students who regularly play video games are more inspired by gamification components than students who do not (Goehle, 2013). Differences have been found between the motivation levels of these two groups of

students. Gamification might have some negative effects as well. Focusing excessively on extrinsic rewards might have a negative impact on intrinsic motivation, which is one of the downsides. The intended outcomes may also be compromised if a gamified procedure is made mandatory rather than voluntary. Moreover, it's important to determine whether the participants are not "gaming the game" by utilising the gamification process while formulating their own rules (Werbach & Hunter, 2012). Furthermore, Permana et al. (2018) pointed out that gamification has the disadvantage of being one-size-fits-all, which implies that all pupils receive identical gamification features. A variety of adaptations must be made to meet the needs and abilities of students in order for them to be provided with learning materials that are suitable for them. Gamification has been associated with risks related to the quality of tasks, which may be compromised when gamified elements divert users from their primary purposes (Blohm & Leimeister, 2013). The loss of productivity may also be a consequence of such distractions. Gamification must, therefore, be considered at the appropriate level. Moreover, productivity is likely to decline when employees feel disadvantaged when they see colleagues cheating the system to gain rewards easily (Reeves & Read, 2009; Zichermann & Cunningham, 2011). Cheating is permitted in worst cases when rules are unclear, which can lead to rejection by other employees. Therefore, to prevent cheating in Gamification, it is essential to have clear rules and controls (Poltrock et al., 2012; Rapp et al., 2012; Reeves & Read, 2009).

2.4 Gamification motivating students to learn

Motivation is regarded as a critical component of learning in education. It explains how students focus and work hard on different academic assignments (Brophy, 2013). As a result, one aspect of a teacher's job description is to sustain student motivation. Increasing motivation typically aims to achieve desired outcomes, like increased effort, persistence, and improved performance (Buckley & Doyle, 2016). Since teachers play a significant role in stimulating students' learning motivation, in this session, the definition of motivation and the summary of research related to motivation and gamification will first be described. In addition, the two main categories of student motivation are intrinsic and extrinsic, so intrinsic and extrinsic motivation will also be addressed next. Moreover, self-determination theory, as a theory of motivation, systematically explains the mechanism of action of human needs and motivations in social and cultural contexts. Meanwhile, self-determination theory's intrinsic needs (i.e., autonomy, competence, and belonging) are closely related to gamification classrooms (Sailer et al., 2017). Therefore, at the end of this section, the implications of self-determination theory and how it is closely related to gamification will be summed up.

Many researchers have also proposed the role of gamification in promoting student learning, especially confirming that it can motivate students' learning. For example, Sebastian (2012) pointed out that gamification can help enrich educational experiences in a way that students will recognise and respond to. Learning activities can become more dynamic and engaging by using the recent notion of gamification, which is mostly from the web development sector (Glover, 2013). Game design features

may be utilised to regulate and generally enhance student engagement and involvement, which is a fundamental selling feature of gamification (Kapp, 2012). The business sector is using gamification to motivate customers to utilise their products and to involve staff in accomplishing organisational goals. In most recent years, gamification has become a successful teaching method for elite colleges, universities, and K–12 institutions (Kim et al., 2018). Since gamification encourages learning by doing, which eventually enhances procedures and results, the healthcare industry is still far from adopting gamification in education (Shute & Ventura, 2013). Gamification also allows students to learn quickly and on their schedule. According to Klopper et al. (2009), gamification facilitates self-directed learning by enabling learners to monitor their advancement.

Gamification relates to the process of repurposing the motivating influence of games for purposes other than entertainment. This concept, which originated in marketing, extended to other situations including business and education (Chris et al., 2016). Gamification allows for learning styles and speed to be adapted for people to master at their own pace, but the organisation's objective is to inspire creativity by motivating employees to use their knowledge and skills to create new ideas (Chris et al., 2016).

Gamification aims to increase people's involvement by integrating game aspects, such as badges, points, and leaderboards, into teaching and learning activities to make them more engaging and enticing. As a result, when individuals participate in

the activities, they sense more ownership and purpose (Muntean, 2011). As noted by Sylena and Sumayah (2015), in education, gamification involves the process of extracting game aspects that make video games enjoyable and engaging and incorporating them into course design without utilising real games. Gamification encourages individuals to learn by practice, which makes progress in procedures and results (Shute & Ventura, 2013). With gamification, students can progress at their speed. Additionally, gamification helps students track their progress, resulting in self-directed learning (Klopfer et al., 2009). Cook (2013) and Lazzaro (2004) describe how participants appreciate the opportunity to fail when exploring in a nonthreatening setting. Learners might feel irritation, surprise, mystery, and enjoyment, each of which provides a personal connection to the gamification or other players (Lazzaro, 2004).

Gamification has been shown to be beneficial for learning and instruction by increasing learner engagement (Kim et al., 2018). Gamification is an effective method that can actively change students' learning behaviours and attitudes and improve their learning motivation and participation. It can impact students' academic performance and comprehension of the material and foster an environment that is conducive to learning (Kiryakova et al., 2014).

2.4.1 Definition of motivation

The motivational potential of gamification in education is a crucial factor. Motivation is the answer to why something is significant enough for a person to undertake a task from start to finish (Kapp, 2021). Moreover, Alsawaier (2018)

discovered that gamification improved the learning of students in the corresponding courses. This was shown by the enhanced motivation to learn, encouraged engagement in participation and collaboration, the satisfaction of their psychological requirements for competence and autonomy, and improved understanding of the task's importance (Alsawaier, 2018). Therefore, from the above, motivation is closely related to gamification. Since this research aimed to explore teachers' use of gamification teaching to stimulate students' learning, it is necessary to describe the meaning of motivation and its connection with gamification in this section.

Motivation involves a conceptual structure used to explain initiating, directing, intensifying, maintaining, and improving the quality of one's behaviour (Buckley & Doyle, 2016; Maehr & Meyer, 1997). Motivation can drive a person to work in a certain way to achieve the desired goal. It is a mental state full of energy and enthusiasm. Motivation refers to a force that influences people's conduct. Meanwhile, the goal of motivating employees is to have the behaviour that maximises the organisation's benefits in a management view (Tohidi & Jabbari, 2012). The theoretical idea of motivation is used to explain human behaviour. When motivated, humans can respond and satisfy their desires. Motivation can also be defined as the process that results in behaviour or the stimulus that prompts someone to want to mimic another person's behaviour and vice versa (Cook & Artino, 2016; Maslow, 1943). Motivation is the process that starts, guides, and maintains goal-oriented behaviours. Essentially, it encourages behaviour to meet a need, an expectation, or an objective (Gopalan et al., 2017). According to Chang (2007), learning motivation is described as: intrinsic

learning and extrinsic learning. Motivation is the portrayal of action in order to receive benefits such as incentives, recognition, and orders that are unrelated to work. Individual motivation leads to engagement and continual learning until the internal and external environments of individuals balance each other or goals are attained. Although there are many factors that influence learning, motivation is the only one that effectively stimulates learning.

2.4.2 Motivation in education

In the field of education, motivation is thought to be an significant component of learning. It describes the focus and effort students put into various academic tasks (Brophy, 2013). As a result, one aspect of the teacher's job description includes keeping students motivated (Buckley & Doyle, 2016). Consequently, motivation is an important topic often discussed in the education category.

In education, motivation can have a variety of consequences on how students learn and act concerning a subject. It has the potential to direct behaviour to pursue certain aims, amplify motivation and effort, make tasks more engaging and sustained, strengthen cognitive processing, assess whether outcomes are reinforcing, and enhance performance (Tohidi & Jabbari, 2012). One of the fundamental elements of effective teaching in education is to promote motivation to study (Kim & Frick, 2011). A student's desire to take part in a training exercise and learn from it is revealed by their learning motivation (Simões-Franklin et al., 2010). The conception of student motivation is utilised in the classroom to describe the level of attentiveness and effort

that students put into various activities, which may or may not be what their teachers expect (Brophy, 2004). Students' academic pursuits are linked to their willpower (Dermitzaki et al., 2012; Furió et al., 2015; Serio et al., 2013). Furthermore, a student's motivation level influences their participation and contribution in a classroom. Highly motivated and involved students will take initiative and engage in activities without waiting for reinforcement from outside sources (Skinner & Belmont, 1993). Outside rewards are required to encourage a low-motivated student to participate in activities in the interim (Gopalan et al., 2017).

Challenge, curiosity, control, fantasy, competitiveness, cooperation, and recognition are the seven factors that are said to support motivation; many of these factors can be found in games (Malone & Lepper, 1987). As essential elements of successful and meaningful learning and achievement, the current learning perspective emphasizes cognition in addition to students' motivation and preferences (Dermitzaki et al., 2012; Serio et al., 2013).

Nine studies on education and learning are included in a thorough assessment of the literature on the effectiveness of gamification projects by Hamari et al. (2014). According to Chapman and Rich's (2018) review, the bulk of the studies featured some failed or ambiguous outcomes, but 100% of the ones the researcher looked at revealed that at least part of the gamification's intended aims was fulfilled. Research on the efficacy of instructional gamification in various fields has been conducted using various game features (Abrams & Walsh, 2014; Cronk, 2012; De-Marcos et al., Pages, 2014; Denny et al., 2018; Domínguez et al., 2013; Drace, 2013; Gasland, 2011; Goehle, 2013;

Lambert & Ennis, 2014; Lin, 2014; Nevin et al., Tsay & Luo, 2018). Once more, all of these studies provided encouraging findings, and several even offered suggestions for ways to make gamification better, like taking into account the requirements of students who perform less well (Chapman & Rich, 2018).

Moreover, motivation to learn is an important concept, which is affected by a series of psychosocial factors that exist both within the student and in their social and natural environment (Buckley & Doyle, 2016). When describing the critical determinants of motivation to learn, some researchers have focused on the clarity and significance of personal control, skills and abilities, personal values, interests and goals, personal expectations, and influences on success or achievement. Failure, emotions, and general mindset are also central factors (Mccombs & Whisler, 1997; Harlen & Deakin Crick, 2003). In addition, intrinsic and extrinsic motivation are the two most prominent forms of student motivation (Wigfield et al., 2012). These motivational types will be discussed in the following section.

2.4.3 Intrinsic and extrinsic motivation

Since intrinsic and extrinsic motivation are two basic types of motivation, and motivating students is an essential part of teachers' teaching, the following will summarise the specific impact of intrinsic and extrinsic motivation and their connection with gamification.

Motivation is a crucial idea in gameplay (Kapp, 2021). When analysing the research, the distinction between internal and external motivation should be made. In

self-determination theory, motivation is examined in the context of intrinsic and extrinsic motivation (Sun et al., 2017). Intrinsic motivation is the primary source of motivation. Extrinsic motivation is the drive that comes from something outside of oneself. For gamification to work, it is essential to comprehend these two components and the study examining their relationship. Much discussion of motivation begins with the differences between intrinsic and extrinsic motivation (Benabou & Tirole, 2003; Sansone & Harackiewicz, 2000). Intrinsic motivation refers to a stimulus, which can drive behaviour, from within the individual. Even if there is no external stimulus or reward, an action can still be stimulated. Additionally, extrinsic motivation is regarded as an external stimulus or a reward, which drives people to act (Wigfield et al., 2012). Intrinsic motivation occurs when people are internally motivated to complete a task because it brings them joy. They feel it is essential or believe what they are learning is critical (Harlen & Deakin Crick, 2003).

In education, intrinsic motivation is the sort of motivation that students feel within themselves. Intrinsic motivation exists when a learner is inspired from within rather than outside of themselves. Intrinsically motivated students are highly involved in learning because they are driven by a particular thing, an interest, or satisfaction or because they want to achieve their own scholastic and personal goals. Students who are intrinsically driven choose to employ techniques that require more effort and assimilate knowledge more quickly. Education-related motivation can have a variety of consequences on how students learn and behave in relation to the subject matter. It may: motivate action toward specific objectives; encourage greater effort and vigour;

increase activity start and persistence, increase cognitive processing, identify the reinforcing effects, and result in better performance. Since students are not always intrinsically driven, they occasionally require contextual motivation, which can be found in the learning environments that teachers design (Nemeth, 1997; Tohidi, 2011; Tohidi & Jabbari, 2011).

Extrinsic motivation makes students more likely to put in the least amount of work required to get the most gain (Afzal et al., 2010). When a pupil is pushed to do something or act in a specific manner by actors (such as money or good grades) outside of him or her, extrinsic motivation is at work (Harlen & Deakin Crick, 2003). Extrinsic rewards may result in over-justification and a consequent decrease in intrinsic drive, according to a social psychological study. In subsequent observations, children placed in conditions for an unexpected reward and those who received no extrinsic reward spent less time playing with the drawing supplies than children who anticipated receiving a ribbon and a gold star for drawing pictures—and received them. Self-determination theory states that individuals may internalize extrinsic motivation if their work aligns with their values and beliefs and satisfies their basic psychological needs (Tohidi & Jabbari, 2011).

2.4.4 Self-determination theory

There are two aspects to the connection between self-determination theory (SDT) and gamification. The first is that SDT is a learning theory of motivation, and this research has explored teachers' use of gamification teaching to stimulate students'

learning, so this study also needed to pay attention to the learning theory behind motivation. Second, some researchers have proposed that SDT is closely related to gamification classrooms, which will be elaborated on below.

Self-determination theory is a psychological theory of human motivation, describes many motivational styles and how they develop through time as a predictor of performance and emotional well-being. According to SDT, the perceived locus of causality of control and how it corresponds with extrinsic and intrinsic motivation impact the positive and negative consequences of incentives (Ryan & Deci, 2000). From the perspective of Legault (2017), SDT focuses on a comprehensive understanding of human motivation and personality. It includes a range of psychological theories that attempt to explain human motivation. Self-determination theory's central tenet is that human beings are motivated by a desire to advance (Legault, 2017). The idea contends that the degree to which the reward is internalised and in line with one's values impacts the motivational response on the continuum between extrinsic and intrinsic motivation.

Six categories of regulation—non-regulation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic regulation—are formed by rewards, according to SDT. The order of these styles' internalization is ascending (Vasconcellos et al., 2020). Furthermore, the organismic integration theory has made an effort to extend SDT by examining how various forms of external motivation can be embedded into the activity at hand and ultimately lead to someone's sense of self. Self-determination theory focuses on what motivates a person to make

decisions without the influence of others (Baard et al., 2004). According to organismic integration theory, rewards based on achieving or failing in status and appealing to participants' egos lead to an introjected regulation of behaviour. Although all forms of rewards based on the extrinsic drive will eventually erode intrinsic motivation, the regulating components of the reward mechanisms may result in the loss of intrinsic motivation (Deci et al., 2001).

The Internal requirements of SDT, name autonomy, competence and belonging, are closely related to gamification classrooms. Sailer and Homner (2020) found that the experimental group using gamification elements such as badges, leaderboards, and performance charts showed higher levels of psychological satisfaction with competency requirements than the control group. And gamification elements such as colour, story, and labour unions were also significantly associated with higher levels of social ownership (Sailer et al., 2017). Therefore, self-determination theory (SDT) has been gradually applied to gamification research to improve students; learning motivation and commitment, as well as their academic achievement (Sailer & Sailer, 2021). For example, to meet the owner's needs, the element of corner color can be used in the game chemistry, so that the participants can design an image by themselves and improve their will input. Nicholson (2012) contends that users-centred components should be incorporated into non-game contexts in order to make a gamification design relevant. He refers to this as "meaningful gamification". Self-determination theory (Deci & Ryan, 2000) serves as the theoretical foundation for meaningful gamification. The three key components that could make an activity

meaningful to participants are autonomy, competence, and relatedness, according to this theory (Deci & Ryan, 2000).

Based on Ryan and Lonsdale (2020), their research was intended to synthesize results from investigations conducted in school settings during physical education using the self-determination theory. The results of this meta-analytic review support the theoretical foundations of SDT, suggesting that it provides a helpful theoretical framework for understanding the motivational process in physical education and a basis for effective interventions meant to improve learning outcomes in physical education and in-class experiences. Furthermore, one of the main principles of SDT in education is that (a) students will be more engaged, learn better, and feel better if they have more independent forms of motivation, and (b) essential psychological need support from parents and teachers encourages this kind of motivation, whereas it needs thwarting inhibits it. These concepts have garnered substantial support at every stage of development, across a broad spectrum of learning contexts and contents, and across hundreds of research studies (Ryan & Deci, 2020).

Therefore, it is not surprising to find that gamification has been employed for enhancing motivation and engagement in the classroom (e.g., Facer et al., 2004; Kapp, 2012; Malone & Lepper, 1987; Prensky, 2001; Raymer, 2011). However, in the school setting, teachers' intention to use gamification for facilitating students' learning is a core issue that needs a better understanding of it. The following section will discuss what factors can increase teachers' intention to use gamification.

2.5 Teacher's intention to teach with gamification

The crucial element of motivation that propels human activity is behavioural intention. It refers to the level of a person's willingness to engage in a specific behaviour (Collins & Waugh, 1998; Waugh & Godfrey, 1993). Moreover, Hong et al. (2021) used TPB to analyse how behavioural attitudes, subjective norms, and perceived behavioural control affect primary and secondary school English teachers' online teaching behavioural intentions. The study found that the three positively correlate with online teaching behavioural intention. In their study, behavioural intention is the level of acceptance and willingness of primary and secondary English teachers to conduct online teaching. Therefore, in this study, the intention to use gamification for teaching has referred to the degree to which teachers accept and are willing to use gamification in teaching.

Some earlier studies clarified that teachers' behavioural intentions to incorporate the innovations into their instruction is one of the key factor in the effectiveness of school reforms (Leithwood et al., 2002; Yin et al., 2011). Moreover, Chen (2022) mentioned that the online teaching behavioural intention of college teachers significantly impact on the teaching practice of online classroom. It can be seen that what teaching methods are employed in classrooms is mainly decided by the teachers. As a result, their views of a particular teaching approach would influence their intention to utilise it because these perceptions significantly influence how they favor or perceive the effectiveness of the method (Khudhair, 2016). Teachers can employ the teaching strategy they have chosen to influence students' learning engagements, which

in turn influence students' learning outcomes (Hardré & Sullivan, 2009). Teachers are crucial in implementing pedagogical innovations in the classroom (Mumtaz, 2000; Parreo et al., 2016); hence, they will be crucial in implementing gamification in their courses.

There is much of research on teachers' intentions to employ different instructional strategies. For instance, Yang (2018) constructed a model of influencing factors of college teachers' micro-lecture teaching behavioural intention based on the UTAUT model, and studied the relevant influencing factors and the different degrees of influence of each factor on behavioural intention. In addition, Xu et al. (2022) researched the behavioural intentions of teachers of different majors in vocational colleges in several provinces during the COVID-19 epidemic and found that implementation attitudes significantly impact behavioural intentions. Moreover, the Shijiazhuang Posts and Telecommunications Technical College's teaching reform method used a gamification concept for curriculum creation. The outcomes showed that gamification of education reform produces excellent results. Positive student participation in class activities and yearly improvements in all evaluation indices are observed. The findings show that teachers must focus on systematising, gamification, and immersing instructional design while ensuring the method's appeal and acceptability (Wang et al., 2017).

In short, the degree to which teachers embrace and are willing to use gamification in teaching is referred to as the intention to use gamification for teaching.

Furthermore, from the above research, teachers need to pay attention to the systematisation, gamification and immersion of teaching design to gain a better understanding of gamification and ensure that this teaching method is helpful to students' learning.

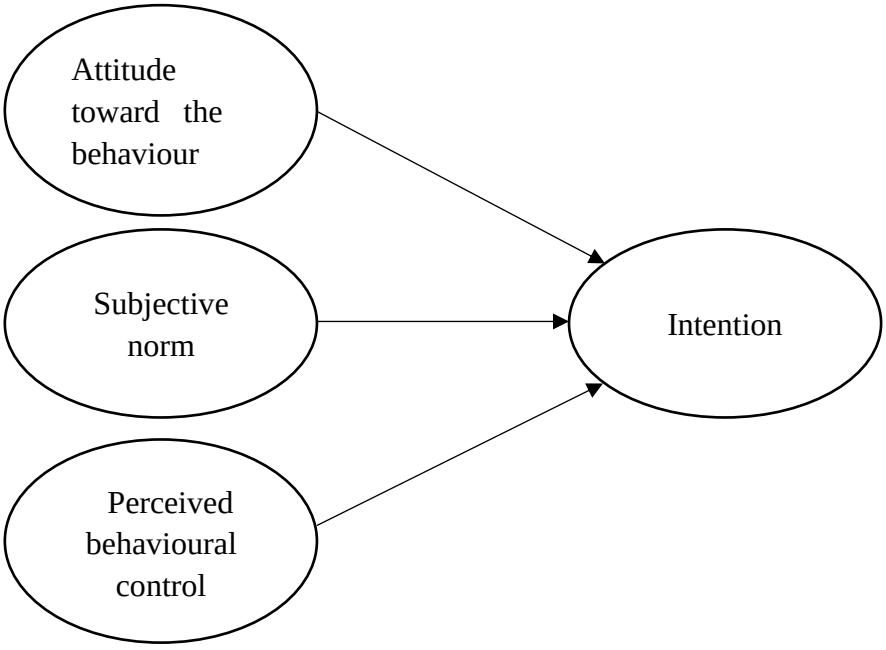
2.5.1 Theory of planned behaviour

In 1991, Ajzen (1991) established TPB, a crucial concept in social psychology aimed at explaining individual behaviour. According to the theory, individuals' conduct controlled by willpower is directly dictated by their behaviour intention, which is made up of three elements: attitude toward the behaviour, subjective norms, and perceived behaviour control. Individual behaviour is influenced by pre-experience through these three components that influence individual behavioural intentions. The favourable or negative appraisal of a certain activity is referred to as attitude toward the behaviour. The social pressure that an individual feels to execute a certain action is referred to as subjective norms. Perceived behaviour control refers to the degree of difficulty a person feels to perform a specific behaviour (Ajzen, 2002). The TPB continues to attract attention in social psychology. These theories were developed to provide succinct explanations of how incentives and knowledge influence behaviour (Ajzen, 1985, 1988, 1991; Eagly & Chaiken, 1993; Olson & Zanna, 1993; Sheppard et al., 1988) expand on the theory of reasoned action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1973). Since they imply that people decide about their actions after carefully considering all available information, they can be seen as deliberative processing models. The TRA

states that the proximal factor of behaviour is determined by the individual's intention to engage in that particular action. A person is motivated by their intentions when they consciously decide to make an effort to complete the task (Conner & Armitage, 1998). By including perceptions of control over behaviour performance as a second predictor, the TPB also attempts to predict nonvolitional actions (Ajzen, 1988, 1991).

Figure 2

The theory of planned behaviour (Ajzen, 1991)



2.5.2 Application of the theory of planned behaviour

After TPB was proposed, it was widely used to explain a variety of behaviours and design behaviour interventions. It is often used in research fields such as consumer behaviour, environmental protection behaviour, and entrepreneurial behaviour. According to Wei and Fan's (2021) review, it is derived from rational behaviour theory and has been successfully applied to explain and predict various human behaviours, such as weight loss (Schifter & Ajzen, 1985), smoking cessation (Godin et al., 1992), technology use (Rei et al., 2002), willingness to participate in planning (Dawkins & Frass, 2005) etc., in psychology, management, sociology, and political participation, environmental protection, etc. In the field of education, TPB is mainly used to predict the behaviour of teachers and students, such as teachers' professional development activities (Dunn et al., 2018), academic entrepreneurship of university teachers (Su & Zhao, 2019), and students' autonomous learning (Zhao, 2019); academic procrastination (Lin & Bai, 2014); and entrepreneurial intention (Liu, 2017).

Moreover, Troung (2019) investigated consumer acceptability of online video and television services, and Hsu et al. (2006) investigated online purchasing behaviour using an expanded version of the theory. Furthermore, Lee et al. (2010) used the theory to investigate teachers' intentions to utilise computers to develop and deliver lessons in an educational environment. In addition, Robinson and Doverspike (2006) examined students' intentions to take an online experimental psychology course against a regular face-to-face course using the theory. It can be seen from the above research contexts that the use of the TPB in education is feasible when the behaviour is intentional but not habitual (Cheng & Chu, 2015). Additionally, a comprehensive model based on the

ideas of the expectation disconfirmation model and TPB has been developed by Liao et al. (2007). It is intended to predict and explain a person's continuing use of online services. TPB and the expectation disconfirmation model has been used in this work to construct an integrated model that predicts and explains a person's continuous use of online services. Furthermore, according to Shalender and Sharma (2021), the empirical analysis shows a positive correlation between buyers' adoption intentions and other factors like attitude, perceived behavioural control, moral norm, subjective norm, and environmental concern. The study's results also suggest that predicting customers' intentions to adopt EVs is a good use for the extended TPB model. Based on the findings, the paper examines the implications for EV adoption in India and offers suggestions for additional research.

In Yang and Su's (2017) investigation into the links between perceptions, behavioural intentions, and actual behaviour, they explore learners' desire to take part in a practice-oriented course offered through a MOOC platform. The Technology Acceptance Model and TPB serves as the main theoretical pillars of the current study's paradigm. In addition, to help their Computer Science students learn algorithms, Begosso et al. (2018) share their experience employing gamification principles in the free and open-source learning management system Moodle. The researcher in this published study developed a module with gamification features to encourage student engagement in learning the foundations of algorithms, data structures, and pointers. They selected Moodle as their learning management system (LMS). They also extensively researched Moodle and how to integrate gamification plugins into the

system. They also utilised and set up the plugins for HotPotatoes, Games, LevelUp, and Badges.

Moreover, the direct relationship between the three antecedents of TPB and intentions have been widely studied. For attitude, using TPB as a theoretical framework, Lee et al. (2010) investigated teachers' intentions to use technology for instruction. They discovered that attitude had the most significant impact on those intentions, with teachers being less concerned with what other people thought about their use of technology. Furthermore, Teo and Lee (2010) found that the attitudes and support of the participating teachers significantly influence the success of any initiative to integrate technology into an educational program. It has been proposed that if educators believe or feel that computers do not fulfill their needs or the needs of their students, they will be less inclined to incorporate technology into their teaching-learning process. In other words, how teachers view the value of technology in the teaching and learning environment shapes their attitudes about computer use, whether good or negative. Previous research on teachers' attitudes toward technological advancements has found that teachers have favourable attitudes toward Information and Communication Technology (ICT) because they seek to improve their ICT skills and knowledge. Studies on the usage of information technology (IT) have shown that attitude is a powerful predictor of intention (Davis 1989; Taylor & Todd, 1995). Kuyini and Desai (2007) used multiple regression analyses to investigate Ghanaian teachers' attitudes toward inclusive education, understanding of inclusive education (perceived behavioural control aspect), and principals' expectations of teachers' teaching practice

(subjective norm factor). They discovered that whereas attitude and expertise were effective predictors of intent to adapt instruction in the inclusive classroom, principals' expectations were not. In addition, the commitment to using gamification may play a role in explaining teachers' using intentions. According to Coladarci (1992), aspects of school organisations that enhance a teacher's view of efficacy may promote that teacher's commitment to the organisation and teaching (McLaughlin et al., 1986; Rosenholtz, 1989). For subjective norms, according to the empirical findings of Lin and Lee (2004) and Kuo and Young (2008), a high subjective norm leads to a high intention to share knowledge (Goh & Sandhu, 2013). In addition, Zhang (2022) used TPB to establish a theoretical model framework to test the influencing factors and mechanisms of mobile learning for rural primary and secondary school teachers. Through empirical analysis, it is found that rural primary and secondary school teachers' attitude, subjective norms, perceived behavioural control, sense of knowledge usefulness, superior influence, self-efficacy, and convenience have a significant positive impact on their intention for mobile learning. Moreover, Sin and Yan (2014) revealed that subjective norm is the most strong predictor of intention, followed by perceived behavioural control and attitude. They discovered that teachers' perceptions of societal pressure and the sufficiency of professional training both have a significant role in predicting their intention for inclusive education. From these empirical studies, it could be expected that subjective norms might have been positively related to intention in this study. In other words, when a teacher recognises that important others, such as parents, other teachers, and the community, support gamification for teaching, or when they

believe that the necessary prerequisites for gamification exist, they are more likely to form an intention to implement gamification for teaching, even if they do not have very positive attitudes towards using gamification. For perceived behavioural control, He (2020) has shown that when individuals evaluate their own control over internal and external factors (including knowledge, skills, time, expertise, etc.), the higher the intention to engage in a behaviour will be. In general, persons with a favourable attitude, a positive subjective norm, and a high level of perceived behaviour control are more likely to intend to undertake the behaviour. The greater the level of purpose and perceived behavioural control, the more likely actual behaviour will occur (Yan & Sin, 2014). According to Knauder and Koschmieder (2019), a teacher's competency and assessment of perceived behavioural control are key elements in the actualisation of tailored student support in the classroom.

In China, some researchers utilise this theory to investigate Chinese students' classroom engagement in English classes. For example, Zhong (2013) investigated Chinese students' desire to communicate using qualitative research methodologies based on this theory. He analysed interview data employing the theoretical framework of planned behaviour as a coding system (Zhong, 2013). Based on their study, Girardelli and Patel (2017) examined the predictive power of the attitude toward the behaviour, subjective norms, and perceived behavioural control on the desire to participate in behaviour in English courses in Chinese schools by using quantitative research methods (Girardelli et al., 2017). According to Jiang's (2022) research, relying on TPB as a framework, using questionnaires to analyse the behaviour of teachers' cooperative

teaching and research, objectively present the current situation of teachers' cooperative teaching and research, finding out the problems of teachers' cooperative teaching and research, and summarise its influencing factors. From the overall level of teachers' cooperative teaching and research, the level of cooperative teaching and research intention and cooperative teaching and research attitude is relatively good, the level of perceived behavioural control and cooperative teaching and research behaviour needs to be improved, and the level of subjective norms needs to be strengthened. Using the interview method to further analyse the cooperative teaching and research behaviour of eight teachers, the research conclusion was that the current situation of teachers' cooperative teaching and research was not ideal, and the subjective norm level of teachers' cooperative teaching and research was low, the control of perceived behaviour insufficient, and the performance of cooperative teaching and research needed to be further improved. To this end, a feasible and effective development strategy for optimising teachers' cooperative teaching and research has been proposed in a targeted manner. To improve the level of cooperative teaching and research, it is necessary to play a leading role and enhance the positive impact of cooperative teaching and research attitudes; explore institutional guarantees, and give full play to cooperative teaching and research. To observe the normative effect; enhance self-awareness, improve the ability and literacy of teachers in cooperative teaching and research; focus on professional guidance, and build a diverse and open cooperative teaching and research platform (Jiang, 2022). The above studies have shown that the TPB may explain teachers' intention to use gamification for facilitating students' learning.

2.5.3 Commitment extended to the theory of planned behaviour

This study believes that commitment deserves to be verified in expanding TPB, mainly for two reasons. One is that some studies have confirmed the effect of commitment on intention, such as the influence of organisational commitment on turnover intention and the effect of emotional commitment on the intention to use websites. More importantly, Huang and Cheng (2022) support a TPB model extension that includes the variable "commitment" as a mediator, limiting the effects of attitudes, subjective norms, and perceived behavioural control on sustainability learning intentions. Furthermore, the second aspect is that Ajzen, the creator of the TPB theory, has verified in recent research that motivation has a mediating effect between the three antecedents and intentions (Ajzen & Kruglanski, 2019), which further shows that it is fascinating to explore whether commitment has a mediating effect and to expand TPB Therefore, this study has focused on the mediating effect of commitment to TPB in the context of teachers' use of gamification for teaching to broaden and enrich TPB.

Commitment as the new variable in this study

Subjective norms, attitude, and perceived behavioural control are the main topics of the applications mentioned in TPB. While there has been much research on the direct correlation between the three anthems and intention, this study aims to draw attention to the variable of commitment, which could be involved in the explanation of

intention. According to the Cambridge Dictionary, commitment is generally understood to be "a promise or firm decision to do something. It is seldom applied in a TPB model that is enlarged. However, an individual's organisational commitment—also known as organisational loyalty—has long determined whether their intention is to remain in a company or leave it (Allen & Meyer, 1990; Lee & Jeong, 2017). This has also been expanded to include research on commitment to jobs and employ commitment. For instance, Wasti (2003) investigated that affective commitment significantly predicted turnover intentions. Tammo et al. (2017) revealed that organisational commitment has a direct relationship with change-supportive intentions and that its effects are mediated by change-related attitudes, subjective norms, and perceived behavioural control, as suggested by the TPB (Tammo et al., 2017). Similarly, Lee and Jeong (2017) found that the positive relationship between job insecurity and intention to leave was mediated by organizational commitment using a sample of 459 workers from various South Korean organisations. Based on these findings from prior studies, affective commitment was among the factors that explained employees' intentions to stay with a company the longest. Moreover, according to a study based on information gathered from 335 users of various websites, affective commitment, calculative commitment, the value of alternatives, and trust were all strongly related to a person's intention to continue using a website (Li et al., 2006). Further research by Borrego and Vázquez-Aguado (2019) revealed a substantial link between affective commitment to the organisation and overall self-efficacy at work. Furthermore, Conner and Armitage (1998) found that commitment would moderate the influence of other variables on intention. As a result,

this extended TPB offers much potential in terms of describing brain processes in explaining the intention to promote changes through commitment. Therefore, investigating whether commitment ought to be included in the TPB was considered interesting.

Recently, in order to explain intentional behaviour, Ajzen and Kruglanski (2019) proposed utilizing motivation as a mediator between the three antecedents and the intentions. In a similar vein, commitment enlarges the TPB and erodes the relationships between the three antecedents and intentions. Therefore, considering whether commitment should be incorporated into the TPB was considered of interest.

2.6 Hypothesised model

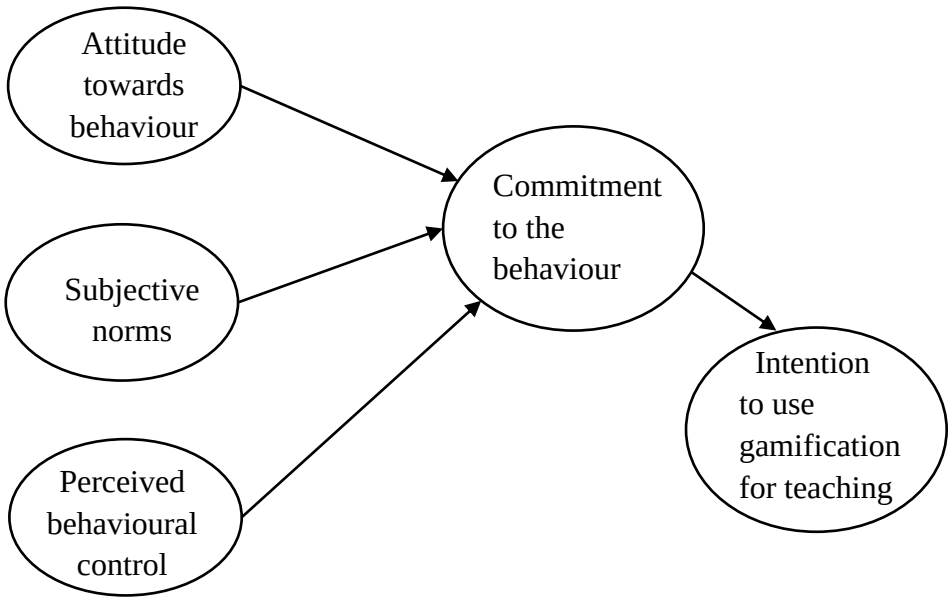
Recently, gamification has been used for a variety of purposes, such as marketing (Huotari & Hamari, 2012), Employee motivation (Kumar, 2013), fitness and health (Boulos & Yang, 2013), website interaction on social media and other platforms (Zichermann & Cunningham, 2011), and retail and customer incentives (Lounis et al., 2013). Gamification is a popular technique for raising engagement and incentivizing desired behaviour. It uses game development, psychology, and human-computer interface (HCI) information. Researchers describe designing and assessing a gamified computer security module that takes a fresh approach to graded learning exercises. This study examined gamification to motivate students to engage in a range of learning activities and give them prompt, transparent feedback and assessment (Cliffe & Butterfield, 2013). Essential individual beliefs (attitudes, subjective norms, and

perceived behaviour control) that influence people's intentions to engage in particular behaviours are described by the TPB. TPB has proven to be effective in adapting to a range of human endeavors. Several studies have used it as a framework to assess teachers' intentions to support inclusive education (Opoku et al., 2020). TPB was the theoretical framework that Lee et al. (2010) used to investigate teachers' intentions to use technology in practical teaching. They found that attitude was the most influential factor in teachers' behavioural intention, while teachers were less concerned about others' views on their own use of technology for teaching. It is also less constrained by internal and external factors; that is, subjective norms and perceived behavioural control have no significant effect on behavioural intentions, and the findings of this study can be used to design effective teacher development programmes. Pierce and Ball (2009) based on TPB research, showed the intention of mathematics teachers to change traditional teaching practice and use technology for teaching. It was found that teachers' attitudes, subjective norms, and perceived behavioural control towards the use of technology in mathematics teaching are factors that determine teachers' behavioural intentions. According to some research, attitude and perceived behavioural control significantly impacted behavioural intention among the study's variables. These factors were also influenced to varied degrees by perceived utility, ease of learning, and facilitating conditions (Teo et al., 2011). Based on these empirical studies and related research in different fields, it was worth using TPB theory in this present study to explore what factors influence teachers to use gamification for teaching.

The theory holds that commitment to the behaviour and behavioural intentions are influenced by attitudes toward the behaviour, subjective norms, and perceived behavioural control. The present study aimed to explore whether the commitment to use gamification for teaching plays a mediating role in explaining the intention to use gamification for teaching. The hypothetical model diagram is presented in Figure 3 below, and more details will be described in the next section.

Figure 3

The hypothesised model of this study



2.6.1 Relationship between attitudes and commitment

Attitudes toward behaviour are beliefs about a person's response to an action performed, including positive and negative feelings (Ajzen, 2002). According to Jung (1971), attitude is a psychological concept that is influenced by three main factors: affection (emotions), values (beliefs), and cognition (thinking) about a particular object

(Al-Swidi et al., 2014; Dossey & Keegan, 2008; Hoyer & Maclnis, 2004). From the definition of attitude and commitment, they have many similarities. They are individual responses or tendencies to specific behaviours, situations, or conceptual presentations. Yusuf (2011) clarified that a person's attitude is a reflection of how much they appreciate or despise something. An attitude is a state of being willing to perform something. A person's attitude is a reflection of what they believe. Gomendio (2017) defines attitude as the propensity to act favourably or unfavourably toward a specific item, circumstance, institution, concept, or person. Ali (2020) asserts that attitudes have a particular influence on behaviour, effort, interest, and awareness. Similarly, "personal commitment" is defined by Johnson (1973, p. 395) as "a strong personal dedication to a decision to carry out a line of action". This definition of dedication to work and family is used in a lot of related studies. Commitment is an attachment that is initiated and sustained by the degree to which an individual's identification with a role, behaviour, value, or institution is considered to be central among alternatives as a source of identity (Almquist & Angrist, 1971; Becker, 1956; Bielby, 1984; Morrow, 1983; Rosenfeld & Spenner, 1988; Safilios-Rothchild, 1971).

Moreover, commitment is defined as an attitude in the available theory. To put it another way, attitudinal commitment occurs when "the aims of the organization and those of the individual become progressively integrated or consistent" (Hall et al., 1970, p. 176) or "the identity of the person (is tied) to the organization" (Sheldon, 1971, p. 143). Thus, when someone connects with a particular organization and its goals, they have an attitudinal commitment and want to stay a member to support these goals.

Additionally, many management studies clarified that employee attitudes influence organisational performance (Guest, 1997; Wright & Gardner, 2003). Organisational commitment is a particular attitude that is significant because of the critical role it plays in influencing outcomes like employee turnover, performance, and absence—all of which are crucial to an organisation's success. (Mowday et al., 1979, p. 226). One of the most researched attitudes in organisational behaviour is attitudinal organisational commitment, which is generally referred to as "the relative strength of an individual's connection with and involvement in a particular organization" (Riketta, 2002).

Regarding the relationship between attitude and commitment, except their definitions are similar. Several studies point to a relationship between attitude and commitment. For example, Vasudevan (2013) investigated that teachers' commitment would work in creating the proper awareness, skill, and attitude for teachers to teach and learn something beneficially. Additionally, Ahad et al. (2021) state that work attitudes and emotional intelligence influence organisational commitment. Furthermore, a study shows that the TPB suggests that organisational commitment has a direct relationship with change-supportive intentions and that its effects are mediated by change-related attitudes, subjective norms, and perceived behavioural control (Straatmann et al., 2017). More importantly, Huang and Cheng (2022) confirmed that attitudes affect the intention to learn sustainability through the mediating role of commitment in mainland China. This shows that the mediating role of commitment from attitude to intention deserves more attention.

From these above studies, it can be seen that there is an influential relationship between attitude and commitment. And their definitions, that is, the causes and effects of their formation, also have certain similarities or connections. Based on these, it was considered worth exploring the effect of teachers' attitudes toward using gamification on commitment. Therefore, this study has examined whether teachers' attitudes towards using gamification in teaching affect their intention to use gamification through the mediating effect of commitment.

H1: Attitudes toward the use of gamification for teaching have a positive impact on intention to use gamification for teaching through the mediating effect of commitment.

2.6.2 Relationship between subjective norms and commitment

Subjective norm is described as a person's perspective of the people who are most important to him and what people should or should not do to his conduct and incentive to comply with specific references (Ajzen & Fishbein, 1980). Subjective norms refer to the pressures a person feels from society, including the influence of significant others and groups, when deciding to take a specific action (Ajzen 1991, 2002). Meanwhile, the definitions and meanings of subjective norms and commitments have some similarities or connections. The definition of attitudinal commitment is that people might be a part of organisations, unions, or professions. Behavioural commitment is to specific actions, remaining a member, pursuing goals, or following specific policies. Organisational commitment, as defined by Wiener (1982, p. 471), is

the sum of all internalised normative constraints to act in a way that serves the needs and interests of the organisation. From the above, it can be seen that the definitions of subjective norms and organisational commitment have many similarities. Additionally, a person's view of what others, such as family, friends, coworkers, and the immediate supervisor, are thinking about their behaviour depends on their subjective norms (Brouwer et al., 2009; Vermeulen et al., 2011). Similarily, according to Yang (1992), it is significant that Chinese people value their interpersonal connections. Cheng (1980) discovered that friendship was one of the most significant elements influencing the attitudes of young Chinese factory workers. In conclusion, Chinese people are generally willing to follow the instructions of the most important persons in order to demonstrate respect, demonstrate obedience, and preserve group unity (Lam et al., 2002).

Furthermore, Lam et al. (2002) studies the role of occupational and social elements in new employees' organisational commitment and intention to depart. Subjective norms and training were found to be major predictors of newcomers' turnover intentions in the Hong Kong hotel business, whereas subjective norms, mentorship, and the job itself influence organisational commitment (Lam et al., 2002). Moreover, Davis et al. (2015) emphasised the role that subjective standards play in a model of environmental commitment, arguing that people are more likely to care about the environment if they perceive that their friends and family members share their values. Through longitudinal analyses, Etcheverry and Agnew (2004) discovered that, roughly eight months later, a couple's decision to remain together was influenced by subjective norms, but that impact was mediated by commitment.

Most of the above studies have examined the significant relationship between commitment and subjective norms. Based on these, it can be seen that it is worth exploring subjective norm affects intention through the mediation of commitment. Therefore, this study has examined whether subjective norms about using gamification in teaching influence their intention to use gamification through the mediating effect of commitment.

H2: Subjective norms significantly influenced the intention to use gamification for teaching through the mediating effect of commitment.

2.6.3 Relationship between perceived behavioural control and commitment

Perceived behavioural control (PBC) relates to one's sense of the ease or difficulty of carrying out a behaviour, or the perceived obstacles or challenges in carrying out a behaviour (Ajzen 1991, 2002). There are two types of perceived behavioural control: internal factors and external factors. Internal factors refer to personal ability, such as professional knowledge, professional skills, confidence, experience, etc., which are teachers' beliefs' basis and driving force. External factors refer to the surrounding environment, such as the relationship between group members, institutions, and the object (Kidwell & Jewell, 2003; Song, 2015). The definition of commitment has the same points as the internal and external factors of PBC. First, it can be clearly seen that in terms of intrinsic factors, both commitment and the definition of PBC are related to emotion, motivation or cognition, and thought. For instance,

According to Zhang et al. (2022), achieving the desired exercise motivation intensity requires a strong contractual attitude and intrinsic motivation. Furthermore, according to Beatty's commitment model theory, the connection between people's ideas and deeds is commitment, which is internalized through behavioural engagement, emotional dependency, and effect expectancies (Beatty et al., 1988). Moreover, Meyer and Allen (1991, 1993) defined job commitment as the force that ties a person to a course of action related to one or more workplace aims. This is very similar to the internal factors of PBC. In terms of external factors of PBC, this part of the definition of job commitment is similar. Yusuf and Metiboba (2012) defines job commitment is a psychological state that defines an employee's interactions with an organisation.

In addition, many empirical studies have verified the relationship between PBC and commitment. For example, Baron and Kenny (1986) found that PBC was greatly impacted by the commitment method. In addition, Bae et al. (2016) investigated that affective commitment influences perceived usefulness, perceived behavioural control, and subjective norm in adopting hospitality employees' intentions to adopt new technology. Moreover, Cop et al. (2020) pointed out that PBC has a positive impact on environmental commitment. Furthermore, Huang and Cheng (2022) investigated that commitment significantly mediated the PBC to the intention of learning sustainability in Guangdong Province. Based on the connection and influences between PBC and commitment, it was considered worth exploring whether perceived behavioural control affects intention through the mediating impact of commitment.

H3: Perceived behavioural control significantly influenced intention to use gamification for teaching through the mediating effect of commitment.

2.6.4 Relationship between commitment and intention

The decision of whether to remain in or leave an organisation is long determined by an individual's commitment to that organisation (i.e., organisational commitment). Beyond organisational commitment, this has been expanded to include the study of commitment (Allen & Meyer, 1990; Lee & Jeong, 2019). Ajzen (2009) points out that making an explicit commitment to the behaviour causes people to establish a specific implicit implementation intention. Correspondingly, there are many empirical studies exploring the relationship between commitment and intention. For example, Bae et al. (2016) explored that affective organisational commitment has a mediating effect on the intention to adopt new technology.

Additionally, Singh and Onahring (2019) showed that organisation commitment influenced entrepreneurial intention. Fennis et al. (2015) explored that a sense of commitment to prior conduct was discovered to be a crucial component accountable for why people do not aim to change their lifestyles. In addition, Goh and Sandhu (2013) discovered that affective commitment, together with affect-based trust, attitude, subjective norms, and perceived behavioural control, had a substantial influence on academics' intentions to share information.

Bailey (2006) investigated retail employee theft using a TPB model that included organisational commitment and the moral standard, as well as study

propositions. Meanwhile, Elsitasari and Ishak (2021) demonstrated that attitude and religious self-identity have no effect on willingness to pay for halal products, however, perceived behavioural control, subjective norm, and religious commitment have a favourable and substantial effect. While commitment to teaching may affect teaching intentions, this study has also focused on the relationship between teachers' commitment to using gamification for teaching and their intention to use gamification for teaching. Furthermore, Straatmann (2017) discovered that organisational commitment has a direct relationship with change-supportive intentions and that its effects are mediated by change-related attitudes, subjective norms, and perceived behavioural control. Using a sample of 459 employees from various South Korean organisations, Lee and Jeong (2019) discovered that organisational commitment mediated the positive link between job instability and intention to leave. Orgambídez et al. (2019) found that affective commitment was one of the factors most important in predicting whether employees would stay with a company. Therefore, it can be seen that exploring the influence of commitment on intention is worthwhile.

H4: The commitment to the behaviour has a significantly positive impact on intention to use gamification for teaching.

2.7 Summary

This chapter has presented the essential background of gamification, its use in education, and its advantages and disadvantages. Then, it introduced the most commonly used theories in the literature on the study of teachers' intentions. TPB is

the most commonly used model to explain teachers intently. At the same time, this chapter has reviewed motivation theories and related concepts that are closely related to gamification. As well as exploring the possible relationship between commitment and intention to influence teachers' use of gamification, the proposed research model and hypotheses were also detailed in this chapter. The following chapter will explain the methodology used to answer the research questions and validate the hypothesised model.

Chapter 3: Methodology

To respond to the research questions, a variety of research methodologies might be used. In order to investigate the studied phenomenon and verify the hypothesised model, the current study used a mixed methods design. The research design, instruments, sample sizes, sampling techniques, data collection, and data analysis method are all covered in this chapter.

3.1 Research design

This research aimed to explore the factors influencing the use of gamification by school teachers. The current study employed a mixed methods approach to address all research questions. Most TPB studies are based on quantitative research methods using questionnaires (Russo et al., 2015), and likewise, this study found that many related studies use questionnaire quantitative research methods as the primary method (Brohi et al., 2021; Malebana & Sanepoel, 2015). Turan et al. (2022) investigated preservice teachers' behavioral intentions to use Web 2.0 gamification tools. To address the main research question of their study, which is the factors that affect the use of Web 2.0 tools by preservice teachers. They adapted the quantitative research method to confirm that preservice teachers should focus on developing their perceived usefulness, perceived ease of use, and self-efficacy to have better behavioural intentions of using gamification methods and tools in their future classes. Therefore, based on the first and second research questions developed in Chapter One, Section 1.3, the factors that affect teachers' use of gamification teaching and whether commitment has a mediating effect

in the three variables and intention of TPB, this study used a questionnaire survey in quantitative research methods to collect data to answer the first and second research questions (as shown in Table 4). Furthermore, in order to know the specific performance of the factors that affect teachers' use of gamification for teaching to explore the third research question of this study, this study used the qualitative research method of in-depth interviews to collect data for analysis.

Table 4

Research questions and corresponding data collection methods

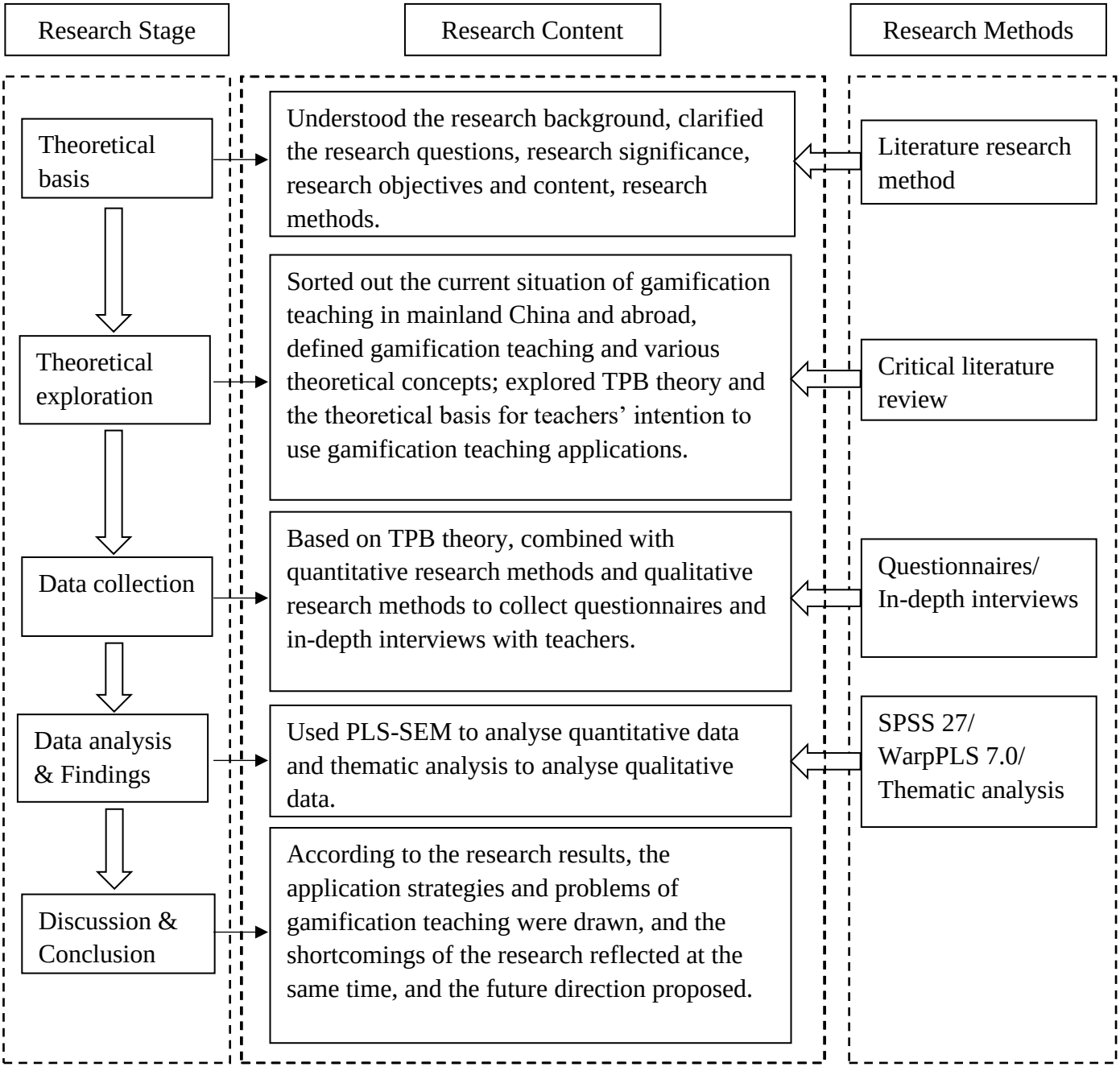
Research Questions	Data collection methods
1. Based on the TPB model, What factors influence teachers' intention to use gamification for teaching?	Used quantitative research methods to collect questionnaires
2. Does commitment mediate the relationship between the three antecedents (i.e., attitudes, subjective norms, and perceived behavioural control) and intentions?	Adopted a quantitative research method by collecting questionnaires and analysing the data results
3. What are the specific manifestations of each influencing factor on teachers' intention to use gamification for teaching by referring to the TPB model?	Used qualitative research methods, implementing in-depth interviews to collect data

This research used a mixed-methods design. First of all, mainly through a systematic literature review, the researcher explored the use of gamification at home and abroad, as well as the learning theory related to gamification, combined with TPB, and developed the research questions of this study. In the first stage, the quantitative research method of a questionnaire survey was used to collect data on teachers' use of

gamification teaching, aiming to understand the factors that affect teachers' use of gamification teaching and the significance of commitment to expanding TPB. Based on the analysis of the results of the first stage, the second stage used the qualitative research method of in-depth interviews to obtain more in-depth information on the use of gamification by teachers and deepen the quantitative research results as explanations and supplements. The design of the study is shown in Figure 4:

Figure 4

Flow chart of the research process



3.1.1 Mixed method approach

In order to better understand what factors influence school teachers' use of gamification for teaching, this research adopted the mixed-method approach to deal with the three research questions. Moreover, as mentioned above, the quantitative research method mainly addressed the factors that affect teachers' use of gamification and explored whether commitment has a mediating effect between intention and the three antecedent variables. The qualitative research method was based on the quantitative research results to understand the performance of factors that affect teachers' use of gamification for teaching. To sum up, this research required combining quantitative and qualitative research methods, that is, used mixed methods to answer all research questions, aiming to provide a more comprehensive display of factors and situations that affect teachers' use of gamification for teaching. Furthermore, in this section, the necessity, advantages, and disadvantages of using mixed research methods would be described next, and related research using mixed research methods would also be mentioned.

When an investigator utilises two or more techniques from the same methodological tradition (for example, more than one quantitative approach or more than one qualitative approach in a single study), that practice is known as mixed method research. In mixed methods research, an investigator employs at least one quantitative and one qualitative method in a way that may enhance their respective methodologies' strengths while minimising their limitations (Leech, 2010). A combination of qualitative and quantitative methods could aid in overcoming constraints and resolving

problems associated with mono-method research, which have been debated in the literature for over 50 years (Kelle, 2006). Planning and executing a comprehensive mixed methods study takes a lot of effort, time, and expertise (Creswell & Plano Clark, 2018; McKim, 2017). However, there are some general benefits to using mixed methods, including (a) gaining a more comprehensive and in-depth understanding of the phenomenon (Hurmerinta-Peltomäki & Nummela, 2006); (b) enhancing readers' confidence in the study's findings and conclusions; and (c) facilitating readers' comprehension of the significance of a study's findings and the meaning of complex phenomena (O'Cathain et al., 2010). Furthermore, the advantages and disadvantages of mixed methods are shown in the following table:

Table 5

Advantages and limitations of mixed methods

Advantages	Limitations
Make good use of strengths in both quantitative and qualitative research.	The researcher must understand various techniques and viewpoints.
Provide a wider range of in-depth research answers because the researcher isn't limited by a particular strategy or technique.	More time-consuming and expensive.
If the data are converging and consistent, give a support your claim with more solid proof.	May limit the study to a single point of view.
When qualitative and quantitative research are combined, a more thorough understanding is required to support theory and practice.	

Note. Based on Johnson and Onwuegbuzie (2004); Leech et al. (2010); Rahman (2016).

This study used a mixed-method approach to address the three research objectives in order to better understand the variables that affect how school teachers employ gamification for their teaching. Such an approach can aid in the development of deep insights through the study of interesting phenomena that are not entirely understandable through the use of only quantitative or qualitative methods (Venkatesh et al., 2013). In addition, qualitative discoveries would be supported by quantitative results in order to have various viewpoints and perspectives (Ulmer & Wilson, 2003). This research can incorporate both the depth and width of meaning into a single project; it is a method that recognises the progression of research as it moves inductively toward solving a puzzle as well as expands the scope of deductive inquiry and enables questions that would normally arise at the conclusion of the first set of findings to be addressed prior to closure (Johnson et al., 2007). In other words, it is a method of conducting research that incorporates both quantitative and qualitative methodologies in the same study. The most prominent advantage of the mixed-method approach is its practical applicability. It gives researchers the methodological leeway they need to thoroughly examine social phenomena by combining qualitative and quantitative procedures (Klein, et al., 2019). Combining qualitative and quantitative methods in the opposite order—beginning with a quantitative study and proceeding to a qualitative investigation—can be very advantageous in many situations. In this sequential qualitative and quantitative design, a quantitative study is carried out to determine the problem areas and research questions that require additional investigation using qualitative data and methods (Kelle, Udo, 2006).

Raed (2018) pointed out that a study strategy incorporating quantitative and qualitative data sources is necessary to gain complete knowledge of gamification. The research in this area focuses on quantitative methods too extensively, relying heavily on surveys and game analytics, while qualitative aspects, such as observations and interviews, are either neglected or non-existent (Raed, 2018). Therefore, this research employed mixed methods to enable a wider understanding of using gamification for teaching.

3.1.2 Quantitative research method

In order to address the research question, which was the factors that affect teachers' use of gamification for teaching, and whether commitment has a mediating effect on intention and attitude, subjective norms, and perceived behavioural control, quantitative research methods were used to collect data and analyse to answer these two research questions. In this section, the specific reasons and advantages, and disadvantages of using quantitative research methods will be described in detail based on relevant research.

The purpose of this study was to present the current state of teachers' use of gamification in teaching and to know what factors influence their use. Therefore, this study adopted a quantitative research method, that is, by collecting questionnaires and analysing the data results. Based on reviewing literature and TPB the dimensions of the research investigation were determined as follows: attitudes to use gamification

teaching, subjective norms, perceived behavioural control, commitment to using gamification, and intention to use gamification. TPB is one of the most widely recognised and employed theories in intention change studies (Zhang et al., 2009). TPB has high predictive power and explanatory power in predicting an individual's intention to engage in or engage in a particular behaviour. In general, TPB was used to predict behavioural intentions fairly accurately (Ajjan & Hartshorne, 2018; Dunn et al., 2018; Yan, 2022). Based on Ajzen's TPB questionnaire, this study used questionnaires to summarise and analyse the current situation and influencing factors of teachers' use of gamification in teaching.

Quantitative research is a social science that uses claims and methods derived from empirical studies, according to Cohen (1980). He defines an empirical statement as one that characterizes the situation as it "is" in the "actual world" as opposed to how it "ought" to be. There are several types of quantitative research. Survey, correlational, experimental, and causal-comparative research are the four categories into which it can be divided (Sukamolson, 2007).

Quantitative researchers usually begin with a general field of study or a topic of personal or professional interest. The design process involves deciding what kind of case or samples to select, how to assess essential factors, and what research techniques, such as experiments or questionnaires, to employ (Neuman, 2006). Quantitative research focuses primarily on measurable and patterned aspects of social behaviour rather than merely identifying them and interpreting the meanings people attribute to

their behaviours (Rahman, 2017). Furthermore, the advantages and disadvantages of quantitative research methods are shown in the following table:

Table 6

Advantages and limitations of quantitative research method

Advantages	Limitations
Testing and confirming existing explanations for how (and, to a lesser extent, why) phenomena occur.	Misses out on underlying and deeper meanings and explanations.
Verifying hypotheses that are formulated in advance of data collection.	It is challenging to articulate the causes of an impact and its significance in a specific situation.
When data are derived from sufficiently large random samples, they can be used to generalize study findings.	Confirmation bias (the tendency to concentrate on verifying beliefs rather than developing theories).
Analysing large populations of people is helpful.	It has a propensity to capture phenomena in a moment.
The researcher may create a scenario that removes the confounding effects of multiple variables to examine cause-and-effect relationships more objectively.	
Utilising statistical software, takes considerably less time.	

Note. Based on Johnson and Anthoy (2004); Rahman (2016).

In fact, there are many studies related to this study that used quantitative research methods. For instance, by utilising the Unified Theory of Acceptance and Use of Technology, Abou-Shouk and Soliman (2021) sought to understand the causes and effects of the desire of tourism organisations to implement gamification as well as the role of customer involvement as a mediating factor. A survey was used as a quantitative

method to gather information from a randomly selected sample of pertinent managers at travel companies. This study aimed to illustrate the current state of gamification in education as used by teachers and identify the elements that affect it. Therefore, this study used a quantitative research design, collecting questionnaires and then analysed the collected data.

3.1.3 Qualitative research method

To address the last research question, understand the specific manifestations of factors that influence teachers to use gamification for teaching, referred to the TPB model. In-depth interviews of qualitative research methods were used to collect and analyse data to respond to research questions more comprehensively. Based on pertinent research, the precise benefits, drawbacks, and reasons for employing qualitative research methodologies would be covered in detail in this section.

Qualitative research is an emergent, inductive, interpretive, and naturalistic method of studying individuals, cases, phenomena, social contexts, and processes in their natural environments. The purpose of this method is to describe the meanings that individuals ascribe to their experiences of the world (Yilmaz, 2013, p. 312). Rather than representing a situation numerically, qualitative research seeks to understand it at a deeper level. In qualitative research, the researcher is the subject and the object of his investigation. The qualitative method aims to produce comprehensive and illustrative data to understand the various aspects of the topic being studied (Queirós et al., 2017). Qualitative research emphasizes this facet of social behaviour in order to comprehend

how individuals interpret and make sense of their experiences. To gather, analyze, and interpret the data, it uses open-ended questionnaires, interviews, diaries, journals, observations, and classroom immersions, in addition to textual and visual content analysis and oral history (Zohrabi, 2013). The universe of meanings, motives, aspirations, beliefs, values, and attitudes—which connects to a broader space of relationships, processes, and events that cannot be reduced to variable operationalization—is the subject matter of qualitative research, according to Maxwell (2013). Additionally, the advantages and disadvantages of qualitative research methods are shown in the following Table 7:

Table 7

Advantages and limitations of the qualitative research method

Advantages	Limitations
It is helpful for carefully examining a select few examples.	Compared to quantitative research, data collection typically takes more time.
It is full of openness, flexibility, and change in the research process.	Data analysis is frequently time-consuming.
It can be used to explain complicated occurrences.	It is more likely that the results will be impacted by the researcher's personal biases and peculiarities.
It is able to explain things in great detail as they arise and are incorporated into specific local settings.	Testing theories and hypotheses are more challenging.
Contextual and environmental factors are investigated by the researcher in order to comprehend the phenomenon of interest.	
Offers descriptions and knowledge of people's own encounters with occurrences, investigating how and why things occur can be done using	

qualitative data from participant categories and words.

Note. Based on Johnson and Anthoy (2004); Rahman (2016).

This research adopted the in-depth interview method and invited several teachers in the target schools to conduct in-depth interviews, aiming to understand more deeply the teachers' viewpoints in using gamification for teaching. The research interview is a crucial technique for gathering qualitative data and has been extensively employed in field and ethnographic research (Qu & Dumay, 2011). In a mixed-method study, the interview is the second most crucial type of data to gather. "Interviews are a popular and commonly utilized technique of obtaining qualitative data," states Burns (1999, p. 118). Therefore, the researcher hopes to gather first-hand knowledge from multiple reliable sources. According to Merriam (1998), the seeker is searching for "a unique kind of information" and wants to know the responders' thoughts (Merriam, 1998, p.71). The premise is that because the researcher cannot examine the informants' feelings and thoughts, interviewing is essential for understanding what and how people "interpret the world around them". At this point, the interview's goal "is to find out more about the person," according to Flick (2006, p. 160). One-on-one and group or collective interviews are the two main categories of interviews. Merriam (1998) asserts that both interview formats fall under goal-oriented discourse.

Conducting in-depth individual interviews with a small group of interviewees to discover their thoughts on a particular idea, initiative, or problem is known as in-depth interviewing, a qualitative research approach (Boyce & Neale, 2006). In-depth

interviews are often described as a form of communication (Burgess & Robert, 2003). Its main feature is the combination of structure and flexibility, interactive, in-depth, and generative (Legard et al., 2003). In-depth interviews are helpful for getting more extensive information on a person's ideas and habits and may go further into a new topic. Interviews are frequently used to put outcome data (e.g., findings from quantitative research) into perspective, giving a more thorough explanation of the phenomena's events and causes (Boyce & Neale, 2006). In order to more fully grasp teachers' perspectives on utilising gamification for teaching, this research utilised the in-depth interview method and asked several teachers in the target schools to participate in the interviews.

3.2 Sampling and collecting procedure

3.2.1 Sampling

In this survey, teachers from the 39th and the 41st schools in Huicheng District, Huizhou City, were selected as the survey objects for this purposive and convenient sampling method. The 39th school was founded in September 2017. It was a nine-year public school established by the government with an investment of nearly 90 million yuan. The school was configured according to the scale of 54 teaching classes, including 36 standard classes in elementary schools, 18 standard classes in middle schools, and 29 classes in grades one to seven, with 1,452 students and more than 100 teachers. In addition, another school, the 41st School in Huicheng District, Huizhou City, was a newly established nine-year public school. This school included elementary

and junior high schools, with a total of about 70 teachers in various subjects. The subjects of the study were all teachers in the two schools, some of whom taught the first to sixth grades of elementary school and the first to third grades of junior high school. There were about 160 teachers in the two schools. They taught 11 subjects: Chinese, Mathematics, English, Science, Politics, History, Geography, Biology, Art, Physical Education, and Music. Therefore, the subjects of the survey were in these two schools. About 150 teachers participated in the questionnaire survey, accounting for more than 95% of the total number of teachers in the school. The teachers participating in the interviews accounted for about 15% of the total, and about 22 teachers were interviewed. Many academics have offered suggestions for choosing the sample size in qualitative studies. For instance, Bertaux (1981) emphasised that a minimum suitable sample size for qualitative studies is fifteen. Additionally, Dworkin (2012) noted that a significant number of books and articles stated that a sample size of between five and fifty is sufficient. Moreover, Namey et al. (2016) stated that a sample size of between eight and sixteen interviews is adequate to achieve saturation. Therefore, 22 interview participants comprised the total sample size chosen for this study to achieve meaning saturation in light of the prior guidelines (Hennink et al., 2016).

Both schools have mainly used traditional teaching methods; that is, teachers used blackboard writing or multimedia to display teaching contents and taught according to the content of textbooks. As two new schools in the district, such a pedagogical approach to learning (i.e., students passively received knowledge and listened and practiced carefully in class) has been challenged. Additionally, students

have been assigned more learning tasks every day since elementary school, and parents have to ask their children to make up lessons and take remedial classes on Saturdays and Sundays. Learning becomes a chore. If the teacher makes the students feel that learning is demanding and challenging to learn well, then the students will completely lose their motivation to study. Therefore, the current classroom teaching process needs to be constantly reformed with the efforts of teachers so that students feel that learning is a pleasant thing in the process of gamification teaching to promote students' long-term development. Although teachers have used their experience to teach and students seem to work hard, their results in the examinations have not been very impressive. Gamification for teaching requires the deep participation and practice of front-line teachers. Interest is the best teacher, and gamification can make people focus on something; it can also be applied to learning. Using gamification for teaching can make students' classroom learning more vivid and compelling, which will significantly help improve their academic performance. Gamification teaching is also a method to stimulate students' interest in learning, immerse them in a pleasant learning atmosphere, seek practical learning experiences and learning experiences for students, and finally make learning full of joy and achieve the goal of pleasure learning (Li, 2009; Shang, 2009). Thus, this study attempted to see if they accept the employment of gamification for teaching and learning.

3.2.2 Sampling strategy

The research subjects were teachers from public middle and primary schools in Huicheng District, Huizhou City. Huizhou City is a second-tier city, which is known to have much fewer educational resources than first-tier cities, such as Beijing, Shanghai, and Guangzhou, while public schools also receive much fewer financial resources than private and prestigious schools (Yang, 2015). It is, therefore, important to explore effective teaching methods that are much more cost-effective for public schools in non-first-tier cities. Gamification may be a cost-effective solution for them (Ibhadode & Ugoji, 2019). Moreover, Huicheng District was selected because the researcher of this study was living in this area at the time of the data collection and understood that teachers in local schools are fond of using traditional teaching methods and lack the intention to use innovative methods. The researcher would like to contribute to the community by exploring how gamification can be promoted to teachers in local schools.

3.2.3 Data collecting procedure

Due to the impact of the coronavirus epidemic on health protection, the data were all collected online. The questionnaire was distributed and collected in electronic form. Returned questionnaires were screened to remove incomplete questionnaires. The official questionnaires of this study were distributed mainly through the network, using the questionnaire-making platform to input the determined items of the actual survey questionnaire and the link to each teacher was sent for them to complete the filling. Completed questionnaires were used for later quantitative analyses. Interviews with

individual teachers were conducted via video calls on social media such as WeChat. The interviews were recorded after the interviewees agreed to do so. The recorded dialogues were transcribed for later qualitative analyses.

3.2.4 Ethical considerations

All questionnaire surveys and interviews in this study received approval from the Human Research Ethics Committee Department of The Education University of Hong Kong. With the consent of all subjects, questionnaire data were collected and interviews were recorded.

3.3 Quantitative data collection and analysis

3.3.1 Questionnaire design

Ajzen (1991, 2002) and Ajzen and Fishbein (1980) provide detailed descriptions of a well-defined process for creating measures of these TPB components for any behaviour. They also made explicit guidelines for establishing direct measures of attitude, subjective norm, PBC, and intention (Ajzen 1991, 2002; Ajzen & Fishbein, 1980). Therefore, based on Ajzen's standard TPB sample questionnaire and advice, this research used a validated TPB questionnaire to design a questionnaire for this study (see Appendix A). The questionnaire included background inquiries and direct measurements of behavioural intention, attitude, subjective norm, and perceived behavioural control. Moreover, this questionnaire used close-ended questions. The closed-ended survey was created using the techniques outlined in Ajzen (2006) and

Francis et al. (2004). The questionnaire mainly aimed to know what factors influence teachers' use of gamification. As a result, the scaled-response format and closed-ended (structured) questions were ideal for the questionnaire's creation. When the dimensions of the variables are already determined to test particular hypotheses, close-ended questions are typically employed in confirmatory research (Johnson & Christensen, 2008). Additionally, because these questions take little time or effort to complete, this format makes it simpler for researchers to analyse the data as well as for participants (AlMohaimmeed, 2012). Meanwhile, Hinkin et al. (1997) state that is utilising five or seven-point Likert scales for new items is advised since they enable the generation of appropriate coefficient alpha reliability estimates. The instrument used in this study, therefore, used a 7-point Likert scale (seven categories), with a range of 1 (strongly disagree) to 7 (strongly agree). Moreover, this research used self-report questionnaires (in Chinese) (see Appendix A). Since researchers have used self-report approaches to examine participants' cognitive processing strategies during problem-solving, decision-making, and judgment tasks (Johnson, 1993), moreover, participants are only asked to report the material they are now thinking about; they are not asked to make any comments or to provide an explanation for their thoughts (Darker & French, 2009).

The questionnaire was divided into two parts. The first part collected personal information (demographic background), such as gender, number of years of work, teaching subject, etc. The second part was the collection of respondents' perceptions of the target variables (those in the later section of Measures). The demographic variables were treated as extraneous variables. Their effects on the dependent variables of this

study were tested so as to understand the extent to which the sample characteristics have an effect on the study (Ajzen & Manstead, 2007). Dependent on the nature of the demographic variables, tests, such as *t*-statistics, ANOVA, and correlation tests, were performed (Reynolds et al., 2003). There were 41 questions in the initial questionnaire, of which questions 1-5 belonged to demographics and personal information, followed by the respondent's school, email address, gender, grade taught, and subjects taught; the second part was the scale part, a total of 26. There were five questions involving five dimensions, including six questions about the attitude dimension, five questions about the subjective norm dimension, seven questions about the perceived behavioural control dimension, four questions about the commitment dimension, and four questions about the intention dimension (see Appendix A).

3.3.2 Measures

Attitude toward the behaviour: In the questionnaire, there were seven questions about attitudes toward using gamification for teaching, ranging from 42 to 48 (see Appendix A for details). According to Fishbein and Ajzen (1975), attitude is used to evaluate the influence of an individual's positive or negative feelings on the performance of an activity. The impact of various forms of labour on attitudes and behavioural intentions has been amply demonstrated. Ajzen (1991) defined the attitude toward the behaviour as the feelings one has regarding how an individual behaves, whether they are favourable or negative. It refers to the degree to which the person's behaviour has been rated as either good or bad. Attitude toward the behaviour refers to

an individual's favourable or unfavourable evaluation of the behaviour in question, which can be quantified by the individual's beliefs and predictive assessments of behavioural outcomes. A particular religion mainly refers to an individual's opinion that specific behaviour is worth not implementing or carrying out. Evaluation relates primarily to an individual's predictive assessment of the positive or negative results that a particular behaviour would produce (Ajzen, 1991; Fishbein & Ajzen, 1975).

In this study, this variable was defined as the favourable or negative appraisal of the use of gamification for teaching. It was measured by 6 items with a seven-point bipolar adjective scale: unhelpful/helpful, inappropriate/appropriate, boring/interesting, unfavourable/favourable, useless/useful, ineffective/effective, and bad/good. These items were: 'I feel that using gamification for teaching is 'extremely unhelpful (1) ↔ extremely helpful (7)'; 'I feel that using gamification for teaching is 'extremely inappropriate (1) ↔ extremely appropriate (7)'; 'I feel that using gamification for teaching is 'extremely unfavourable (1) ↔ extremely favourable (7)'; 'I feel that using gamification for teaching is 'extremely useless (1) ↔ extremely useful (7)'; 'I feel that using gamification for teaching is 'extremely ineffective (1) ↔ extremely effective (7)'; and 'I feel that using gamification for teaching is 'extremely bad (1) ↔ extremely good (7)'.

Subjective norms: The questionnaire had five questions about subjective norms, ranging from 16 to 20 (see Appendix A for details). A person's impression of what individuals who are important to him should or should not do to his conduct and incentive to adhere to a specific reference is known as a subjective norm (Ajzen &

Fishbein, 1980). Subjective norms are the individual's perceptions of social pressure to engage in or refrain from a particular action from others around him. According to Eagly et al. (1993), subjective norms are the individual's assessment of whether the other person is crucial in translating the notion of an individual in necessary conduct. It is categorised as peer pressure as well. If someone engages in or wants to engage in such activity, it refers to whether or not those around them significantly influence them. These individuals could have been spouses or friends, relatives, colleagues, local authorities, or other significant individuals (Ibrahim et al., 2017). Therefore, the impact of these roles on teachers was not considered in this study. In this study, subjective norms mainly referred to teachers' perceptions of whether leaders, colleagues, students, policies, etc., those who were important to them, supported their gamified teaching. It was not difficult to see that these influences come from the outside and the social environment in which the individual lives. Meanwhile, subjective norms referred to teachers' views on norms related to the development of gamification based on the social environment in which they live.

This variable in this study was defined as the degree of social pressure that an individual feels regarding the use of gamification for teaching. It was measured by 5 items with a seven-point Likert scale from strongly disagree (1) to strongly agree (7). These items were: 'I think that people who are important to me would like me to use gamification for teaching'; 'I would use gamification because people who are important to me think that I should do it; 'I think that people whose opinions I value would encourage me to use gamification for teaching'; 'People who are important to me think

that gamification is good for teaching'; and 'I know some people who are important to me have used gamification for teaching'.

Perceived behavioural control: The questionnaire had five questions about perceived behavioural control, which were 27 and 28 questions, 35 to 37 questions (see Appendix A for details). According to Ajzen (1991), perceived behavioural control is determined by the availability or lack of the required opportunities and resources, as well as by the individual's assessment of how easy or difficult it is to carry out the targeted activity. Ajzen and Driver (1992) claim that in some circumstances, perceived behavioural control can directly affect behaviour in addition to intention. Corresponding to subjective norms, perceived behavioural control refers to teachers' perception of their ability to carry out gamification teaching, including perceived control beliefs and behaviour development capabilities. Refers to teachers' judgment on their own ability to carry out gamification for teaching when faced with those mentioned above promoting or hindering factors, mainly refers to the ability of individuals to carry out gamified teaching after comprehensively weighing their own abilities. Therefore, this variable was defined in this study as the degree of difficulty a person feels if using gamification for teaching. This study used 7 items with a seven-point Likert scale from strongly disagree (1) to strongly agree (7). These items are: 'I am confident about using gamification for teaching'; 'I am able to use gamification for teaching'; 'To me, using gamification to teach is not a challenge'; 'It would be difficult

for me to use gamification in teaching'; 'Whether or not to use gamification is entirely up to me'; and 'If I want to, it is easy for me to use gamification for teaching'.

Commitment to the behaviour: The questionnaire had four questions about commitment to the behaviour, which were items 38 to 41 (see Appendix A for details). Organisational commitment as a metric for how strongly people identify with and engage with particular organisations (Mowday et al., 1979). There are many empirical studies on the relationship between commitment and intention. For example, Bagus and Kholis (2015) demonstrated that organisational commitment affects employees' intentions to report other employees to the Republic of Indonesia Supreme Audit Agency. In this study, commitment to using gamification represented whether teachers are happy or comfortable teaching using gamification, whether they enjoy teaching using gamification, and whether they are committed to teaching using gamification. In other words, it focused more on how teachers feel and how they feel about using gamification. And this variable was defined as the enjoyment and comfort of using gamification, to measure the commitment to using gamification. This study used 4 items with a seven-point Likert scale from strongly disagree (1) to strongly agree (7). These items were: 'I would be very happy to use gamification for teaching'; 'I enjoy discussing about gamification with others'; 'I feel comfortable in using gamification for teaching'; and 'In general, I am indicated to use gamification for teaching'.

Intention to use: In the questionnaire, there were four questions about the awareness of using gamification teaching, which were items 9-12 (see Appendix A for

details). TPB believes that the factors that affect a person's intentions come from attitudes toward the behaviour, subjective norms, and perceived behavioural control. Broadly speaking, empirical evidence strongly supports this theory and predicts their intention to carry out a particular behaviour with high accuracy. Behavioural intention is the most direct factor affecting behaviour, and attitude towards the behaviour, subjective norms, and perceived behavioural control can affect intention (Ajzen,1991). In this study, this variable was defined as the extent to which an individual is willing or is planning to use gamification for teaching. It was measured by four items with a seven-point scale from extremely improbable (1) to extremely probable (7). These items were: 'I intend to use gamification for teaching'; 'I am willing to use gamification for teaching'; 'I plan to use gamification for teaching;' and 'I will try to use gamification for teaching'.

3.3.3 Pilot study

In this study, a piloting questionnaire survey was used to assess the reliability and validity of questionnaire measures. To effectively implement the TPB questionnaire, five volunteers from the mainland were randomly selected for pilot testing. They all had teaching experience in primary and secondary schools or primary and secondary school teachers at the time of data collection. The pilot test allowed them to fill out the questionnaire first, record the description of their doubts, and correct some ambiguous expressions in the questionnaire. For example, item 29 in the questionnaire was originally, "For me, using gamification in teaching is not a challenge". In terms of

Chinese translation, it was initially translated into similar ‘difficult’ words. Still, later, the testers reported that their understanding was a bit inappropriate. Therefore, it was changed to become a Chinese vocabulary closer to the ‘challenge’ but easy to understand. Additionally, some Chinese words used in the two questions were also reflected by the pilot testers, and similar but easy-to-understand vocabulary or the word order was changed (details see Appendix A). After the pilot test, the questionnaire modified the expression of a few items. Finally, the final version of the questionnaire was formed (see Appendix A).

3.3.4 Reliability and validity of the quantitative study

The reliability analysis of the questionnaire in this study was mainly by calculating Cronbach’s alpha (> 0.7) value of the questionnaire, which refers to the average value of the split-half reliability coefficient obtained by all possible item division methods of the scale. This method is the most commonly used in social science research (Carmines & Zeller, 1979). Using SPSS 27 to analyse the questionnaire data, the overall Cronbach’s α value of the questionnaire data was 0.978, indicating that the measurement indicators were highly consistent and reliable. Additionally, in terms of questionnaire validity, confirmatory factor analysis was used to report the convergent validity and discriminant validity of the questionnaire. In addition, the TPB questionnaire has been widely used in different fields and has good reliability and validity. For example, the content validity and reliability of the TPB questionnaire on

adolescents' balanced dietary behaviour in a post-disaster environment remained high (Dewi et al., 2022).

3.3.5 Quantitative data analysis method

As a purposive and convenient sample was used, the partial least squares (PLS) method to structural equation modelling (SEM), PLS-SEM emphasises predicting statistical models that provide causal explanations, was utilised to assess both the measurement and structural models. In their two-step model-building technique for SEM introduced by Anderson and Gerbing (1988), they placed an emphasis on the analysis of two conceptually distinct models: the measurement model and the structural model. The relationships between the measured variables that support the latent constructs are described by the measurement model, also known as the factor model. This stage uses confirmatory factor analysis to assess the unidimensionality, validity, and reliability of latent constructs in order to define the links between the observed variables (CFA). For instance, it can be important to adjust factor loading initially, test validity and reliability, and also make use of the goodness of fit (GOF) indicator (Hair et al., 2014).

As a sophisticated quantitative research method, structural equation modelling (SEM) finds wide application throughout many other areas of business research, as well as in research in the social sciences and behavioural sciences (Hayes et al., 2017). In SEM, the latent variables (LVs) are measured indirectly through the manifest variables.

Manifest variables are usually referred to as “indicators”. It is common for indicators to contain errors when measuring LVs based on a questionnaire administration. In this context, LVs can refer to perception-based constructs such as job satisfaction. For question-statements in questionnaires, indicators frequently store numeric answers on Likert-type scales (1 = strongly disagree, 7 = strongly agree). In each question statement, a specific LV is referenced, and accuracy is expected to be measured by using a certain degree of imprecision (Kock, 2019) where the model structures are designed to yield causal explanations (Sarstedt et al., 2017a; Wold, 1982). A 7-point Likert scale was used to measure the variables of the study from 1-strongly disagree to 7- strongly agree.

A measurement model specifies the relationships between the latent variables and their corresponding measurable items, while a structural model specifies the relationships among the latent variables. To examine a measurement model, some criteria for addressing the reliability and validity of the measures have to be adopted, such as composite reliability, Cronbach’s alpha, and convergent validity (Hair et al., 2014). For testing a structural model, the five-step approach by Hair et al. (2014) was used. First, the collinearity between each set of predictor variables in the structural model was evaluated. The latent variable scores were imported into SPSS software to compute the variance inflation factor (VIF) values based on two ordinary least squares regressions (Hair et al., 2014). Second, the significance of path coefficients was assessed by use of bootstrapping, which helped to compute the empirical *t*-value for each hypothesised relationship. Third, similar to multiple regression analysis, the R2 value and the standardised β coefficient were computed. Fourth, unlike multiple

regression analysis, there was not a significant value for each R2 value (Hair et al., 2014). Finally, the blindfolding approach was used to measure "how well the path model can predict the originally observed values" (Hair et al., 2014, p. 183). The PLS-SEM is a non-parametric method that is used for non-normal data (i.e., data that are not normally distributed) (Haenlein & Kaplan, 2004; Hair et al., 2011; Urbach & Ahlemann, 2010). SPSS 27 and WarpPLS 7.0 were the software tool used for the analysis.

3.4 Qualitative data collection and analysis

3.4.1 The design of the interviews

To gain an in-depth and comprehensive understanding of teachers' views on the use of gamification for teaching and to facilitate the discovery of problems in the current promotion or application of gamification teaching, this study also adopted in-depth interviews in the qualitative research method. Based on the results of the previous statistical data analysis, the interview outline was drafted and adjusted. The outline mainly focused on the division of dimensions in the TPB model. Structured and in-depth interviews were conducted with the teacher interviewees, mainly involving teachers' attitudes, subjective norms, and their own perceived behavioural control and commitment to using gamification teaching, and intention to use gamification for teaching. Further analysis was based on the TPB perspective of school teachers' attitudes towards gamification for teaching, intentions, sources of influencing factors, and even the actual situation of using gamification for teaching. Considering the cohesion between the questions in the actual interview process, the interview questions

of each dimension were integrated. For example, “Do you find it useful to use gamification for teaching?” (see Appendix B for interview questions). The interviews aimed to provide explanations and explanations for the results of the questionnaire survey so that the influencing factors and current situation of teachers’ use of gamification teaching could be better presented. During the Covid-19 period, the interviews were conducted through WeChat voice calls, and the interview time with each interviewing teacher was controlled to be within 15-30 minutes.

The design of the interview questions of this study was guided by the TPB, combined with the problems found in quantitative research, that is, the factors that affect teachers’ use of gamification, the interview outline of this study was compiled. For example, the quantitative data analysis found that attitude will directly affect teachers’ behavioural intention to use gamification. The questionnaire only asked teachers how useful and effective they think gamification is, but it is not clear whether teachers think it is useful and their specific views on gamification teaching. Through interviews and in-depth questions, richer information to understand the specific manifestations or views of teachers’ attitudes about using gamification could have been obtained. Other interview questions were also designed according to the results of the questionnaire analysis, and the purpose was to discover more targeted and deeper sources of influencing factors on teachers’ use of gamification. In addition, different subjects and different grades were selected as the interview objects, and the source of factors behind the teachers’ intention to use gamification for teaching in primary and

secondary schools was deeply excavated in an attempt to play an auxiliary or supplementary role in quantitative analysis.

3.4.2 Trustworthiness of the qualitative study

For the trustworthiness of qualitative data in this study, it will be discussed below. In qualitative research, validity has a different definition that may be closer to ideas like trustworthiness, authenticity, and quality (Maxwell, 2013). That is to say, since the "objective reality" is also being constructed from a constructivist standpoint, there is no guarantee that the outcome will represent the "objective reality" in qualitative research. Qualitative research has two specific validity threats: bias and reactivity (Maxwell, 2013). However, the impact of the two cannot be unnecessary and must be avoided completely. To protect the integrity of the data acquired, the researcher can only maintain as much integrity as feasible. However, it is more crucial to recognise the existences and "determine what specific validity threats are most significant and plausible, and what tactics are most suited to cope with these" (Maxwell, 2013). This study has referred to the practice of natural inquirers to improve trustworthiness summarised by Guba (1981).

(1) Tried to collect teachers' teaching plans and classroom materials related to gamification teaching (By contacting the academic director in charge of teaching in advance to communicate with them and collect information).

(2) After the first draft of the report was completed, it was handed over to the interviewed teachers for review, and formally used as the research material only after confirmed to be correct.

(3) Tried not to make inferences about the teacher's teaching situation. The analysis was based entirely on the original transcript of the interviews.

(4) Kept the original materials, such as interview recordings and completed drafts of the recordings and texts, for repeated inspections.

It was believed that the bias and the impact of researcher identity on the quality and validity of data could be limited by the measures above to some extent.

3.4.3 Qualitative data analysis method

For qualitative data analysis, the thematic analysis method was used. TA is a method for systematically discovering, organising, and interpreting patterns of meaning (themes) in a set of data. By focusing on meaning throughout the collected data, thematic analysis assists the researcher in seeing and making sense of shared or communal meanings and experiences. For analysis, the initial step in the analytical process is to familiarise the researcher with the data provided. Stage two of the thematic analysis, which tried to produce first codes from data, was completed based on data familiarisation and writing down of early thoughts. Phase three begun with the hunt to find the ultimate themes, as the data extracts were first coded and aggregated, and the analyst was prepared with an extensive list of these initial coding. Technically, this phase was divided into two parts. The produced themes had to be examined and

validated against the coded extracts in the first substage, and the themes had to be evaluated in connection to the whole data set in the second substage (Majumdar, 2021). The conclusion of a theme analysis should draw attention to the dataset's most prominent constellations of meanings. These constellations contain elements of effect, cognition, and symbolism. According to Joffe and Helene (2012), a thematic analysis of interviews conducted with a carefully chosen sample of people who do not seek the assistance of mental health professionals would reveal how these people represent the various mental health experts. This methodology involves identifying and interpreting similarities between the discourse and written forms surrounding a subject (Braun & Clarke, 2012). Therefore, this research could further look for more information about the reasons why the influencing factors affect teachers' use of gamification in teaching. This could help to generate more insights for both research and practical implications.

Using thematic analysis for the qualitative data

In qualitative data, the theme summarizes critical information about a research question and, to some extent, represents a patterned psychological response and meaning. Thematic analysis is a research method identifies, analyzes, and interprets themes using qualitative data, according to Braun and Clarke (2006, 2017). Thematic analysis is an adaptable technique that is independent of any epistemological framework. According to Holloway and Wheeler (2010) and Smith et al. (2011), qualitative research offers comprehensive and in-depth explanations and descriptions of the research topic. It employs various specific methods, all of which emphasize the

importance of comprehending the participants' experiences about the particular phenomenon. Thematic analysis is a qualitative approach that is problem-oriented. Through the identification and extraction of "themes" from the original data, the thematic analysis method employs themes to analyze the research questions. In addition to identifying "topics" based on word frequency, the topic analysis method considers the possibility that the problem and the topics under investigation had high or low frequency in the data.

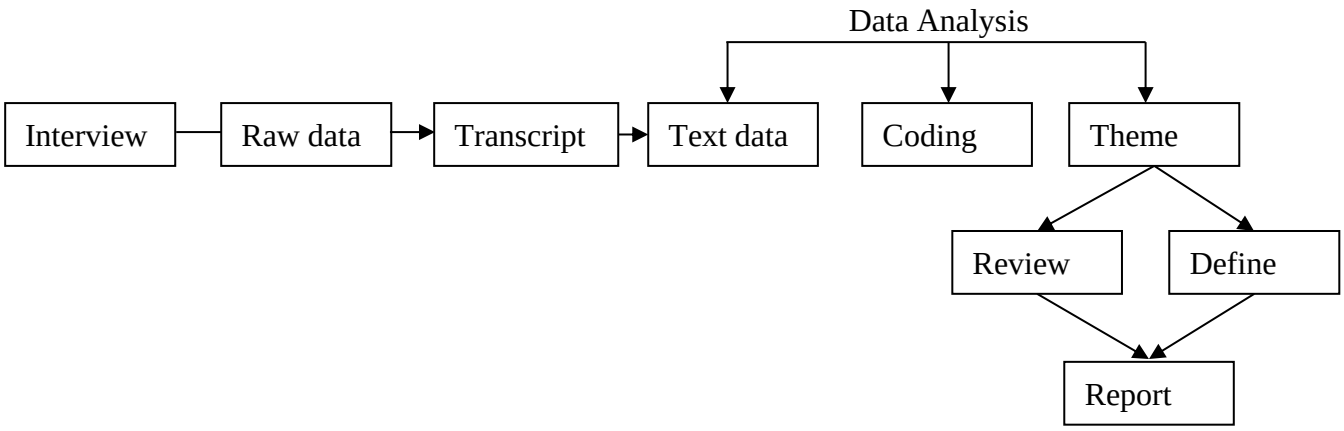
"Thematic analysis is a method for detecting, analyzing, and reporting patterns (themes) inside data," state Braun and Clarke (2006). A minority of writers outline distinct procedures for these alternatives, but the majority combine deductive and inductive versions to produce a hybrid approach (Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006; Rishi et al., 2015). In qualitative data analysis, thematic analysis is widely and flexibly employed. Several attempts have been made to provide a more systematic approach to its application (Boyatzis, 1998). Theory is the first step in the deductive method of theme analysis, also called theoretically-driven coding (Boyatzis, 1998). Jones and colleagues (2018) illustrate how theory directed their research by basing their coding frame on Edward's (2015) concept of community capacity. A deductive method can be helpful when concentrating on an inevitable feature of the data or a particular discovery that would be best understood or clarified concerning an established theory or framework (Braun & Clarke, 2006). As a result, an inductive approach tends to provide a broader, more expansive analysis of the entire body of data (Braun & Clarke, 2006). In this study, based on TPB theory, the existing theoretical

framework of TPB was used to identify the themes that need attention. As mentioned earlier, thematic analysis can be done in two ways: inductive and deductive. Among them, the deductive approach is suitable for in-depth analysis based on the collected data of the participants such as questionnaires to realise the viewpoint of the concerned group or individual (Creswell, 2003; Hatch, 2002). This study was based on the results of the questionnaire data analysis, and then in-depth interviews with some of the participants were conducted to collect more abundant data. Therefore, for the interview results, a deductive approach was used to analyse the theme.

A six-step process for topic analysis was proposed by Braun and Clarke (2006). It consists of data familiarization, preliminary coding, theme discovery, theme review, theme definition, and naming, and report analysis writing. This analysis process is reciprocating rather than linear. The analysis process can go back to any point during its progression. The six analysis stages of the topic analysis method in this study are shown in Figure 5 and more elaboration will be discussed in the next section.

Figure 5

Thematic analysis method step diagram



Step 1: Familiarising with the data

Thematic analysis requires a basic understanding of the data, including its breadth and depth, and the recording of preliminary observations about the data. The interviews and original data are transcribed into text form to perform a thematic analysis; this process is valuable for familiarizing oneself with the data (Riessman, 1993). Verify and proofread transcriptions against the source data to ensure accuracy. Understanding every facet of the data is necessary, regardless of the study's goal—clarifying the underlying meaning or characterizing the target problem's surface semantics. Familiarity with data frequently necessitates recurrent research and a proactive search for meaning. Researchers should read through the data at least once before beginning to code. Doing so will help to clarify the research question and identify possible themes (Boyatzis, 1998). In this study, the audio data of the 22 respondents needed to be transcribed into text data. The method used by the researcher was to transcribe the audio

data by using speech recognition software and listening to the audio recordings repeatedly. During this process, in order to ensure the accuracy of the recording and transcription, the researcher also checked the written data many times, and, at the same time, became familiar with all the collected data.

Step 2: Form the initial code

Once the investigator is familiar with the data, the preliminary coding can be carried out. Currently, textual data fragments containing one or more keywords are linked to the initial codes extracted from the raw data. These fragments are characterized by being brief, instantaneous, and responsive to the experiences or actions that the participants have described (Charmaz, 2005). According to Boyatzis (1998), coding is the most fundamental element of the original data or information that helps explain the study's pertinent phenomenon. According to Tuckett (2005), coding is the process of meaningfully organizing data and is a step in the analysis process (Miles & Huberman, 1994). A coding manual, which serves as a larger coding framework or template that defines and guides the application of codes, should logically accommodate a code. A code must be sufficiently distinct and well-defined to prevent it from overlapping with other codes (Attride-Stirling, 2001; Crabtree & Miller, 1999; King, 2004; Nowell et al., 2017). In thematic analysis, deductive analysis is an effective method of data analysis because it is supported by a pre-existing conceptual framework, sensitising concepts, or preparatory coding of a small subset of the data (Yukhymenko et al., 2014). After defining the coding framework or template, researchers apply the

same codes to the entire data set by labeling data extracts with relevant codes noting any potential patterns or relationships between items that can inform the creation of subsequent themes (Braun & Clarke, 2006). This present research was based on TPB, a theory that has been widely used in social psychology. To develop this work, thematic analysis and deductive coding were used. Subsequently, the researcher coded the entire data set based on TPB.

Step 3: Searching for themes

The coded and compiled data extracts are analyzed in the third step to look for any potential themes that might be more important (Braun & Clarke, 2006). The "core" of a topic is defined by its relevance to the research question; a theme is a high-level abstract summary of significant information pertaining to a research question. Different codes can be categorized and combined to create potential themes, from coding to themes. Finding themes in the coding process can be aided by the use of visualizations like mind maps and tables. To better understand the relationships between various themes and codes, a topic network diagram for the potential themes should be created after the themes are obtained (Gbrich, 2007).

Step 4: Reviewing themes

In order to review a theme, one must examine and edit both the theme and the code that goes with it. This step includes dividing and merging the theme and determining whether the codes can create a coherent theme. If not, the investigator must

determine whether the subject is flawed or whether the code is inappropriate for the topic (Boyatzis, 1998; Crabtree & Miller, 1999).

Step 5: Defining and naming themes

A theme is further refined by being named and defined. The goal of theme reviews and theme optimization is the same; the distinction is that theme review requires a deeper engagement with the overall data background, considering the theme's organic connections (Miles & Huberman, 1994). In defining and naming a topic, the theme's substantive content and name should adhere to the principle of simplification, and the data that falls under the same theme should be consistent and coherent. This process will ensure that the theme becomes manageable and contains enough content (Braun & Clarke, 2006).

Step 6: Writing reports of analysis

The report-writing process can begin when a comprehensive list of subjects has been compiled. Composing constitutes the final phase of the logical step and a crucial component of the analysis. When composing a report, it is imperative to consider both the structure and subject matter of the writing (Riessman, 1993). Research questions should be connected within the generated theme's framework to tell a succinct, logical, and coherent "story." The report's format should be chosen carefully to aid in audience comprehension. It should be grounded in the content's data but go

"beyond" it by selecting a few solid examples or removing some of the original data to bolster the argument (Braun & Clarke, 2006; Yukhymenko et al., 2014).

3.5 Merging of the quantitative and qualitative analyses for reporting

Based on the TPB model, this study used quantitative research questionnaires to answer two research questions: What factors influence teachers' use of gamification teaching, and whether the commitment mediates between AT, SN, PBC, and intention? The qualitative research was designed to answer the remaining research question: How do the factors that influence teachers' use of gamification specifically affect it? The results obtained through quantitative research are used to design interview questions in qualitative research. For example, if this study had confirmed through quantitative analysis that attitude significantly affects the intention to use gamification, then a series of interview questions corresponding to attitudes would have been designed, such as "What do you think about using gamification in teaching?" "Do you find using gamification for teaching helpful?" The same goes for other factors. All interview questions were further designed based on the quantitative research results, aiming to provide a more comprehensive and in-depth explanation of the quantitative research results. Since quantitative analysis can confirm the degree of influence of each influencing factor on intention, qualitative analysis can understand the specific performance of the influencing factors in a practical situation. Therefore, combining quantitative and qualitative research analysis can provide a more comprehensive phenomenon to answer all research questions and better achieve the research objectives.

3.6 Summary

This chapter has detailed the methodology and rationale used to address all research questions. The study design, sample and sample characteristics, data collection, and study analysis methods were also introduced. This study adopted a mixed research method to answer the research questions, using the questionnaire survey and analysis to verify the proposed research hypotheses, and the qualitative research part used in-depth interviews and thematic analysis to support and supplement the quantitative research results. The next chapter will describe the quantitative and qualitative research findings and analysis.

Chapter 4: Findings

This chapter is dedicated to the quantitative and qualitative findings. The analysis of the quantitative data was carried out by Software SPSS and WarpPLS. The qualitative data analysis was carried out using the thematic analysis approach. The discussion of the findings will be presented afterward.

Table 8

Process of data analysis and research design

Level of integration	Implementation strategy	Details
Research design	Explanatory sequential design	Quantitative data were collected from two schools, including elementary and junior high schools. A total of 152 questionnaires were collected, and 1 used an in-depth interview with 22 teachers.
Methods	Process	The first stage was to collect questionnaires and then conduct interviews based on the results of the questionnaire analysis, aiming to provide more explanations and supplements for the research.
Interpretation and reporting	Findings & results	Presented and well-organised the quantitative and qualitative results analysis; then summarised the meaning, research significance, suggestions, etc., based on the analysis results.

4.1 Quantitative results & findings

To answer the main research question of this study, which was what factors influence teachers' intention to use gamification for teaching, the quantitative results

from testing the constructed model discovered through the survey data analysis will be presented in this chapter. For this study's statistical analysis, Warp-PLS and SPSS were employed. The questionnaire was analysed in three steps: (a) descriptive statistics of the data, (b) analysis of the measurement model, and (c) analysis of the structural model. At the end of this chapter, the findings and their significance are also displayed.

4.1.1 Number of responses

In the final phase of this study, a total of 152 questionnaires were received from two public nine-year schools in Huizhou City, namely schools with both primary and junior high schools. Among them, 152 questionnaires were filled out completely, and the questionnaires with no subjects were discarded because they were unqualified. Therefore, all 152 questionnaires collected were used for further data analysis.

4.1.2 Descriptive Analysis

Sample features (Demographic background information)

A total of 152 valid electronic questionnaires were collected in this study, of which, 152 were valid questionnaires, and 152 subjects completed all the questions. The first part of the questionnaire was basic information, mainly to reflect the background information of primary and secondary school teachers, including their characteristics including school, gender, teaching grade, and teaching subjects. The specific descriptive statistics are shown in Table 9.

Among the 152 teachers who participated in the survey, 23 were male and 129 were female. The grades they taught were about 10% to 16%, from first to ninth grade, respectively, evenly distributed. Most teachers mainly taught Chinese, mathematics, and English, accounting for 39.5%, 19.7%, and 17.1% respectively. In addition, 117 of these teachers have used gamification for teaching, and only 35 teachers have not. Regarding the time they use, 33 people have used it for less than one year, accounting for 23%, 28 people have used it for one to two years, accounting for 18.4%, and 56 people have used it for more than 2 years, accounting for 36.8%. It shows that most teachers have used gamification teaching, and most teachers have used it for more than 1 year.

Table 9

Descriptive analysis

Features		Total	Frequency	Percent
Gender	Male	152	23	15.1
	Female		129	84.9
Grade	Grade 1	152	20	13.2
	Grade 2		7	4.6
	Grade 3		16	10.5
	Grade 4		25	16.4
	Grade 5		18	11.8
	Grade 6		18	11.8
	Grade 7		14	9.2
	Grade 8		15	9.9
	Grade 9		19	12.5
Teaching Subject	Chinese	152	60	39.5
	Math		30	19.7
	English		26	17.1
Used Gamification or not	Yes	152	117	77
	No		35	23

Among the five latent variables, Table 10 shows mean scores, standard deviations, and correlations. The mean scores of each variable ranged from 4.67 to 5.34 (out of a seven-point scale). Based on the standard deviations of the variables, it is also clear that the scores for each variable tended to be quite close to the mean. As can be seen from the table, all latent variables have significant correlations. As a result, it would be worth considering the hypotheses.

Table 10

Means, standard deviations, and correlations for the five latent variables

Variable	Mean	SD	1	2	3	4	5
AT	5.34	0.98	(0.891)				
SN	5.19	1.10	0.784***	(0.878)			
PBC	4.67	1.13	0.692***	0.699***	(0.817)		
COM	5.07	1.12	0.833***	0.769***	0.707***	(0.888)	
INT	5.41	1.24	0.792***	0.644***	0.625***	0.737***	(0.875)

Notes. AT = attitudes toward the using of gamification; SN = subjective norms; PBC = perceived behavioural control; COM = commitment to using gamification; INT = intention to use gamification; numbers in parentheses are square roots of average variances extracted; *** $p < .001$.

4.1.3 Measurement model assessment

Measurements' reliability and validity

One of the most used methods to assess measurements' reliability is internal consistency. Measurements' internal consistency analysis followed Bagozzi and Yi approach of comparing three consistency indicators (composite reliability, Cronbach's alpha, and average extracted variances) with criteria (Bagozzi & Yi, 1988). The reflective measures of the latent variables were examined for reliability, convergent

validity, and discriminant validity to look for measurement biases (Cheon et al., 2012). Table 11 displays the results. The internal consistency of the latent variables was good, with composite reliability values ranging from 0.888 to 0.939 and Cronbach's alpha values ranging from 0.887 to 0.939, all above the 0.7 criteria (Cheon et al., 2012). Second, all latent variables proved to have acceptable convergent validity because their AVE values ranged from 0.817 to 0.891, exceeding the threshold of 0.50 (Cheon et al., 2012).

Finally, two tests were used to confirm the discriminant validity of all latent variables (Kock, 2015). The first one was that each item had a structure loading above 0.7 for its respective latent variable. Furthermore, the strongest correlations between latent variables were found with their own measures rather than with any of the other latent variables, indicating discriminant validity. Table 11 confirms that the strongest correlations were found between each latent variable with their own measures as opposed to any of the other latent variables. Additionally, Henseler (2009) pointed out that the composite reliability (CR) coefficient is more convincing in the PLS-SEM test when higher degree of isomorphism exists between the facet indicators. The higher the degree of isomorphism between the facet indicators. If the composite reliability (CR) coefficient of the PLS-SEM test is between 0.6 and 0.7, it means that the reliability of each dimension of the measurement model is acceptable. According to the analysis of the data test results shown in Table 11, the combined reliability coefficient of each dimension in this study reached more than 0.8, exceeding the critical value of 0.6, indicating that the reliability of the model was high. The above indicators

comprehensively show that the surveyed data in this study had good internal consistency reliability (Henseler, 2009).

Table 11

Results for assessing the measurement model

Variable	AVE	Composite Reliability	Cronbach's Alpha	Structure Loadings
INT	0.875	0.929	0.929	0.840 ↔ 0.896
SN	0.878	0.910	0.909	0.814 ↔ 0.930
PBC	0.817	0.888	0.887	0.710 ↔ 0.890
COM	0.888	0.937	0.937	0.863 ↔ 0.911
AT	0.891	0.939	0.939	0.878 ↔ 0.909

Notes. AT = attitudes toward the using of gamification; SN = subjective norms; PBC = perceived behavioural control; COM = commitment to use gamification; INT = intention to use gamification; AVE = average variance extracted.

4.1.4 Assessment of the structural models

Structural models were assessed by means of the full collinearity test, output model fit, coefficient of determination (R^2) for each dependent variable, and the standardised beta coefficient (β) for each hypothesised relationship (Hair et al., 2014). To test for multicollinearity (also known as full collinearity) among the latent variables in the three structural models, this study employed the full collinearity VIF (FCVIF), which could also be used to assess common method biases. Collinearity in multiple regression models is traditionally regarded as a predictor-predictor phenomenon. When two or more predictors measure the same underlying concept or a component of that construct, they are said to be collinear in this classical sense. Classic or vertical, collinearity is the only type of collinearity included in this definition (Kock, 2015). The

full collinearity test was proposed by Kock and Lynn (2012) as a thorough approach for assessing both vertical and lateral collinearity at the same time (see also Kock & Gaskins, 2014). Variance inflation factors (VIFs) are generated for all latent variables in a model using this technique, which is entirely automated by the software WarpPLS. The presence of a VIF greater than 3.3 is seen to be a sign of pathological collinearity, as well as a sign that a model could be tainted by common method bias. As a result, the model can be declared free of common method bias if all VIFs from a comprehensive collinearity test are equal to or lower than 3.3. In a structural model integrating all latent variables, the FCVIF detects both vertical and lateral collinearity, surpassing the "conventional" VIF, which only looks at vertical collinearity (Kock, 2015). For regression-based models, the FCVIF value of a variable should be less than 3.3, and for models incorporating measurement errors, such as factor-based PLS-SEM models, the FCVIF value should be less than 5, but this threshold could be reduced to 10 for highly correlated variables (Kock, 2015). Table 12 shows that the FCVIF values were all less than 5, suggesting that both multicollinearity and common method biases were trivial. For readers' information, the "classic" or vertical collinearity VIF values for the latent variables in the three models ranged from 2.121 to 4.999, all below the threshold of 5 for factor-based PLS-SEM (Kock, 2015).

Table 12

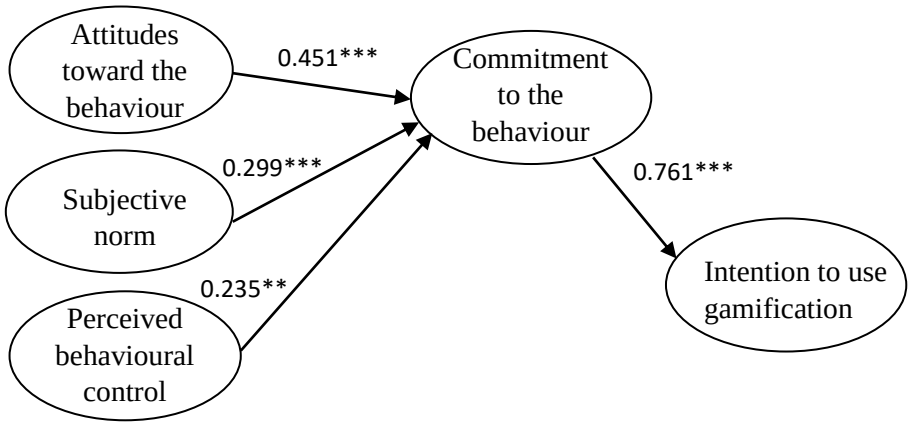
Results for assessing the structural model

Dependent Variable	Independent Variable				R^2	Adjusted R^2
	AT β	SN β	PBC β	COM β		
COM	0.451***	0.299***	0.235**	---	0.802	0.798
INT	---	---	---	0.761***	0.580	0.577
(3.773)	(4.740)	(4.981)	(2.121)	(4.999)	---	---

Notes. Numbers in parentheses are FCVIF values. AT = attitudes toward the using of gamification; SN = subjective norms; PBC = perceived behavioural control; COM = commitment to using gamification; INT = intention to use gamification; β = beta coefficient; R2 = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < .001$; ** $p < .01$.

Figure 6

The results for the structural model



The structural model was tested. The test results are shown in Table 12. The adjusted R^2 values for the dependent variables indicated that each dependent variable was significantly explained by its respective independent variables. Regression models

use the β value to indicate if the associated independent variable is significantly related to the dependent variable.

Standardising the β value, the higher the β value, the stronger the relationship between the two variables. The hypothesised models are illustrated in Figure 6. In addition, if the hypothesised relationship is significant, a hypothesis is supported, and vice versa. In Table 12, attitudes toward using gamification, subjective norms, and perceived behavioural control explained 79.8% of the variance in intentions to use gamification and 57.7% of the variance in commitment to use gamification.

The adjusted R2 of COM was 0.798, indicating that 79.8% of the variation of COM can be explained, which had high explanatory power. The path coefficient β of AT on COM was 0.451, and $p < 0.05$ had a significant positive effect. The hypothesis was true. The path coefficient β of SN on COM was 0.299 and $p< 0.05$, which had a significant positive effect. It represents that the hypothesis was true. In addition, the path coefficient β of PBC on COM was 0.235, $p < 0.05$; while it had a significant positive effect, the hypothesis was true.

Additionally, the adjusted R2 of INT was 0.577, indicating that COM could explain 57.7% of the variation, which had moderate explanatory power. The path coefficient β of COM to INT was 0.761, and $p < 0.05$ had a significant positive impact, the hypothesis was true.

Since Figure 6 shows the Path Coefficient of each latent variable to dependent variables. It illustrated that attitudes toward using gamification, subjective norms, and perceived behavioural control significantly influenced the commitment to using

gamification for teaching. In addition, attitudes toward using gamification and subjective norms significantly influence the intention to use gamification.

4.1.5 Indirect and total effects

There was a significant indirect effect of commitment to using gamification on the intention to use gamification (β = 0.228, $p < 0.001$). There were also significant effects for subjective norms, perceived behavioural control (β = 0.179, $p < 0.001$), and attitudes towards the behaviour (β = 0.343, $p < 0.001$). The indirect effects of SN, PBC, and AT on intention via commitment were all significant ($p < 0.05$), indicating that the effects of these three variables on the results via the effect of commitment (see Table 13).

Table 13

Results for the indirect effect and p-values of the structural model

Variables	Indirect effect (β)	*p*-values
AT→COM→INT	0.228	< 0.001
SN→COM→INT	0.179	<0.001
PBC→COM→INT	0.343	<0.001

Notes. COM = commitment to using gamification; AT = attitudes toward the using of gamification; SN = subjective norms; PBC = perceived behavioural control; INT = intention to use gamification; β = beta coefficient.

Based on these results, a PLS-based structural equation modelling analysis validates the hypothesis of this study, indicating a positive path coefficient for the

moderating effect. Overall, the quantitative analysis yielded two main results. The first is that attitudes toward using gamification for teaching, subjective norms, and perceived behavioural control can have a significant impact on the commitment to the behaviour, so if wanting to improve the commitment to using gamification for teaching, it can considered starting from the above three variables to interfere. The second is that both AT and SN can directly affect the intention of using gamification for teaching and also need the mediating role of commitment. That is to say, adjusting AT or SN can change the intention of using gamification for teaching. In addition, the results showed that PBC had a significant effect on the INT of using gamification, even changing PBC necessarily affects the INT of using gamification for teaching. At the same time, through the mediating effect of commitment, the INT of using gamification for teaching can be affected.

4.2 Qualitative results & findings

4.2.1 Participants' characteristics

The 22 teachers who participated in the interviews were from primary and secondary schools in Huizhou City. Three males (23%) and nineteen females (86%) made up the qualitative sample, which was drawn from respondents who took part in the quantitative survey. Respondents ranged in age from 24 to 44, with nine respondents aged 20-29 (41%), 11 respondents aged 30-39 (50%), and one 44-year-old (4%) in the 40-50 year age groups. Regarding the teaching years, that is, the time from the

beginning of teaching to the present, 19 teachers accounted for 86% of the teaching time in the range of 1-10 years. Among them, only two teachers had taught for 14 years and 20 years, accounting for 14% of the total number of respondents. In terms of educational level, seven teachers—representing approximately 32% of the total—had a master's degree, while 15 teachers—representing about 68%—had a bachelor's degree. In addition, in terms of grades taught, 10 teachers only taught grades 1-6 in the primary school group, accounting for 45%. There were also 12, accounting for 54.5%, who taught grades 7-9 at the junior high school level. Further, these teachers taught a total of 8 subjects, namely Chinese, Mathematics, English, Geography, Chemistry, History, Physics, and Ethics & Law. The details of respondent information can be found in Table 14 below:

Table 14

Demographic information for teachers

Teacher	Number	Gender	Age	Grade	Education level	Teaching years	Teaching subject
1	A	male	27	8	bachelor	5	geography
2	B	male	32	6	bachelor	8	math
3	C	female	26	4	bachelor	5	Chinese
4	D	female	32	8, 9	master	5	English
5	E	female	27	1	bachelor	5	math
6	F	male	30	9	bachelor	7	chemistry
7	G	female	44	8, 9	bachelor	20	ethics & law
8	H	female	37	9	bachelor	14	English
9	I	female	30	8, 9	bachelor	6	history
10	J	female	28	1	bachelor	4	math
11	K	female	28	3	bachelor	5	Chinese
12	L	female	27	7, 8	master	2	history
13	M	female	32	9	bachelor	7	physics
14	N	female	27	2	bachelor	4	math
15	O	female	37	2	bachelor	14	Chinese
16	P	female	30	7,9	master	3	English
17	Q	female	32	3,8,9	master	6	English

18	R	female	24	1	bachelor	1	Chinese
19	S	female	30	2	bachelor	7	Chinese
20	T	female	28	4,7	master	3	English
21	U	female	27	3	master	3	Math
22	V	female	35	9	master	9	English

4.2.2 Findings of the interviews

As stated earlier, the quantitative research results show that attitudes, subjective norms, and perceived behavioural control affect teachers' intention to use gamification for teaching. Based on this result, to respond to the research question, which is the specific performance of various influencing factors on teachers' gamification teaching intention, through the analysis of the qualitative research results, the overall findings were found to be consistent with the quantitative research results. However, richer viewpoints and practical applications are presented to enrich the whole research and explore the influence of teachers using gamification to teach the intention to show a more comprehensive appearance.

According to the 22 teachers interviewed in this research, 21 teacher interviewees have had experience using gamification in teaching. Before analysing the content of their interviews in detail, the following will list some examples of using gamification in teaching (see Table 15 for more information).

Table 15

Examples of teachers using gamification in practice

Teacher	The practice of using gamification
Teacher C3	Using SeeWo, an online teaching platform, the teacher has used scores and rankings of students doing some exercises.
Teacher E5	In class, the teacher has used the form of group points to make students compete, and sometimes use rewards, such as asking students to sit upright in class, and those who sit upright will get points, and those who raise their hands to answer questions or perform well in class will earn points.
Teacher H8	The teacher has used the pass in the gamification element to let the students master the knowledge, and the points competition ranking makes them more interested in learning.
Teacher I9	Has mainly used two methods. The first, to use some functions on the SeeWo teaching platform to use gamification. The second, to use group competitions or points. Group competitions allow students to complete a task together in groups and finally compare rankings. Points are divided into individual points and group points. In short, they want to motivate students to score more points and be more involved in learning.
Teacher B2	In an activity course, the teaching difficulty of graphic rotation is adopted in a gamified way, that is, grouping them to compare the speed of rotation and rewarding the group that completes the fastest. In the end, students can master it, and students will remember it firmly.
Teacher J10	This teacher has used the online teaching platform and tug-of-war or grouping in the classroom, integrating knowledge in this process and then watching the students' final scores to see their knowledge mastery.

In short, based on the interviews with the teachers, most teachers were found to use gamification to assist teaching with the help of existing functions of the online teaching platform or gamification elements such as group points, competitions, rankings, and rewards. The purpose is to attract students' interest and promote students' mastery of knowledge.

Since the quantitative research results show that teachers' intention to use gamification for teaching is affected by attitudes, subjective norms, and perceived behavioural control, the outline of the interviews was also related to these factors. Moreover, qualitative research was also carried out to address the research problem: the specific presentation of these influencing factors on teachers' use of gamification for teaching.

4.2.2.1 Attitude toward using gamification to teach

First of all, from the analysis of attitudes toward using gamification to teach, the views of some interviewees are shown in Table 16. For this part of the investigation, this study mainly conducted interviews with teachers about whether gamification teaching is useful and whether it is effective. According to their responses, it can be seen that the effect they are mainly concerned about is the teaching effect and students' learning. The teaching effects and students' learning experiences in the context of gamification can be categorized as attitudes, as teacher interviewees expressed their perceptions (known as attitudes) towards the enhanced classroom atmosphere, increased student activity, and the achievement of teaching goals while also noting the positive impact on students' learning enthusiasm, participation, and interest in the content.

For the teaching effect, 11 teacher interviewees proposed that the classroom atmosphere is more active, the students are more active, and the teaching goals can be achieved after using gamification. Regarding students' learning, 15 teacher

interviewees mentioned the help of gamification to students, including improving students' classroom participation, students' attention, and self-learning ability. To sum up, the teachers' attitudes toward the usage of gamification generally stem from worrying about the effectiveness of instruction or student learning. They like using it more or be more dedicated to utilising it, ultimately raising their intention to use gamification if it supports or assists these two features. Some teachers consciously plan to use gamification because they believe it will help students learn. The results of this portion of the interviews align with those of the quantitative data analysis.

Table 16

Themes and sample quotations for the dimensions of attitude towards using gamification to teach

Theme	Meaning	Sample quotes
Teaching effects	The teaching situation when using gamification teaching, such as classroom atmosphere, and whether the teaching objectives can be achieved	" The classroom atmosphere is very active. My feeling is that I think that gamification teaching can improve the enthusiasm of most students, and the expected teaching objectives can be achieved" (T1) " Gamification teaching, first of all, it can improve the atmosphere of the learning classroom" (T2) " When using the new gamification teaching method, I want to achieve the purpose of my class, which is to make students' interest in learning more high-pitched. Then in the process of using these gamification tutorials, I will obviously feel that the children's interest has improved, and then they are also a lot happier. The teaching effect has also improved" (T3) " Gamification teaching can still stimulate students' interest and activate the classroom atmosphere" (T5) " In gamification teaching, the atmosphere of the classroom will be more active, and then the teaching goals can basically be well achieved" (T6) " The boring knowledge will be presented more vividly, and then the classroom form will be more lively and vivid" (T7)

Table 17

Themes and sample quotations for the dimensions of attitude towards using gamification

Theme	Meaning	Sample quotes
Student’ s learning	The enthusiasm and initiative for students to learn, absorb knowledge, and master skills	“ I think it is helpful for students’ study. For example, for students with poor grades, if we give a general lecture, these students are not interested, and they will not listen to the teaching content. However, if you use gamification to teach, they will attend the class and participate in the class actively, which also forms a role in improving the interest of students who do not love learning and mobilising their enthusiasm” (T1) “ From a single class, for the atmosphere of the class, as well as the improvement of students’ attention, it is relatively fast to achieve an effect. And then the students are clearly showing that they are active and interested in participating in the class” (T7) “ It is helpful for students’ learning, because for some children, their concentration in class will not be as good. If you use gamification to teach, you can refocus their attention when they are sometimes distracted” (T3) “ Students are not willing to absorb direct knowledge. Gamification teaching means that he can learn from the elements of the game and enjoy it. That is, he feels that he is playing a game, and then he will not reject learning too much” (T4) “ It's helpful for students. Getting them interested in learning and also increases their motivation” (T5)

A. Teaching effects

According to numerous studies, Schroeder et al. (2007) claimed that teachers' teaching has a significant impact on students' learning (Nye et al., 2005; Rivkin et al., 2004; Wright et al., 1997). In this study, teaching effects meant the teaching situation when teachers use gamification, such as classroom atmosphere, students' performance in class, and whether the teaching goals can be achieved. Furthermore, Wright et al. (1997) claimed that differences in teaching efficiency were discovered to be the predominant factor determining student academic gain. Therefore, based on the above, the effect of teachers' teaching was significant to students.

In the interviews for this study, most teachers mentioned the teaching effect of using gamification. More importantly, in the interviews with 22 teacher interviewees, when they expressed their attitudes about using gamification in teaching, in terms of teaching effects, the main content mentioned were:

- The changes in classroom atmosphere.
- The realisation of teaching goals.
- The students' performance in the classroom.

For example, using gamification for teaching can activate the classroom atmosphere or help them better achieve their teaching goals. The main three points mentioned by the teacher interviewees regarding teaching effects will be analysed in detail and presented in the following.

A1: Classroom atmosphere

Many teacher interviewees mentioned that using gamification for teaching can make the classroom atmosphere more active, mobilise the overall atmosphere of their classrooms, and thus, help their teaching in class (T12, T11, T14, T9, T16). One teacher, for instance, said that:

"When I use gamification for teaching, I can obviously feel more active than in our traditional classroom format." (T12)

Moreover, she added that the classroom atmosphere is entirely different after using gamification for teaching:

"Compared with using traditional teaching method, and the atmosphere of the whole classroom is affected." (T12)

Notably, one teacher interviewee mentioned the importance of control using gamification (T11). Suppose the use of gamification teaching is appropriate. In that case, the classroom atmosphere will become active, and the teaching effect will be improved. Still, if using gamification is not appropriate, it will make the classroom more difficult to control, making it more challenging to maintain classroom discipline.

"Gamification teaching is actually a teaching method that is more difficult to control. When gamification teaching is used well, the classroom's teaching effect will greatly improve, and better results will definitely be achieved." (T11)

Moreover, a teacher interviewee pointed out that she is willing to use gamification for teaching because it can help make the classroom more active (T14).

"I am quite willing to use gamification because using it in class can make the class more active." (T14)

In addition, another teacher interviewee illustrated that using gamification can make the classroom atmosphere better:

"If I use gamification for teaching, the classroom atmosphere will be better…" (T9)

Similarly, one teacher interviewee commented that:

"I like to use gamification in teaching, mainly to mobilise the classroom atmosphere of students…" (T16)

Furthermore, another teacher interviewee added an example of a morality and law class:

"In the course of morality and law, some knowledge may be boring, difficult, and unintelligible for children. If the elements of games can be added, it will be easier for children to understand the knowledge content of the class, and the atmosphere of the class will be more active." (T11)

In addition, a teacher interviewee pointed out that:

"The primary purpose of using gamification is to mobilise the classroom atmosphere of the students in this way…" (T16)

A2: Teaching goal

From the interviews, whether the teaching goal is achieved is an essential part of the teaching effect. Several teacher interviewees stated that using gamification for teaching can achieve their expected teaching goals (T1, T3, T5, T12). For example, one teacher interviewee mentioned that:

"Using gamification for teaching can help me achieve my expected teaching effects and teaching goals." (T1)

He also added which teaching goals are more conducive to the realisation of:

"Especially the goals of students' knowledge and skills, as well as the goals of emotional value." (T1)

One of the teacher interviewees also stated using gamification for teaching can achieve teaching goals, especially in the lower elementary classrooms:

"Instructional goals can be achieved using gamification, especially in lower grade classrooms." (T3)

Similarly, one teacher interviewee illustrated that using gamification for teaching can achieve the intended teaching goal:

"Using gamification can achieve the teaching goal. Although I don't use it daily, it can meet my expectations whenever I use it." (T5)

Moreover, one teacher interviewee stated there is no difference between gamification and traditional teaching to achieve teaching goals:

"Both the traditional teaching method and the gamification teaching method can achieve the teaching goals, and there is no difference in this part." (T12)

In addition, another teacher interviewee made a different supplement. He said that using gamification for teaching can achieve the teaching goal, but it needs to be carefully prepared in advance in the teaching design part before class (T7).

"I can use gamification to achieve the teaching goal, but it needs to be carefully designed and prepared in advance." (T7)

A3: Students' performance in class

According to the interviews, when many teacher interviewees mentioned the teaching effects of using gamification, they would pay attention to and emphasise the impact and changes on students' classroom performance. For instance, one of the teacher interviewees related that more students raised their hands in class because of the use of gamification:

"By using this method of group points competition, it was found that there were significantly more students who automatically raised their hands to answer questions than usual." (T12)

She mentioned the situation of asking questions in class when she used traditional teaching methods:

"*I usually ask a question; there is no such way of linking rewards or points. Without using this kind of gamification element, maybe only two or three students will raise their hands automatically and voluntarily."* (T12)

However, she clarified that students' performance changed in the classroom when she used gamification:

"But if I propose to use the group points ranking to conduct this class, I will find that the students in this class will rush to answer the questions. After I came up with a question, many students who wanted to answer raised their hands like a reflex, very fast." (T12)

Moreover, one teacher interviewee also emphasised that gamification is very effective and useful in improving students' attention in class:

"Gamification is still very useful for middle school and primary school students. They will concentrate a lot in class, and the teaching effect will be improved. Otherwise, they can easily get distracted." (T8)

Meanwhile, a teacher interviewee mentioned that using gamification for teaching can also allow students to participate more in class:

"If I use gamification for teaching, more students will be involved in the interaction…" (T9)

Furthermore, one teacher interviewee claimed that she is willing to use gamification for teaching because it can help make the classroom more active and involve students:

"The whole class is relatively active, and the children are very active in participating." (T14)

Additionally, another teacher interviewee pointed out that students be more active in class after using gamification:

"When I use gamification, the students are very active and happy expressing themselves." (T1)

B. Students' learning

When students actively participate in what they are learning, they tend to comprehend more, pick up more information, remember it longer, enjoy it more and be better able to see the connection between what they have learned and their daily lives (Park, 2003). Thus, for students, more active participation in learning will help them absorb knowledge and master skills better. The development of a stable adjustment in stimulus-response relationships as a result of functional contextual interaction via the senses is known as learning (Lachman, 2010). Hence, the definition of students' learning is the desire and drive of students to learn, comprehend, and acquire skills.

Some of the above sample answers are more concerned about the teaching effect on teachers' attitudes. In addition, eight teachers mentioned that they view gamification teaching from the perspective of students' learning. Regarding student learning, the teacher interviewees paid the most attention to four aspects: students' interest, students' participation, students' enthusiasm for learning, and students' attention. Next, based on the four aspects mentioned by the teacher interviewees, this section will analyse the student's learning and the attitudes that affect teachers' use of gamification.

B1: Students' interest

Many teacher interviewees are using some classic elements of gamification to teach, such as scores and rankings, group competitions or rewards, etc. These ways can increase students' interest in learning, especially in class. They showed a higher interest

in learning and further contributed to their learning. For instance, one teacher interviewee mentioned that:

"I think it is very helpful for students to study. Students will be very interested in the content." (T8)

Moreover, one of the teacher interviewees mentioned that gamification can enhance students' interest in learning, especially for younger students at the elementary school stage:

"When it comes to gamification, if it is aimed at younger students, that is, at the primary school stage, to improve their interest in learning…" (T17)

In addition, one teacher interviewee stated that she is willing to use gamification teaching because of the benefits of gamification on students' interest in learning:

"I use gamification to mobilise children's enthusiasm, especially to improve the learning interest of some underachievers." (T18)

Moreover, another teacher interviewee claimed that gamification is particularly helpful in improving the learning interest of underachievers:

"The use of gamification also plays a role in improving the interest of underachievers." (T1)

He also added a practical example:

"For example, there is a student whose grades are inferior. If we teach in a regular way, these students will also have poor grades and will not be interested in

learning. If he is not interested, he will not listen to the class seriously, but if you use gamification for teaching, he will also participate in the course." (T1)

Furthermore, one teacher interviewee illustrated that using gamification to mobilise the interest of younger students:

"I usually use gamification to mobilise the interest of children…" (T7)

In addition, another teacher interviewee supported the same perspective:

"We use gamification methods in our teaching process and let students stimulate some of their interests in the classroom." (T3)

Meanwhile, another teacher interviewee mentioned that she uses gamification to raise the interest of students:

"I use gamification for teaching when students need to be interested in it." (T5)

It is noticeable that one teacher interviewee pointed out that using gamification can improve the competitive interest of students:

"For children, for students, it is still relatively binding, or it can improve their interest in competing." (T19)

B2: Students' participation

According to the interviews, students' participation in class is an essential part of their learning. The more students participate, the more engaged they are in learning, which is conducive to their learning. Many teacher interviewees mentioned that using gamification for teaching is beneficial to students' learning because it can greatly

improve students' participation in class, allowing them to be more involved in learning and better absorb knowledge. For example, one teacher interviewee claimed that:

"Using the method of gamification, relatively speaking, the degree of participation of students in the whole class will be improved…" (T12)

She also added that increasing student participation can facilitate student-centered classes:

"Using it (gamification) can achieve the form of what we call student-centred, and student's participation in the classroom is greatly improved." (T12)

Moreover, she illustrated that another benefit of using gamification is that it can improve students' self-learning ability:

"And the students' self-learning ability is constantly improving in the classroom, which is a gamification classroom…" (T12)

In addition, one teacher interviewee illustrated that:

"It definitely works because the students are happy; they feel a lot more engaged and are more willing to participate in the class…" (T6)

She also added that using gamification can help students learn new knowledge more actively:

"It is also helpful for their learning, because through gamification, students will be more willing to learn new knowledge, and they will be more impressed by active learning." (T6)

Similarly, another teacher interviewee supported the same view by saying:

"If it is gamification, children will be happy to participate…and it can enhance their sense of participation in the classroom…" (T15)

Moreover, she emphasised the necessity of using gamification in lower-grade classes:

"Like our lower-grade Chinese, we often need to learn literacy, which is often learned through recognition and reading. But if it is just repeated mention and reading, for students, this kind of classroom link is very dull, and the learning form is also very boring." (T15)

She also added a practical example in her Chinese class:

"You can use gamification, such as letting them participate in role-playing and scoring points. That is, one person at the same table will be the observer, and the other will be the reader, and then the observer will give him a score after the reader finishes reading." (T15)

Furthermore, one teacher interviewee mentioned that:

"Gamification is useful, allowing students to participate more actively in classroom activities." (T9)

In addition, she added that students' participation has increased, and there will be more interactions, which can help their learning in class. She related that:

"There will be more interactions because students will be more willing to participate and feel that this kind of gamification teaching may have a more relaxed and happy atmosphere." (T9)

Moreover, another teacher interviewee commented:

"It is useful mainly because it makes class participation more intense…". (T22)

B3: The learning enthusiasm of students

According to the interviews, most teacher interviewees stated that the attitude of using gamification is closely related to students' learning situation. That is to say, the teacher interviewees feel that gamification can benefit students' learning, and increase their intention of using gamification. The enthusiasm of students to learn is an essential part of students' learning, so many teacher interviewees mentioned the enthusiasm for learning. For example, one teacher interviewee reported that:

"Gamification can further mobilise children's enthusiasm for learning…" (T21)

Moreover, a teacher interviewee illustrated that using gamification would increase students' learning enthusiasm and make students more active in learning:

"Using gamification for reading will increase students' enthusiasm for reading and make them more active in learning." (T15)

Furthermore, a teacher interviewee commented on the other benefits of improving students' learning enthusiasm:

"I like to use gamification in teaching, ….to improve their enthusiasm for learning, and then create a compelling competitive environment." (T16)

Meanwhile, another teacher interviewee supported the same opinion and added that it is beneficial to some underachievers of students:

"I use gamification to mobilise children's enthusiasm, especially to improve the learning interest of some underachievers." (T18)

B4: Students' attention

From the interviews, teacher interviewees mentioned that students' attention plays a crucial role in student learning because students can absorb the knowledge and skills more effectively when they concentrate in class. Therefore, among the attitudes stated by teachers about using gamification for teaching, students' attention to learning is also very influential. For example, if students concentrate more after using gamification, they will have a stronger intention to use gamification.

As one teacher interviewee illustrated that using gamification for teaching can attract students' unintentional attention:

"Using gamified teaching can attract students' unintentional attention and then improve their learning efficiency." (T2)

He also added an example for using gamification in Math class:

"For example, I taught an activity course on graphics rotation. Then, when we rotate, we can use gamification to attract student's attention and let students grasp

the direction of rotation. At that time, students remembered impressively, and it was challenging to forget." (T2)

Moreover, a teacher interviewee mentioned that gamification is useful for attracting students' attention, especially for lower-grade students:

"Gamification can help lower-graders focus more on one of their classes and improve their interest." (T3)

Furthermore, another teacher interviewee pointed out that compared with direct teaching method:

"Some younger students need to learn through gamification because direct teaching cannot attract the child's attention, and gamification teaching can let him learn from it." (T7)

Meanwhile, one teacher interviewee supported the same view by saying:

"With gamification, it is easier for students to focus, and their concentration is much better." (T8)

Additionally, another teacher interviewee commented that:

"Through gamification, the students enjoy it, so they are more engaged in the class. When they are all involved in the class, their concentration will definitely be improved…". (T11)

Moreover, a teacher interviewee illustrated that first-grade students need to be more attentive so she would like to use gamification:

"…the first-grade children have less self-control, and in a class of 40 minutes, they cannot fully focus on your class. Therefore, teachers still need to take some measures to make them more attentive." (T10)

In conclusion, the attitude of the interviewed teachers to use gamification mainly comes from the concern of teaching effect or student learning. If it helps or promotes these two aspects, they will enjoy using it more or be more committed to using it and finally increase their intention to use gamification. There are also teachers who directly intend to use gamification because she finds that gamification is beneficial to students' learning. The findings of this part of the interview results are consistent with the quantitative data analysis results. It shows that this part of the findings not only supports the quantitative research results that the attitude towards using gamification affects the intention to use gamification through the mediating effect of commitment, and that attitude directly affects the intention to use gamification but also provides a richer demonstration for the whole part. Furthermore, many studies have confirmed that gamification can motivate students' learning (Sebastian, 2012; Kapp, 2012; Glover, 2013). And according to the answers of teacher interviewees, it can be found that if the teaching method can improve student learning, it will positively affect teachers' attitudes towards the use of gamification.

4.2.2.2 Subjective norms

From the perspective of subjective norms, it can be seen from the interviews of teachers that most teachers are mainly affected by external factors. There are three aspects mentioned most, the first is the school's policy or the requirements of the superior leaders, and the second is the teaching content, the third is the grade they taught. In addition, the thirteen teachers interviewed all said that the influence among colleagues is feeble, which also shows that the leading role among colleagues does not promote or hinder teachers' gamification teaching. School policies and school leaders will have a particular impact on teachers' teaching work and are also part of the social pressure they feel (Bao, 2018). Leadership willingness is out of the teachers' control and they have no influence over leadership willingness. All of the above categories have an influence on a teacher and the environment that they are in. The teachers will encounter pressure to follow the school management and the environment they are in. For teaching content, here is more refer to teaching syllabus and curriculum. Moreover, teachers have no control over the teaching curriculum and syllabus, and that is why teaching content placed under the category of subjective norms. Additionally, teachers are unable to change the social pressure where students need to attend the public examination. For example, the sixth grade of elementary school and the second and third grades of junior high school all need public examinations. These are things that teachers cannot change and are also part of the social norms they perceive. That is the reason this also falls under the subjective norms category.

Therefore, this part will analyse the three themes most frequently mentioned by teachers from the interview results, the specifics will be expanded in the following table (Table 18) and analysis.

Table 18
Themes and sample quotations for the dimensions of subjective norms

Theme	Meaning	Sample quotes
School’ s policy	The school’ s policy, including schoolleadership, regarding the use of gamification, whether to encourage or oppose it;	“ Our school’ s policy does not have very specific regulations on the use of gamification, but as long as it is helpful for teaching, schools are encouraged and supported” (T1) “ In the case of gamification teaching, schools are encouraged and generally supportive” (T4) “ The school is very encouraging because, with this kind of gamification teaching, it can really help students, and then there is a good sense of atmosphere in the classroom” (T3)
Teaching content	The content of the teacher’ s class and the teaching progress and goals	“ Sometimes in a class in the afternoon when the atmosphere is relatively dull when the students who have just come to the class are not excited enough, I will use it to mobilise the atmosphere” (T11)
Teaching grade	Grade taught by the teacher	“ I teach first-year students to use gamification just to mobilise the atmosphere of the classroom” (T10) “ As a teacher of senior grades, I don't use gamification too much, because I may focus more on students’ academic performance and their entrance exams” (T2)

A. School's policy

The collection of expectations for a particular behaviour and standards inside a school is referred to as school policy. School policies are put in place to guide the day-to-day functioning of the school as well as to make it a safe and effective place for learning to occur (Google search.com). In this research, the school's policy, including school leadership willingness, regarding the use of gamification, whether to encourage or oppose it. In the interviews, a total of 11 teachers mentioned that the school's policies have a significant impact on their use of gamification. Specifically, they are instructions or encouragements from leaders, and formal policy guidance (on using gamification) in school. In addition, a science teacher mentioned that the teachers of the school's physical and physical science courses often use gamification in teaching. These are the specific manifestations of subjective norms affecting teachers' use of gamification in teaching.

A1: Formal guidance on using gamification

During the interviews, many teacher interviewees mentioned that their school did not have clear instructions on using gamification. Still, school officials encouraged teachers to use gamification as an innovative teaching method. In other words, even though many teachers have yet to receive official guidance from their schools on using gamification, they all said that the official guidance from their schools plays a vital role and will directly affect their intention to use gamification. In addition, some of the interviewees also mentioned that they hope to receive official guidance from their school on using gamification, saying that this will also encourage them to use it more.

In short, for teacher interviewees, whether it is clear official guidance from their school or general opinions and directions in the absence of official guidance, it is part of the school policy. This subjective norm is an essential factor affecting teachers' intention to use gamification for teaching.

As one teacher interviewee claimed that the school do not have clear guidance on using gamification:

"Our school's policy does not have very specific regulations on the use of gamification…" (T1)

However, he added that the school still has an open and accessible attitude. As long as it is helpful to teaching, the school will promote:

"But as long as it is helpful for teaching, schools are encouraged and supported…" (T1)

In addition, another teacher interviewee mentioned that the school encourages teachers to use gamification for teaching:

" The school is still encouraging…" (T5)

Moreover, she explained that the school will also hold some symposiums to encourage teachers to use innovative teaching methods:

"The school sometimes holds some teaching seminars, advocating our teachers to use more innovative teaching methods, saying that gamification is used a lot in elementary school…" (T5)

Furthermore, one teacher interviewee illustrated that the school encourages teachers to use innovative teaching methods such as gamification, especially for teachers of some specific subjects:

"The school encourages some technical teachers to use this relatively new teaching method, and those teachers of the main subject should also use it…' (T6)

Additionally, a teacher interviewee claimed that their school supports it and concluded some teaching examples on using gamification by saying:

"…the school supports it. They must have studied it or concluded it based on many teaching examples…" (T9)

Meanwhile, another teacher interviewee pointed out that their school does not have a clear policy on using gamification

"No school policy clearly states gamification…" (T14)

A2: Leadership willingness

In the interviews with teachers, it was evident that school policies greatly influence their use of gamification in teaching, and the views and opinions of school leaders or their superiors on their use of gamification are particularly important. If school leaders encourage and support them to use gamification, they will be more willing to use it in teaching.

As one teacher interviewee mentioned that school leader encouraged teachers to use innovative teaching methods:

"School leaders also support innovative teaching methods, so our teachers can be bold and free to use gamification." (T1)

Teacher interviewees also stated that school leaders encourage them to use all teaching methods helpful for student learning:

"The school currently encourages teachers to use gamification because school leaders believe they support any teaching method that helps students learn." (T9)

Meanwhile, another teacher interviewee claimed the same opinion by saying that:

"…the school supports teachers using gamification in teaching…" (T14)

Furthermore, a teacher interviewee emphasised the significance of leadership willingness:

"The influence of policy and leadership is significant, and they are also very supportive, so we all like to use it." (T14)

Additionally, a teacher interviewee pointed out that:

"Regarding the opinions of policies and leaders, they must favor this kind of gamification teaching…" (T15)

Another teacher respondent said their school leaders support using gamification, especially for teachers teaching younger age groups:

"…the leaders will also agree with this teaching method, and our teachers in the lower grades generally like to use it." (T15)

Moreover, a teacher interviewee mentioned that their leader supported them in using gamification in class:

"The leaders still advocate this kind of gamification class…" (T18)

Furthermore, a teacher interviewee mentioned that their school leader supported teachers using gamification:

"Everyone supports it because it can bring better results, so everyone is more willing and supportive of this aspect of work…" (T16)

B. Teaching content (teaching syllabus)

The ideas and resources covered in a course are referred to as teaching content. It often includes a syllabus, course objectives, and learning outcomes. Any informational content, such as assigned readings, videos, exams, and other learning resources, is necessary for participation or comprehension (UC Berkerley.com). The teaching content means the subject matter covered in class and the teacher's progress and objectives in this study.

Meanwhile, four interviewed teachers mentioned that they all intend to use gamification teaching because of the needs of teaching content, such as the teaching schedule of the schools and course objectives.

B1: The teaching schedule of the schools

According to the interviews, many teacher interviewees mentioned whether their school's teaching schedule would affect their intention to use gamification for teaching. Since the schools have an overall teaching schedule for each semester, teachers will arrange teaching according to this overall schedule. Therefore, if they

want to use gamification for teaching, they might also consider whether it can adapt to the school's overall teaching schedule.

For example, a teacher interviewee mentioned that she might not use gamification frequently because of teaching time and contents:

"In fact, gamification is basically used in teaching, but due to the influence of class time and some content factors, the frequency of use may not be high." (T11)

Moreover, a teacher interviewee claimed that the teaching requirement and teaching schedule influenced him to use gamification:

"Generally speaking, it is a teaching requirement, which means the teaching schedule in our school…" (T1)

Meanwhile, he added that if the teaching time and overall schedule do not allow it, he would choose the teaching method of direct explanation:

"If the course needs to be rushed… or if there are not enough class hours, I will choose to speed up the progress, and I will choose to use a teaching method that focuses on direct explanation." (T1)

Furthermore, another teacher interviewee illustrated that:

"Some teachers feel that using gamification may affect their overall teaching progress…" (T2)

Additionally, a teacher interviewee claimed that the influence of course progress and teaching schedule:

"The biggest difficulty is the problem of course progress, which is the specific stage to which we should complete the goal of one week's class…" (T5)

B2: Curriculum (course objectives)

In the answers of many teacher interviewees, they all mentioned that they would be willing to use gamification for teaching because of the needs of course objectives. These course objectives require innovative teaching methods and creating an atmosphere in open classes. For instance, a teacher interviewee stated that:

"If it is a course that requires gamification for teaching, I will still specially design some courses that require using gamification for teaching." (T2)

Moreover, one teacher interviewee illustrated that she would use gamification in large-scale open class:

"Generally speaking, it will be used in large-scale classes like open class competitions…" (T3)

Meanwhile, one teacher interviewee supported the same opinion by saying that:

"If we are taking regular classes, if we are taking open courses, or classes with competitions, we must consider gamification for teaching…" (T3)

In addition, a teacher interviewee mentioned that she wanted to use gamification to increase student interest:

"When using the new gamification method, I want to achieve the purpose of my class, which is to make students' learning interest more high-spirited…" (T3)

Furthermore, another teacher interviewee stated that he would like to use gamification because he wanted to attract students' attention:

"Some younger students need to learn through gamification because traditional teaching methods cannot attract children's attention. In this situation, I would use gamification for teaching." (T4)

Additionally, one teacher interviewee illustrated that using gamification to attract students:

"Generally, it is used more in the beginning courses, once every two or three classes, because it needs to attract students." (T6)

Moreover, a teacher interviewee pointed out that the influence of using gamification:

"It is still used a lot, and every teacher basically uses it, especially when they want to mobilise the atmosphere of the classroom…" (T8)

Furthermore, she also added an example by saying that:

"For example, sometimes in a class in the afternoon when the atmosphere is relatively dull when the students who have just come to the class are not excited enough, I will use it to mobilise the atmosphere." (T8)

In addition, another teacher interviewee mentioned that using gamification depends on course objectives and content:

"Some teaching content is suitable for use, and it is helpful. However, some teaching content could be ideal for using gamification in teaching, so I will not use it. It depends on course objectives and content." (T9)

Moreover, one teacher interviewee supported the same perspective by saying:

"*Completing teaching content and teaching objectives and integrating gamification elements and course content is crucial in influencing me to use gamification."* (T21)

As one teacher interviewee reported that different course goals for senior students will affect his willingness to use gamification:

"The goal of the senior class may be more inclined to the teaching of knowledge, the output of knowledge…, so it will not be inclined to the teaching of gamification and entertainment." (T4)

She also added that she would be quick to use gamification if there was no need for exams.

"If exams are approaching and I need to teach some revision lessons or mock exams, I definitely do not use gamification…" (T4)

C. Teaching grade

Grade refers to the stages in the school according to students' years of study. For example, the current school system in mainland China generally stipulates that the duration of primary school education is six years, and schools are divided into six grades; the course of junior high school education is three years, and schools are divided

into three grades. The first academic year for a student is the first grade, the second academic year is promoted to the second grade (Baidu Baike.com). Based on these, the definition of teaching grade here refers to the different years of study of students taught by teachers. According to the answers from the teacher interviewees, they all pointed out that their willingness to use gamification is often affected by the grades of the students they teach. Whether the students are about to take public exams is very important, especially for middle school students (grades 7 to 9). A few teacher interviewees pointed out that the factor affecting their intention to use gamification was the grade they were teaching. For example, gamification was used less when teaching upper grades and more used when teaching lower grades. Additionally, some teacher interviewee pointed out the significant influence of public examinations. If students are closer to public examinations, they will choose traditional teaching methods more because they may be more time-controllable.

C1: Public examination

Many teacher interviewees mentioned that they may not be strongly willing to use gamification because students are about to take public exams or there is a certain amount of teaching pressure from entrance exams.

For example, one teacher interviewee stated that he will be less willing to use gamification as the exam approaches.

"…if the exam needs to be taken as soon as possible…" (T1)

One teacher interviewee demonstrated that teachers are facing the pressure of public examinations especially for senior grades:

"…we all face the influence of the pressure of further education, especially when we teach senior grades, senior students have to take entrance examinations…" (T2)

Moreover, she also stated that some teachers think using gamification might influence their teaching progress:

"…Some teachers feel that the use of gamification may affect their teaching progress…" (T2)

As another teacher interviewee came up with the similar opinion by saying:

"…as a teacher of senior grades, I do not use gamification too much because I may focus more on students' academic performance and their entrance exams." (T4)

Meanwhile, one teacher interviewee claimed that he would use gamification less when students need to take public examination:

"Sometimes, when students want to take the high school entrance examination, they may have to add a lot of practice tutorials or review classes so that gamification will be used less." (T17)

Furthermore, another teacher interviewee pointed out that public examination brings certain pressure to teachers' teaching progress:

"There are exam tasks, which are tasks related to teaching progress, which will put a certain amount of pressure on me…" (T19)

C2: The grades of students

From teacher interviewee responses, they also mentioned that the grade level they teach affects their intention to use gamification. For example, teachers who teach senior students may have more intense teaching schedules, and using gamification for teaching will consume less teaching time. In contrast, students in lower grades need gamification to attract their attention and adjust the classroom atmosphere.

One teacher interviewee demonstrated that she would want to use gamification to mobilise the classroom atmosphere in first-grade classes.

"I teach first-year students to use gamification just to mobilise the classroom atmosphere…" (T10)

He also added the specific reason for using gamification by saying:

"Because I teach first-grade children, they are relatively young and very suitable for gamification." (T10)

Similarly, one teacher interviewee pointed out the significance of using gamification for younger students:

"For younger children (such as grade 1-grade 3), using gamification for teaching will be even more significant." (T3)

Moreover, a teacher interviewee mentioned that third-year students were enthusiastic about gamification:

"Third-grade children love to play, and everyone is enthusiastic about gamification…" (T11)

Additionally, another teacher interviewee described that second-grade students enjoy the competitive element of gamification:

"We are teaching lower grade students, second grade now. The kids are younger, so they have a certain sense of competition…" (T18)

She added the internal connections and functions by saying:

"So using gamified competitive elements, they are more willing to do it, and it can also motivate them to learn." (T18)

From the answers of these teacher interviewees, it shows two situations. One is that senior students are facing the pressure of further education. They have more knowledge courses to learn, and the teaching progress is relatively tight. In this case, the teachers may be biased towards traditional teaching, with no strong intention to use gamification. Second, when teachers are facing lower-grade students, especially young children, who need more interesting teaching methods to improve their concentration. At this time, teachers will want to use gamification to assist in teaching. This may reflect an external factor in the subjective norm, i.e., the grades of students and public examination, which can influence teachers' intention to use gamification.

4.2.2.3 Perceived behavioural control

For teachers using gamification to teach, there are four main aspects that summarise their perceived behavioural control. These aspects are the difficulty of use, workload, teaching effect, and training situation. The difficulty of use means that they

use gamification for instructional design and preparation difficulty, and difficult to use gamification in the classroom. The workload is whether to increase the workload, lesson preparation time, and overall workload after using gamification. Teaching effectiveness is mainly concerned with the change in the effect of using gamification compared to traditional teaching. Training refers to whether teachers have participated in gamification-related training before and their willingness to participate in the future. Since perceived behavioural control is the perceived difficulty of doing something. If teachers find it difficult to use gamified teaching in the classroom, their perceived level of using gamified teaching will decrease, and ultimately their intention to use gamified teaching will weaken. When teachers perceived that their workload will increase with the use of gamification, the level of their perceived behaviour control level will decrease, and it will likely cause them not to use gamification and their intentions to use gamification will decrease. Moreover, if the teachers perceive that using gamification will improve their teaching effectiveness, they will be more open to using and implementing gamification. And their perceived behaviour control level will increase. And then strengthen their intention to use gamification for teaching. Furthermore, the teachers expressed an increased intention of using gamification if the teachers could receive systematic training for gamification. The teacher interviewees reported that they would feel it would be easier to use gamification and therefore their perceived behavioural control level increased. Finally, it can strengthen their intention to use gamification. This is why these four aspects would be categorized under the PBC.

Table 19

Themes and sample quotations for the dimensions of perceived behavioural control

Theme	Meaning	Sample quotes
Difficulty to use	Refers to the difficulty of teachers using gamification to teach	" If you want to choose a gamification method that complements the teaching activities, it is still a bit difficult" (T7) " The initial stage will be more difficult" (T9) " The kind of gamification that progresses every day may be more difficult to design" (T8)
Workload	The use of gamification in teaching increases lesson preparation time or make instructional design is more complex	" Even if it is used well sometimes, it still takes a lot of time. It really takes a lot of work to do it well" (T8) " It' s a little bit more work because sometimes it needs to be designed a little more, and sometimes it' s a little less" (T10)
Teaching effectiveness	Compared with traditional teaching methods, the teaching effect of teachers using gamification	" Traditional learning is mainly based on teachers. Teachers say that students are passively learned. With this gamification, I think the protagonist is handed over to the students" (T6) " The atmosphere in the classroom can be enlivened, and then the students can be relaxed" (T3)
Training participation	Teachers' participation in gamification-related training and their willingness to participate	" I have not participated in any special professional training. If there is the training I would like to attend, I am happy to learn" (T1) " I still want to take part in more professional training" (T6)

A. Difficulty to use

Difficulty refers to how easy it is to complete an item, and "difficulty to use" guides how difficult it is to use something. Difficulty to use means the challenges teachers face while using gamification to teach in this research. When talking about what makes teachers feel more relaxed and comfortable using gamification, several teacher interviewees mentioned that when they are thinking about whether to use gamification, the difficulty of using it is significant. A teacher interviewee mentioned that she needs help understanding gamification, and it is difficult to use gamification, so she does not intend to use it. Some teacher interviewees also reported that she finds it difficult to use gamification, precisely because she needs to learn how to organically combine gamification with course content, so the difficulty of use will affect her intention to use gamification. The following are the details and analysis of their elaboration.

In terms of difficulty of use, based on the teacher interviewee responses, there were three main areas in which they talked about the difficulty of using gamification. The first concern is that using gamification will lead to a loss of discipline in classrooms, especially in lower grades. The second is the difficulty in instructional design, such as the gap between ideas and implementation. The third reason is that due to the limitation of teaching experience, teachers with rich experience in using gamification will be more comfortable using it. In contrast, teachers with less experience using gamification will find it more challenging.

A1: Discipline in the classroom

Several teacher interviewees mentioned that they sometimes worry that using gamification in the class will lead to losing discipline because younger students can be particularly excited. For example, one teacher interviewee stated that she concerns the discipline after using gamification:

"If you use gamification for teaching, the classroom may get out of control. Especially in lower-grade classrooms, discipline can quickly get out of control..." (T2)

Moreover, a teacher interviewee demonstrated that some students are overly motivated when using gamification.

"Sometimes, students are overly motivated by gamification. They are so excited. Then, the discipline may get out of hand." (T3)

One teacher interviewee stated that she needed to increase her focus and attention to classroom discipline when using gamification.

"I need to pay great attention to how to control classroom discipline in class…" (T11)

A2: Difficulty of instructional design

At the same time, many teacher interviewees mentioned difficulties they face in instructional design, such as wanting to use gamification but needing to know how to design it. Or they do not know how to create gamification according to the characteristics of different students.

For example, one teacher interviewee claimed that he does not know how to design the gamification in teaching:

"I really do not know much about gamification teaching, and I do not know how to design it…" (T5)

As one teacher interviewee demonstrated that since she was unfamiliar with gamification, she could not implement her ideas well.

"I have the initial idea of using gamification by myself, but I am not particularly good at using gamification, so many of my ideas cannot be implemented." (T3)

In addition, one teacher interviewee expressed the difficulty of designing gamification based on student characteristics.

"It is challenging to design teaching based on the characteristics of students and the teaching content…" (T6)

One teacher interviewee said that using gamification is difficult in terms of design if it requires constant innovation.

"If you develop it by yourself, you will encounter technical limitations and thematic limitations, and you will encounter such difficulties." (T7)

One teacher interviewee explained that gamification needs to consider student participation and the achievement of teaching goals, and this process requires a certain amount of thinking time.

"The design requires ingenuity to balance children's participation and whether it can achieve its teaching goals. This process requires more thinking…" (T11)

Another teacher interviewee said that the time to use gamification should also be well-controlled.

"You need to control the timing of gamification yourself or design it better…" (T13)

A3: Teaching experiences

Some teacher interviewees mentioned that the intention to use gamification also relates to the teacher's teaching experience. For example, teachers with rich teaching experience may be more proficient in gamification because they have more mastery of different students. Teachers with less teaching experience may be unable to control gamification well because they are not skilled in grasping the classroom.

For example, one teacher interviewee mentioned that she often has initial ideas for using gamification but is consistently unable to implement her ideas well due to her lack of teaching experience.

"Sometimes I have the initial idea of using gamification by myself, but I am not particularly good at using gamification, so many of my ideas cannot be implemented…" (T3)

She also added that some teachers who are experienced in using gamification will be more comfortable using it.

"…there are still some teachers who are good at these gamification applications, and they will also use it in a normal teaching process." (T3)

Moreover, another teacher interviewee supported the same perspective by saying:

"if you are a novice teacher, it may be more difficult…" (T4)

She also said that more experienced teachers could use gamification easily.

"Conversely, for some teachers who may be a little bit familiar with gamification and have rich teaching experiences, it would not be difficult." (T4)

B. Workload

The workload is the actual work task or achievable work task (Wikipedia.com). The workload in this study refers to the workload of the teacher's teaching, including his teaching tasks and the total task load of working in the school. In the interview, when teacher interviewees talked about whether the use of gamification in teaching would increase the workload and affect their intention to use, most of them mentioned that using gamification sometimes requires more time in instructional design and course preparation, but not all of them think it will increase workload. Whether to increase the workload is also on a case-by-case basis. For example, some of them said that using gamification in the open class will not increase the workload because the open class itself requires more preparation time. In addition, some teachers say that using gamification will only take more time to prepare when you are not very skilled and accustomed to using it at the beginning, which may increase the workload. But as long as you use it a few times and get a better grasp of gamification teaching, it will not increase the workload. At this time, they will prefer to use gamification and have a

stronger intention to use it. According to their interviews, the workload they mentioned after using gamification mainly focused on two aspects. The first aspect is the pre-class preparation using gamification, and the other aspect is the frequency of using gamification. That is, if you use gamification more, the workload will increase, but if you use it less, you will not feel the increase in workload.

From these, it can be seen that the workload of teaching using gamification is sometimes increased and sometimes not, and when teachers feel that the workload of using gamification will not increase, their perceived behaviour is well controlled, and they are more committed to or prefer to use gamification, and finally have a stronger intention to use it.

B1: Preparation before class

Several teacher interviewees suggested that using gamification sometimes increases their workload, which is reflected in the fact that they need to do much preparation before class, which takes a certain amount of time.

For example, one teacher interviewee mentioned that using gamification needs much time to prepare in advance:

"It depends on the specific class. Using gamification for teaching every class will increase my workload because a lot needs to be prepared in advance." (T1)

As one teacher interviewee supported the same opinion by saying:

"It takes a while. Before class, I might think of ways to think or design…" (T4)

She also added that using gamification takes much time for preparation:

"It takes much time to prepare gamification lessons…" (T4)

Moreover, another teacher interviewee demonstrated that it is not ideal for front-line teachers to prepare a lot before class:

"Our daily work could be more convenient for our front-line teachers, and it may not be possible to carry out gamification for teaching on a large scale." (T5)

Furthermore, one teacher interviewee mentioned that sometimes she would like to use it, but preparation takes too much time:

"Even if you need to use it well sometimes, preparing before class still takes much time..." (T8)

Meanwhile, a teacher interviewee claimed that the preparation of using gamification will increase the workload.

"If you use gamification, it needs more preparation time, and the workload will definitely increase…" (T6)

One teacher interviewee mentioned that gamification must be well integrated with teaching objectives and that pre-class preparation and design require much time.

"It still takes time to design and arrange in advance, in order to integrate gamification and teaching goals well…" (T12)

In addition, another teacher interviewee said that because he is only a subject teacher and not a head teacher, he will have more time to prepare and design gamification.

"The design may be because I am just a subject teacher, so I should have time..." (T13)

He added that the head teachers are busy and may need more preparation time.

"But if it is other teachers who are head teachers or other teachers with different positions, they may have little time." (T13)

B2: Frequency of using gamification

According to the teachers' interviewee answers, it can be found that they mentioned whether gamification would increase their workload and the frequency of using gamification many times. In other words, if gamification is always used, it will increase the workload if used frequently; if used infrequently, it will not increase the workload.

As one teacher interviewee demonstrated, if he were to use gamification frequently, his teaching burden would increase.

"If you let me use gamification in teaching all the time, it will indeed increase my teaching burden." (T1)

Moreover, one teacher interviewee mentioned that she does not have enough time to apply gamification in every class because the teaching design needs time.

"If I have to apply it in every class, I may not have enough time to design new gamification links…" (T3)

Another teacher interviewee explained that he would feel tired if he used gamification frequently and would feel more relaxed if he used it less.

"It depends on the frequency and time of use. If you use it more, you will be more tired. If you use it less, it will be fine." (T14)

These show that the workload of teaching using gamification can sometimes increase and sometimes not and that when teachers believe the workload will not increase, their behaviour is perceived as being well-controlled, they are more committed to using gamification or prefer it, and finally, they have a stronger intention to use it.

C. Teaching effectiveness

The teacher effect is the discernible impact a specific instructor has on the results of his or her students throughout a specific academic year (kennedykrieger.org). It has been asserted that numerous research papers showed that there is a connection between teachers' effectiveness and pupils' academic progress. In general, effective teaching and teacher effectiveness has been defined in specific instructional strategies (e.g., Kemp & Hall, 1992; Taylor et al., 1999). For instance, an effective teacher might use organised teaching techniques (Kemp & Hall, 1992). Effective teachers frequently take satisfaction in having great interactions with their students both within and outside of the classroom, giving timely feedback, and promoting group work among students (Hammer et al., 2010). It is obvious that there are various operationalisations of effective teaching or teacher effectiveness.

In this study, teaching effectiveness has mainly focused on the teaching effect produced by teachers in the process of using gamification to teach, including students' classroom participation, teacher-student interaction, classroom atmosphere, and other

content in the teaching process, especially compared with the difference when using traditional teaching methods.

From the perspective of teaching effectiveness, compared with traditional teaching methods, most teachers affirm the benefits of gamification for teaching. For example, it improves the subjectivity of students, adjusts the classroom atmosphere, and increases the interaction between teachers and students and student-to-student. These benefits also increased their perception and promoted their greater commitment to using gamification for teaching. Finally, it also enhances their intention to use gamification.

C1: Students raising their hands in class

When discussing teaching effectiveness, several teacher interviewees mentioned that gamification can engage students in class more. For example, they will be more willing to raise their hands to answer questions.

One teacher interviewee stated that students raise their hands voluntarily in class after using gamification.

"In the form of gamification, the number of students who voluntarily raise their hands will increase, and the opportunities for you to communicate with different students will increase." (T12)

Moreover, another teacher interviewee demonstrated that her students would be more active in raising their hands in the class.

"I think some children who are usually more introverted or reluctant to raise their hands will actively participate in the class." (T14)

Similarly, one teacher interviewee supported the same perspective by saying:

"Gamification allows children of different levels to participate in the classroom, allowing them to raise their hands more often to answer questions…" (T21)

C2: Student-to-student interaction

Due to gamification adds many elements of group discussion and competition to students, teacher interviewees mentioned that it also adds a lot of student interaction and promotes student communication.

For instance, one teacher interviewee pointed out that interaction and communication among students increased because of group discussions.

"It actually includes some of these links of group discussions, it means that the opportunities for communication between classmates will be greatly increased…" (T2)

Similarly, one teacher interviewee showed the same view by saying:

"When I use gamification, the interaction between students has also increased…" (T15)

She also added a practical example in her Chinese class:

"For example, one student at the same table is an observer, one student is a reader, and then the reader reads the observers to score him." (T15)

Furthermore, another teacher interviewee stated that gamification brings more effective competition to students, and students are willing to participate.

"It can form a more effective competition among students, and students are quite willing to participate…" (T16)

C3: Interaction between students and teachers

Teacher interviewees also mentioned increased interaction with their students as student engagement in the classroom augmented following gamification. It reflects that teachers communicate more with different types of students, and students may have a higher recognition of teachers through this teacher-student interaction.

One teacher interviewee claimed increased opportunities for teachers to communicate with students.

"For the communication between teachers and students, I think this opportunity will increase…and the opportunities for you to communicate with different students will increase...." (T12)

Moreover, another teacher interviewee said that teacher-student interaction has increased, and the overall atmosphere of the class has improved.

"There are more interactions between teachers and students, and the overall state is improving…" (T16)

One teacher interviewee explained that using gamification has brought her closer to her students, and students have a higher recognition of teachers.

"Using gamification can bring us closer to each other. Then, the student may take a more surprised attitude towards you, and he will recognise your teaching more…" (T17)

To summarise, teaching effectiveness is one of the reasons for teachers' perceived behavioural control, and the specific manifestation is that teachers perceive that students have better classroom participation, more interaction between teachers and students, and a more active classroom atmosphere when using gamification. And when they feel that the teaching effectiveness is high, the perceived behavioural control will be better, and then they will have a stronger intention to use gamification.

D. Training situation

Rowntree (1981) pointed out that training is the systematic development in a person of the information, attitudes, and abilities required for him to perform successfully in a job or task whose requirements can be relatively accurately recognised in advance and which calls for a pretty standardised performance from anybody who attempts it (Rowntree, 1981, p. 327). In this study, many teachers expressed their desire to participate in training related to gamification for teaching, and the training here refers explicitly to training on gamification.

Regarding the training teacher interviewees have participated in before, most teacher interviewees said that they have not participated in special training on gamification, or they think it is better and more professional training. They also expressed their desire to participate in professional training to improve their ability to

use gamification to teach and make new progress. The reason is that they feel that participating in gamification training enhances their ability to use gamification for teaching. As a result, they will become more confident or like to use gamification, or more comfortable to use it, and finally, have a stronger intention of using it. Therefore, based on the reflections of the teacher interviewees, the following will analyse the two aspects they expressed to be most concerned about. The first aspect whether they have participated in systematic training on gamification, and the other part whether they want to attend training about using gamification.

D1: Training status

When asked about the status of teacher interviewees who have participated in training on gamification, many teacher interviewees reported that they had yet to participate in systematic training.

One teacher interviewee mentioned that he had attended relevant training, but did not participate in special systematic training about gamification.

"When I was in college before, I had participated in relevant training, but it was not special systematic training…" (T6)

Moreover, one teacher interviewee reported the same situation by saying:

"I have not participated in any special professional training before…" (T2)

Similarly, another teacher interviewee stated that she has not taken any professional training about using gamification.

"I haven't taken any relevant training before…" (T12)

Furthermore, another teacher interviewee demonstrated that she has not participated in professional training

"I have no professional training in gamification…" (T16)

D2: Requirements for systematic training

Although most of the teacher interviewees stated they have not participated in systematic training on gamification, they all expressed that they would like to participate in systematic training to learn more professional and practical teaching skills about gamification, enrich their teaching methods, and improve their teaching abilities.

For instance, one teacher interviewee mentioned that she would like to participate in more professional training.

"I still want to take part in more professional training…" (T6)

Moreover, one teacher interviewee stated she was eager to participate in systematic training to become more comfortable using gamification.

"I think with professional training and a better grasp of using gamification, I will be more comfortable using it." (T6)

As one teacher interviewee claimed that she hopes to participate in systematic training to learn innovative teaching methods to improve her teaching abilities.

"If it is free, I am still willing to participate because it is still necessary to improve my teaching ability. Especially some innovative teaching methods, such as gamification…" (T2)

Similarly, she would love to attend related training if her school could host some gamification seminars.

"If the school can hold some related gamification teaching lectures, I am very happy to participate…" (T12)

Another teacher interviewee stated that she would like to participate in systematic training because it would allow her to use gamification with more confidence later.

"If I can study it systematically, my confidence in using it will also increase, and I will prefer to use it more freely, and then I will be more conscious to use it." (T12)

Furthermore, one teacher interviewee mentioned that she wanted to participate in more professional training to enrich her teaching skills.

"I want to attend it to have a more professional understanding of what gamified teaching is and, secondly, to continuously enrich this teaching model, which may help me better teach in different subjects and environments in the future." (T16)

From there, it can be seen that the workload of teaching using gamification is sometimes increased and sometimes needs to be improved. When teachers feel that the workload of using gamification will not increase, their perceived behaviour is well controlled, and they are more committed to or prefer to use gamification, and finally have a stronger intention to use it.

4.2.2.4 Intention to use gamification for teaching

According to the interview results, the teacher interviewees' intention to use gamification teaching was divided into four themes identifying the reasons why they were willing to use it and the reasons why they were unwilling to use it. Based on these two themes and all the content mentioned in their answers summarising the analysis, the following thematic analysis table was obtained.

First of all, the reasons why they are willing to use gamification are mainly to stimulate students' interest, adjust the classroom atmosphere, and improve students' enthusiasm and concentration. Secondly, the main reasons for their reluctance to use it are the fear of affecting the teaching progress, the inappropriate use of conceptual courses, and the loss of discipline. In summary, attitudes, perceived behavioural control, and subjective norms were quantified to impact the intention to use gamification significantly. The interview analysis results are consistent with the quantitative results. Still, the interview results provide some supplements, such as activating the classroom atmosphere, improving students' interest and learning motivation, and improving their concentration. This section will introduce it in detail.

A. Students' interest

Students' interest means the propensity of the student towards a specific subject in which he or she is able to connect without difficulty. Seven teachers mentioned that because the use of gamification in teaching can improve students' interest, they will be more committed to using gamification based on this and, thus,

have the behavioural intention to use gamification. This also suggests that commitment affects behavioural intentions to use gamification, consistent with findings from quantitative research. Detailed content and analysis are below.

A teacher interviewee mentioned that using gamified classrooms will improve the learning interest of students who are not interested in learning:

"If you use gamification teaching, students will actively participate in this gamification classroom, which also improves the interest of underachievers." (T1)

Moreover, one teacher interviewee also stated that she would use gamification for teaching because it can improve students' interest:

"When using gamification, one reason is…, and the other is to make students more interested in learning. Then, in the process of using gamification to teach, I will feel that the children's interest has increased." (T3)

Furthermore, another teacher interviewee claimed that he intended to use gamification for teaching based on the reason of arousing students' interest:

"It is based on using gamification teaching to arouse students' interest…" (T5)

To sum up, these teachers all stated that they tend to use gamification to teach to increase students' interest and promote more effective implementation of classroom teaching.

B. Classroom atmosphere

The dimensions of a positive learning environment include order and organisation in the classroom, clarity of the rules, the teacher's control over the class,

and respect between the teacher and students. The classroom atmosphere and teacher management style are directly related. Täte (2006) asserts that compassionate teachers work harder for their students' success and effective teachers are skilful in setting the classroom atmosphere in which their students can learn. In other words, they care about their students not only for academic but also affective reasons (Täte, 2006).

In the interviews, eight teachers mentioned that the reason for using gamification is that it can activate the classroom atmosphere, improve students' enthusiasm, increase the fun of teaching, and help to promote classroom teaching. Since the use of gamification has a positive effect on classroom teaching, they will be more committed to using gamification or prefer to use gamification, thereby increasing their intention to use it.

For example, a teacher interviewee mentioned the reason for using gamification in teaching, mainly to mobilise the enthusiasm of students and activate the classroom atmosphere:

"I use gamification mainly to mobilise the enthusiasm of students and activate the classroom atmosphere." (T13)

Moreover, a teacher interviewee mentioned that compared with traditional teaching methods, gamification teaching could activate the classroom atmosphere and increase the vitality of the classroom.

"Compared with traditional teaching methods, the classroom atmosphere using gamification will be much more joyful…and the classroom atmosphere will not lack vitality." (T15)

When asked another teacher interviewee about the purpose of using gamification in teaching, she mentioned:

"The main purpose is to mobilise the classroom atmosphere of the students in this way or to improve the enthusiasm of the students and then create an environment for effective competition." (T16)

Furthermore, a teacher interviewee stated that she uses gamification in her classroom because she wants to adjust the classroom atmosphere and improve student motivation:

"Using gamification in the classroom is to mobilise the classroom atmosphere and improve their enthusiasm for the class." (T10)

Similarly, one teacher interviewee mentioned that the class atmosphere is totally different after using gamification.

"The atmosphere of the whole class is different." (T14)

One teacher interviewee demonstrated that gamification can enhance the learning atmosphere of the classroom.

"Firstly, it can enhance the classroom learning atmosphere…". (T2)

Another teacher interviewee mentioned that gaming can improve the atmosphere in the class, and the students are more active.

"The overall classroom atmosphere will be good, and students will feel more active…" (T16)

To sum up, many teachers mentioned that the active classroom atmosphere would make them more willing to use gamification for teaching. In addition to the positive impact of the three antecedents on intention based on the perspective of TPB, teachers will also consider classroom atmosphere to influence the intention to use gamification in teaching.

C. The motivation of students

In this study, students' motivation is the desire to participate in the learning process also relates to the motivations or objectives behind students' participation or absence from academic activities. When asked about the reason for using gamification, seven teachers mentioned that gamification can promote students' initiative and enthusiasm in class and make some students who are prone to distraction more focused. These functions can enhance students' learning motivation, so they will prefer to use gamification based on this, and their intention to use it will be stronger.

For example, a teacher interviewee stated that using gamification is beneficial to enhancing students' motivation and participation in class.

"For a gamified course, some children who are usually introverted or unwilling to raise their hands will actively participate in the class, which enhances their learning motivation…" (T14)

Moreover, a teacher interviewee also mentioned the advantages of using gamification in teaching.

"Using gamification is better because students will be motivated, Then they can get higher scores or improve in certain aspects, such as enhancing learning motivation and interest…" (T16)

As one teacher interviewee pointed out her students would be more motivated after using gamification.

"Children will be much more motivated to devote themselves to learning…" (T15)

According to the reflections of these teacher interviewees, they intend to use gamification in teaching because gamification can promote students' participation in the classroom, be more active, and enhance their learning motivation.

D. Students' concentration

Students' concentration in class can greatly affect their learning. And three teachers mentioned that gamification can improve students' concentration, especially two teachers who teach lower grades. They mentioned that gamification seems to be more necessary for younger students because their self-discipline will be higher than that of higher grades. Therefore, because of this benefit of gamification, they will prefer to use it on younger students.

For instance, a teacher interviewee mentioned that gamification is helpful in improving the teaching process and specific performance is concentrate students' attraction:

"Then, it can attract students' unintentional attention, on the one hand, improve their concentration, and then improve their learning efficiency." (T2)

Meanwhile, a teacher interviewee also stated a similar point of view:

"Because for some children, their concentration in class is not so good. If you use gamification for teaching in teaching, you can focus their attention when they are distracted." (T3)

Furthermore, a teacher interviewee explained that gamification teaching could attract students to answer questions and participate in the classroom more than traditional teaching:

"Students feel that they are not interested, and they will lose their attention. However, gamification can allow children of different levels to participate." (T21)

Moreover, a teacher interviewee mentioned that she uses gamification mainly because it increases student engagement and it is easier for students to focus:

"The main reason for using gamification is that classroom participation is relatively high, making it easier for students to concentrate." (T22)

Based on the above, in addition to attitudes, subjective norms, and perceived behavioural control in the perspective of TPB, which will affect teachers' intentions to use gamification in teaching, teachers also added that some elements that affect their

intentions to use gamification are students' interests, classroom atmosphere, and students' learning motivation and concentration in class.

Table 20

Reasons for using gamification

Theme	Students' interest	Classroom atmosphere
Meaning	The propensity of the student towards a specific subject in which he or she is able to connect without difficulty	The dimensions of a positive learning environment include order and organisation in the classroom, clarity of the rules, the teacher's control over the class, and respect between the teacher and students. The classroom atmosphere and teacher management style are directly related.
Sample quotes	" Generally, it is to arouse children's interest and attract children's attention to the classroom." (T7) " The use of gamification in teaching is to increase the interest of students." (T5) " The main purpose of using gamification in the class is to improve the interest of the students because history may have some knowledge points in the liberal arts, and some knowledge is relatively dull. The text becomes the type of game that is more acceptable to the students." (T12) " Use gamification to mobilise students' enthusiasm and initiative and possibly increase their interest in this subject because interest is the best teacher. " (T13)	" Using gamification to teach has a specific effect because it can liven up the classroom atmosphere and make students more likely to be interested in the subject." (T13) " When I was using gamification for teaching, the classroom atmosphere was very active, and everyone could participate, which reflects the improvement of students' subjectivity." (T1) " For some activity courses, if an active atmosphere is also required, I think it is better to use gamification teaching, which can mobilise students' enthusiasm for learning." (T2) " One of the cases where gamification is used is when many students are in the class to liven up the atmosphere." (T4) " Using gamification teaching can stimulate students' interest and activate the classroom atmosphere." (T5)

Table 21

Reasons for using gamification

Theme	The motivation of students	Students' concentration
Meaning	The desire to participate in the learning process also relates to the motivations or objectives that students' participation or absence from academic activities.	Every lesson needs students to focus their minds on what they are studying consistently.
Sample quotes	" I found that in class, when students are in a foul mood, using gamification will fully mobilise their enthusiasm and increase motivation for learning." (T3) " If it means using gamification, it means that it can mobilise the motivation and enthusiasm of students in a classroom in a larger area." (T7) " The purpose of using gamification is to increase the motivation of students. If teaching is taught by gamification, it is easier for him to concentrate, and his concentration is much better." (T8) " Sometimes, I want to change the teaching method to mobilise students' motivation to learn, and I may use gamification to teach." (T9) " The purpose of using gamification for teaching is to improve their enthusiasm and strengthen their motivation for class because first-grade children do not have such strong self-control." (T10)	" If I use gamification, the younger children will be more focused on one of their classes, and their interest in class will be improved." (T3) " For example, some young students need to be taught through gamification because traditional teaching, such as direct teaching, cannot attract children's attention, so they can only learn from it." (T4) " For first-year students, they can't entirely focus on your class, so we still have to take some ways to make them more focused. At this time, I would use gamification to teach." (T10)

Table 22
Reasons for not using gamification

Theme	Class hours are limited	Conceptual knowledge
Meaning	Each teacher has a total number of courses that need to be completed each semester. The total number of teaching hours is fixed, and all courses must be taught within a limited time.	Conceptual knowledge is a relatively abstract, organised type of knowledge. Concepts, principles, and theories in various disciplines belong to this type of knowledge.
Sample quotes	“ Sometimes, the reason for not using gamification teaching is generally the teaching requirements. If the course needs to catch up with the schedule, if the exam needs to be taken as soon as possible, or when the class time is not enough, I will choose to speed up the progress, and I will choose to give priority to the direct teaching method.” (T1) “ There are generally several situations in which gamification for teaching is not used. Sometimes, it is because of the use of gamification for teaching to go to a class, and the time may sometimes not be enough.” (T3) “ I sometimes don’ t use gamification to teach because I don't have enough time.” (T6) “ There are various reasons for not using gamification sometimes, and I have to catch up with the teaching schedule, especially since it is time-consuming.” (T8)	“ For example, in some more conceptual courses, students need to concentrate more than their attention, and then the teacher’ s teaching, if the use of gamification teaching, may distract the students or the grasp is not very firm. I may not use gamification.” (T2) “ Sometimes, I don’ t use gamification for teaching because the purpose of the class is that it may be more inclined to teach knowledge, output knowledge, and the pursuit of exams. At this time, I will not choose to prefer gamification or entertaining for teaching.” (T4) “ I won’ t use gamification for courses that need to be taught more conceptually.” (T6) “ Sometimes, I don’ t need to use gamification because I don't know much about it, and I don't know what other better ways to integrate it into the class besides this gamification method.” (T9)

Table 23
Reasons for not using gamification

Theme	Usage	Classroom discipline
Meaning	Are teachers comfortable using gamification, and how they know how to use it appropriately	Classroom discipline is a form of discipline appropriate to the regulation of children and the maintenance of order in schools and is an aspect of classroom management and teacher-student interaction. The term refers to students complying with a code of behaviour often known as the school rules.
Sample quotes	“ I sometimes use gamification, which takes a lot of time because I am not very good at using it.” (T6) “ Sometimes, I don’ t use gamification because I know less about it, and I don't know what other better gamification teaching methods can be integrated into the classroom besides this gamification method.” (T9)	“ Sometimes, gamification is not used in teaching. After all, in the first grade, sometimes it is easier for students to play too much, and discipline will be difficult to control.” (T5) “ Classroom discipline can sometimes get out of hand with gamification for teaching.” (T2)

4.3 Summary

This chapter first provided quantitative analysis details using SPSS and WarpPLS tools. The first section showed the profile of the respondents, descriptive statistics, and sample characteristics. The second part presented the analysis of the measurement and structural model. Overall, the measurement items were found to be reliable and valid. The final analysis results also verified the hypothesised model. Based on TPB, confirming that attitude, subjective norm, and perceived behavioural control significantly affect the intention to use gamification, it also verifies that these three antecedents also positively impact commitment, and this effectively expands the TPB model.

Then, this chapter used the thematic analysis method to conduct a qualitative analysis of the interview data. In general, the views and content put forward by all participants were found to align with the results of quantitative research. That is, attitudes towards using gamification, subjective norms, and perceived behavioural control all significantly impact the intention to use gamification for teaching. Through interviews, the researchers were able to gain a deeper understanding of how these influencing factors specifically affect the intention to use gamification to teach. This also provided a richer explanation and complements the overall quantitative research results. The next chapter will discuss these findings, including a summary of the research objectives and results, implications for the study findings, and concluding comments.

Chapter 5: Discussion

This study aimed to explore the factors that affect teachers' use of gamification for teaching and its specific performance on impact and verify whether commitment mediates between attitudes, subjective norms, and perceived behavioural control and intention. This study was the first in mainland China to explore the influencing factors of school teachers' intention to use gamification for teaching. It examined the relationship between commitment and intention based on TPB theoretical framework. The main findings of this study were: 1) Attitude, subjective norms, and perceived behavioural control all significantly affect commitment. 2) Commitment mediates between the three antecedents and the intention to use gamification. 3) AT and SN can directly influence the intention of using gamification for teaching, while commitment also plays a mediating effect. These main findings were found to be consistent with the hypothesised model. These findings are discussed in detail in the following sections.

5.1 Discussion of the quantitative results

Since this study aimed to explore the factors influencing school teachers to use gamification in teaching, TPB was adopted as the theoretical framework. Moreover, the researcher added a variable commitment to the TPB, which was also based on the similarity between attitude, subjective norms, and perceived behavioral control and commitment. Based on the quantitative findings, the path coefficient β of AT on COM was 0.451 ($p < 0.05$), supported the hypothesis. Moreover, the path coefficient β of SN on COM was 0.299 ($p < 0.05$), representing that the hypothesis was true. In addition,

the path coefficient β of PBC on COM was 0.235, $p < 0.05$, which also supported the hypothesis. Furthermore, the path coefficient β of COM to INT was 0.761 ($p < 0.05$), supporting the hypothesis. Quantitative results supported the effectiveness of the expanded TPB, showing that attitudes, subjective norms, and perceived behavioral control influence intentions to use gamification through commitment. It also indicates that commitment affects behavioral intention. In other words, based on TPB, this study provides a richer and more comprehensive explanation for influencing teachers' intention to use gamification. This finding suggests that enhancing teachers' intentions to use gamification can change their attitudes toward gamification, subjective norms, and levels of perceived behavioral control, thereby changing their commitment to using gamification and promoting teachers' intentions to use gamification.

Overall, most of the teachers are willing to use gamification in teaching, and attitudes and subjective norms will directly affect the intention to use gamification. This result shows that it directly changes teachers' attitudes or promotion of gamification. Factors affecting teachers' subjective norm levels, such as school policies and leaders' opinions, can enhance teachers' intentions to use gamification.

5.1.1 The Testing of the hypotheses

The quantitative results of testing the hypothesis indicate that attitude, subjective norms, and perceived behavioural control all have an impact on the intention to use gamification through the mediating effect of commitment. In addition, commitment also has a significant impact on behavioural intention. Furthermore,

attitudes and subjective norms directly affect the intention to use gamification. In this study, most of hypotheses were supported by the data. This finding points out to a successful extension of the TPB model in the context of this research. The discussion of the quantitative results of the testing of the hypothesis and the extension of the TPB model are presented in the following subsections.

5.1.2 Attitudes and its effect on commitment and intention

In this study, the first hypothesis proposed in the hypothesis model was that attitude significantly affects the intention to use gamification through the mediating effect of commitment. The finding supports this hypothesis. First of all, the attitude towards using gamification significantly influences the commitment to using gamification. This hypothesis was formulated based on the similarity in definitions between attitude and commitment mentioned by many researchers. According to Yusuf (2011), a person's attitude reflects how much they appreciate or despise something. Moreover, Gomendio (2017) stated that attitude is the inclination to behave favourably or unfavourably toward a particular object, situation, organisation, idea, or individual. Meanwhile, Ali (2020) asserts that attitudes have a particular influence on behaviour, effort, interest, and awareness. This is very similar to the definition of commitment proposed by Johnson (1973, p. 395), who pointed out that personal commitment is "a strong personal dedication to a decision to carry out a line of action". Furthermore, a similar definition he proposed has been used in many studies. For example, commitment is an attachment that is initiated and sustained by the degree to which an

individual's identification with a role, behaviour, value, or institution is considered to be central among alternatives as a source of identity (Almquist & Angrist, 1971; Becker, 1956; Bielby, 1984; Morrow, 1983; Rosenfeld & Spenner, 1988; Safilios-Rothchild, 1971).

In addition to the similarity in the definitions of attitude and commitment, it is worth mentioning that in existing theories, commitment is directly defined as an attitude (Hall et al., 1970, p. 176). Within organisational commitment is the concept of attitudinal commitment, which refers to an individual's association with a specific organisation and its goals and the desire to continue as a member to achieve these goals further. This is similar to one definition of attitude as its influence on specific goals and behaviours (Mowday et al., 1979, p. 226). Furthermore, one of the most studied attitudes in organisational behaviour is attitudinal organisational commitment, often understood as the relative strength of an individual's affiliation and involvement with a specific organisation (Riketta, 2002). Moreover, Mowday et al. (1979) pointed out that organisational commitment is another crucial attitude. Since attitude and commitment have many similarities in many studies, this study proposes the hypothesis that attitude has a significant influence on commitment. The research results also support this hypothesis. This finding is consistent with Vasudevan's (2013) investigation that teachers' commitment would create the proper awareness, skill, and attitude for teachers to teach and learn something beneficial. Moreover, this finding agrees with findings revealed by Ahad et al. (2021), who stated that work attitudes and emotional intelligence influence organisational commitment. Furthermore, McCaul et

al. (1995) expounded that the most accurate definition of organisational commitment, as it is currently measured, is the overall attitude that workers have about their company. Yousef (2000) also found a correlation between attitude and commitment; employees' behavioural attitude towards the organisation increases as affective commitment rises.

Secondly, it was hypothessed in this study that attitude has a significant impact on the intention to use gamification, and the findings supported this hypothesis. Although there are few previous studies exploring intentions to use gamification based on TPB, many related studies on the significant impact of attitude on intentions are consistent with the findings of this study. For example, Lee et al. (2010) used TPB as a theoretical framework to study teachers' intention to use technology for teaching. They found that attitude was the most influential factor in teachers' intention. Moreover, Ha et al. (2019) aimed to investigate the effects of different factors on Vietnamese consumers' online shopping intention, and they found out that attitude significantly influenced the consumers' online shopping intention. Furthermore, Weng et al. (2018) also found that the attitude toward use influences teachers' intention to use multimedia. Additionally, Siripipatthanakul et al. (2022) pointed out that the intention to purchase organic food is influenced by attitude toward organic food consumption. According to Kim and Kim (2021), their findings show that certain TPB model variables, in particular attitude and subjective norms, had a significant impact on participants' intentions to continue. In addition, based on Ayob et al. (2016), the study attempted to uncover the crucial factors that influence students' intention of waste separation at Universiti Teknologi Malaysia. Their research shows that attitude is one of the determinations that

significantly influenced the intention of waste separation. Furthermore, Ndubisi (2004) confirmed that attitude significantly directly affects the intention to adopt e-learning.

5.1.3 Subjective norms and its effect on commitment and intention

The hypothesis proposed in this study was that subjective norms will significantly affect intentions to use gamification through the mediating effect of commitment. The findings were found to support this hypothesis. There are two points worth discussing: the relationship between subjective norms and commitment and the significant impact of subjective norms on intentions to use gamification.

Regarding the relationship between subjective norms and commitment, one is that their definitions are similar, and the other is that some studies have also revealed a correlation between them. Firstly, there are similarities in their definitions. Subjective norms refer to the pressures a person feels from society, including the influence of significant others and groups, when deciding to take a specific action (Ajzen 1991, 2002). Similarly, the definition of attitudinal commitment is that people might be a part of organisations, unions, or professions. Meanwhile, behavioural commitment is specific actions, remaining a member, pursuing goals, or following specific policies. Furthermore, although there is not much research exploring commitment and subjective norms, especially in the field of education. However, some studies have revealed the relationship between commitment and subjective norms. In the Hong Kong hotel industry, Lam et al. (2002) found that training and subjective norms were significant predictors of newcomers' intentions to leave, while subjective norms are influencing

factors of organisational commitment (Lam et al., 2002). This is consistent with the findings of this study. Moreover, through longitudinal analyses, Paul and Agnew (2004) expounded that commitment mediated the impact of subjective norms on a couple's decision to stay together about eight months later. Furthermore, Davis et al. (2015) emphasised the role that subjective norms play in a model of environmental commitment.

There are many studies on the influence of subjective norms on intentions, but very few in the context of teachers using gamification for teaching. In this study, the hypotheses proposed that subjective norms influence intentions to use gamification, and the findings were found to support this hypothesis. This finding is in agreement with the findings revealed by Sin and Yan (2014) who reported that subjective norm is the most strongest predictor of intention for inclusive education. Moreover, it is also consistent with the investigation of Tran et al. (2023) that the outcomes validate how subjective norms affect teachers' intentions to utilise the Zalo app (a kind of social media) for work. Similarly, Aslan (2023) also found that subjective norms influence halal customers' intention to purchase. Furthermore, the finding is consistent with the study of Utama and Muntashofi (2023), who demonstrated that subjective norms and entrepreneurial values favourably impacted entrepreneurial intention. In mainland China, many researchers have also conducted studies that have confirmed that subjective norms significantly positively impact behavioural intentions. Ma et al. (2014) found that users' intention to use the national quality course website is affected by subjective norms. In addition, Wang et al. (2020) explored and found that subjective

norms can significantly affect the intention of intelligent learning in university societies. Moreover, many research studies are consistent with this present study's findings in mainland China. Zhang and Jiao (2015) investigated that the subjective norms influencing the acceptance of online platform MOOCs among college students have a significant positive impact on behavioural intentions. In addition, Zhao and Zhang (2017) found that subjective norms positively impact college teachers' behavioural intentions in blended teaching. These are consistent with the findings of this study.

5.1.4 Perceived behavioural control and its effect on commitment and intention

This study hypothesised that perceived behavioural control will significantly influence the intention to use gamification through the mediating effect of commitment. The findings support this hypothesis. First, the results of this study confirm that perceived behavioral control has a significant impact on commitment. This finding is consistent with Baron and Kenny (1986), who found that PBC was significantly impacted by the commitment method. Moreover, this finding agrees with the finding Cop et al. (2020) pointed out that PBC positively impacts environmental commitment. Furthermore, this is consistent with the findings Huang and Cheng (2022) investigated that commitment significantly mediated the PBC to the intention of learning sustainability in Guangdong Province. In addition, although there are currently few studies on the impact of perceived behavioural control on commitment, there are many similarities between the two concepts. For example, one of the definitions of PBC refers

to personal ability, such as professional knowledge, professional skills, confidence, experience, etc., which are teachers' beliefs' basis and driving force (Kidwell & Jewell, 2003). Meanwhile, Meyer and Allen (1991, 1993) defined job commitment as the force that ties a person to a course of action related to one or more workplace aims. Judging from their respective definitions, they have many similarities. This study confirms that PBC has a significant influence on commitment. It is also based on the similarity of their meanings and sublimates their correlation. This finding provides a more prosperous and new perspective for future research on perceived behavioural control and commitment.

Regarding the relationship between PBC and intention, the result shows that PBC significantly influences intention to use gamification. Several related studies have also explored the relationship between them. Al-Emran et al. (2020) expounded that perceived behavioural control has a significant influence on continuous intention to use e-learning in Dubai, UAE. In addition, Shalender and Sharma (2021) found that perceived behavioural control positively correlated with the adoption intention of buyers. Moreover, students' behavioural intention to use Moodle in Macau was found to be significantly influenced by their perceived behavioural control (Teo et al., 2019).

5.1.5 Commitment and its effect on the intention

This study proposed a critical and innovative hypothesis that commitment has a significant influence on the intention to use gamification. The findings support this hypothesis. The significance of this discovery is that commitment can be used to

explain the intention to use gamification for teaching. This is a new finding and is consistent with some existing research that confirms commitment significantly influenced intention. For example, Lee and Jeong (2017) discovered the mediating effect of organisational commitment on job insecurity and turnover. Moreover, Witjaksono et al. (2019) found that religious commitment has a significant impact on behavioural intention. Similarly, Wasti (2003) pointed out that affective commitment was a significant predictor of turnover intentions. This is highly consistent with the findings of this study. Furthermore, Silaban and Syah (2018) pointed out that organisations must be firmly committed to boosting workers' motivation at work. A solid organisational commitment will reduce turnover intention in a business or an organisation. Moreover, their research confirmed that organisational commitment affects employees' turnover intentions. Concurrently, Ekhsan (2019) expounded that organisational commitment has a significant influence on turnover intention.

In addition, although there are few studies on the mediating role of commitment in attitudes, subjective norms, perceived behavioural control, and intentions, some researchers have begun to notice the role of commitment in TPB. For instance, Nurtjahjono et al. (2023) revealed that organisational commitment is a mediator between work satisfaction and turnover intention. This direction is consistent with the findings of this study.

Furthermore, this study confirmed that commitment can be used to explain the intention to use gamification for teaching. Similarly, Ajzen and Kruglanski (2019) suggested that motivation be included as a mediator between the three antecedents and

intentions. The finding of this study suggests that commitment lengthens the TPB and weakens the connections between the antecedents and intention. Moreover, this finding is consistent with Huang and Cheng (2022) confirmed that commitment mediates between students' attitudes, subjective norms, perceived behavioural control, and intention to learn sustainability in Geography. To sum up, this finding has reference significance for building a theoretical expansion model of TPB and promoting teachers' use of gamification for teaching in the future.

5.2 Discussion of the qualitative results

The interviews aimed to explore how TPB affects teachers' intention to use gamification specifically, that is, how each influencing factor affects behavioural intention from the perspective of TPB. First, the qualitative and quantitative research results consistently support the hypothesis. Qualitative research itself is intended to provide supplements and explanations to quantitative analysis. Most teacher respondents generally expressed positive attitudes toward using gamification in their teaching. In addition, almost all teacher interviewees stated that subjective norms, such as school policies or leadership attitudes, played an essential role in deciding whether they would use gamification ideas. Also, in terms of perceived behavioural control, the difficulty of using gamification, the workload of using gamification, teaching effectiveness, and related gamification training conditions will all affect their level of perceived behavioural control.

5.2.1 Attitude towards using gamification for teaching

Based on the qualitative results, attitudes towards using gamification have a significant influence on teachers' intention to use gamification, which means that if teachers are interested in gamification, recognise, accept, and are willing to use gamification for teaching, they will generate a desire to use gamification for teaching and the intention to using gamification would be strengthened. Most of the teacher interviewees were found to have a positive attitude towards gamification. Regarding attitude, the main factors influencing their attitude towards using gamification were found to be teaching effectiveness, teaching goals, and students' learning. Regarding the teaching effect, gamification can activate the classroom atmosphere and promote students' performance in class. Some teacher interviewees mentioned that gamification has made students' performance in class more active, such as more students answering questions in class and students answering faster. As Santiara and Abdullah (2022) stated that students will be more inclined to follow the learning flow in a positive classroom atmosphere.

In terms of teaching goals, the majority of teacher interviewees stated that using gamification can achieve teaching goals. However, some teacher interviewees mentioned that the prerequisite is to make sufficient preparations before class or to make a complete teaching design based on the specific situation of the students to achieve the teaching goals. In addition, some teacher interviewees said that using gamified teaching will be more challenging to control than traditional teaching methods.

However, if used well, the teaching goal can be achieved, and better teaching effects will be achieved.

Regarding students' learning, teacher interviewees said that after using group points and rankings in gamification elements, students became more active in class and more willing to answer questions. Some teacher interviewees also stated that gamification can help some easily distracted students pay attention in class. Meanwhile, this is consistent with some studies showing that gamification positively affects students' motivation, engagement, and performance (Lin et al., 2018; Piskorz, 2016; Purgina et al., 2019; Wichadee & Pattanapichet, 2018). Moreover, as many students lack the motivation and interest to learn (Zichermann & Cunningham, 2011), teachers will have more intention to use gamification based on gamification can improve students' learning. Furthermore, in the research of Zhang and Jiao (2015), the attitude of local college students toward MOOCs was found to have the most significant impact on their MOOC acceptance intentions. Local college students believe they have benefited from using MOOCs to improve their learning performance, so they have a positive attitude toward MOOCs. Consistent with the interview findings, students' learning significantly affected teachers' attitudes. Moreover, this finding agrees with Campbell et al. (2001) who investigated that teaching methods can influence current students' existing approaches to learning.

5.2.2 Subjective norms

The qualitative research results also show that subjective norms significantly influence teachers' intention to use gamification teaching through the mediating effect of commitment. This is consistent with the quantitative findings and supports the hypotheses. Most of the teacher interviewees stated that school policies and leaders' willingness, especially the leadership's willingness, would affect their commitment and intention to use gamification. Some teacher interviewees demonstrated that if leaders openly gave instructions in school meetings to encourage teachers to use gamification, this would greatly increase their enthusiasm for using gamification. This finding might be related to the Chinese culture's tradition of respecting authority and maintaining harmonious relationships (Bush & Qiang, 2000; Walker & Qian, 2018). Also, the tradition of respect for authority is widespread in the school environment (Bush & Qiang, 2000; Shi et al., 2020). This is also consistent with the opinion proposed by Kelman (1958, 2006) in social influence theory that essential people can influence a person's attitudes, beliefs, and thus, actions or behaviours by adopting the induced conduct to receive rewards or avoid punishment. Therefore, paying attention to school leaders' influence and leading role has reference significance for promoting the use of gamification for teaching.

Additionally, several teacher interviewees stated that they would reduce the use of gamification when faced with the pressure of entering higher schools and taking exams. They will use traditional teaching methods more conservatively during that time. One reason is that teaching time is limited, and the other is that they are more proficient in conventional teaching methods. This is consistent with Deng and Carless's (2010)

study of mainland teachers' choices when facing examination pressure, which found that many teachers emphasised repetition and memorisation within a school policy stressing examination preparation.

5.2.3 Perceived behavioural control

Another finding from the qualitative research results was that perceived behavioural control positively influences intentions to use gamification, supporting the proposed hypothesis. Moreover, teacher interviewees suggested several aspects that would affect their level of perceived behavioural control. The most mentioned aspects are the difficulty of using gamification, its impact on workload, and the usefulness of teaching effects. Another noteworthy aspect is their participation in gamification training. Some teacher interviewees said that one of the problems faced when using rewards as a gamification element is that the rewards set for students need to be changed frequently. Otherwise, the freshness of the rewards for students will be reduced, and maintaining continuous enthusiasm will not be easy. Margolang et al. (2019) pointed out that rewards are an educational tool that teachers can use to increase students' enthusiasm for learning. Moreover, Bolat (2023) investigated that rewards are an effective classroom management tool for teachers.

In addition, how to select and set prizes is one of the confusions expressed by teacher interviewees. Points and rankings are also gamification elements often used by many teacher interviewees. They said using points and rankings in groups will stimulate students' fighting spirit. Because they want to gain points, they will focus more on

learning and participate more actively in class. However, some teacher interviewees also expressed concern that students would focus too much on gaining points and ignore the process of learning and thinking.

In addition, teacher interviewees also said that when using gamification, it is difficult to set rules and control them, the situation in the class is also complex, and students are constantly changing.

Several teacher interviewees also mentioned that they want to organically combine gamification with social media, computers, and electronic devices. They hope there will be some demonstrations or instructions for their reference in this part.

Regarding training, most teacher interviewees said they had yet to participate in systematic training on gamification. Most of them learned about gamification through Internet searches and colleagues, or they learned a little about gamification when studying in normal universities. Almost all teacher interviewees expressed their desire to participate in professional gamification training to improve their mastery of gamification and use it better in future teaching.

In addition to training, teacher interviewees also proposed an idea worth exploring: to establish a platform for teachers to communicate with each other. They can share some materials or resources they used gamification in their classes on the platform, reducing preparation time before class.

Workload was also repeatedly mentioned by teacher interviewees, who stated that using gamification sometimes requires spending more time on instructional design. Moreover, they noted that the workload is related to teaching experience. Teachers with

rich teaching experience spend less time preparing for using gamification because they can better integrate it.

Teachers are more committed to using gamification than traditional teaching methods. At the same time, the interviewed teachers mentioned that gamification can better attract the attention of easily distracted students and improve students' autonomy and the subjectivity of classes. According to subjective norms, it is evident from the teacher interviews that most of them are primarily impacted by outside forces. The three topics most frequently discussed were the teaching grade, the teaching content, and the school's policy or the demands of the superior leaders. The thirteen teachers who were interviewed all agreed that there is very little influence among peers, demonstrating another way in which peers' leadership does neither help nor hurt instructors' efforts to include gamification in their lessons.

For perceived behavioural control, four main aspects influence it. These aspects are the difficulty of use, workload, teaching effect, and training situation. Teachers perceive that the difficulty of using gamification in teaching is low, and the workload will not increase too much after use. They will be more committed to using gamification and enhance their behavioural intention of using gamification. If schools want to promote the use of gamification, they should pay more attention to the workload of teachers, and schools can provide more technical support for gamification. In addition, since most teachers have not received professional training in gamification, and they all want to participate in relevant professional training, schools are more likely

to carry out professional training or lectures to enhance teachers' commitment to using gamification, and ultimately enhance their intention to use gamification.

5.3 Theoretical and educational implications

5.3.1 Theoretical implications

Based on TPB, this study has explored the factors that influence teachers' use of gamification for teaching and the specific manifestations of the influence of each element. It has also added a new variable, commitment, to see whether commitment mediates the three antecedents and intentions. The results of this study also confirmed that attitudes, subjective norms, and perceived behavioral control influence teachers' intention to use gamification through commitment. The theoretical contributions of this study mainly include two points. The first is that attitudes, subjective norms, and perceived behavioural control can explain teachers' commitment to using gamification. Moreover, attitudes, subjective norms, and perceived behavioral control directly affect behavioral intentions through the mediating role of commitment. This is an innovative discovery because most of the past research on TPB was to verify the original TPB model in different fields (Aithal et al., 2023; Gansser et al., 2023; Khan et al., 2023). However, this study expanded the TPB model and confirmed the role of commitment to TPB, providing a more prosperous reference for future related research. In addition, few studies explore teachers' use of gamification based on TPB. Gamification is an innovative teaching method and a relatively new teaching direction in the education area in mainland China. Currently, much research on gamification is in first-tier cities

(Ma et al., 2023; Xin et al., 2023). This study can also provide a reference for related research on the implementation of gamification among teachers in second and even third-tier cities. Another point is that commitment can be used to explain the intention and change the understanding of behavioural intention. Perhaps this can provide a more comprehensive model and perspective to understand teachers' use of gamification. In addition, many studies on TPB are used in different fields such as business, environment, and the tourist industry (Alam & Sayuti, 2011; Baker et al., 2007; Groot & Steg, 2007), but there are relatively few in the educational area. Especially about teachers using gamification based on TPB, which is rarely seen, this study has been an innovative perspective to explore based on TPB.

5.3.2 Educational implications

Since this study has explored the mediating effects of attitudes, subjective norms and perceived behavioural control through commitment in TPB theory on teachers' behavioural intentions to use gamification in teaching, it can provide information for popularising the use of gamification for teaching in primary and secondary schools and promoting teachers' use of gamification in teaching. The following discussions are suggestions for some practical applications in education.

Schools should pay attention to the influence of teachers' attitudes, subjective norms, and perceived behavioural control in using gamification, actively enhance teachers' cognition of gamification, make teachers more committed to using gamification, and improve teachers' behavioural intention to use gamification. First of

all, in classroom teaching, schools can introduce great gamification teaching cases, so that teachers can understand and feel gamification more intuitively. Secondly, schools can analyse the advantages of gamification from multiple perspectives to teachers, broaden teachers' professional vision, stimulate teachers' interest in learning gamification, and guide and improve teachers' behavioural attitudes to use gamification. Third, schools should play the role of subjective norms as much as possible. The specific method is to formulate policies to encourage and support teachers to use gamification, and actively carry out gamification-related teaching experience exchange meetings and academic seminars, to enhance teachers' recognition of gamification teaching and promote their commitment to using gamification, and enhance their behavioural intention to use gamification. In addition, schools should also pay attention to teachers' perception of the difficulty of using gamification, provide technical support and academic guidance as much as possible. They should also pay attention to teachers' workload, the balance between course schedules and the use of gamification. Schools can also carry out more professional training on innovative teaching methods such as gamification, improve teachers' perception level of using gamification, and enhance their commitment and intention to use gamification. Additionally, according to the qualitative research process, some mathematics teachers said that when teaching the rotation of graphics in the course, using a gamified teaching method can allow students to master the direction of rotation and can make students remember it more firmly and not easily forget it. In addition, some chemistry teachers also said that using gamification to learn some easily forgotten knowledge will make students remember it

more deeply. This finding may provide some inspiration and reference for teachers in mathematics, chemistry, and other similar subjects. Perhaps they can give more priority to using gamification to teach some knowledge that students are easy to forget.

5.4 Limitations and future direction on research

This study also has certain limitations. First, the surveyed schools were only for primary and secondary schools in a certain area, and the conclusions have certain limitations and cannot represent the development of gamification teaching in schools in all regions and at all levels. Second, considering that the sample size of each specific subject was very large. It is difficult to balance, and it is impossible to evenly survey the same number of teachers of the same subject. Third, the number of interviewees was not particularly large, and it may not have been possible to fully understand the teachers' thoughts. In future research, the scope of the investigation can be expanded, or detailed analysis can be carried out for each academic stage or a specific discipline, and the number of interviewees can be increased to make the research conclusions more representative. Although this study verified the influencing factors and mechanism of teachers' behavioural intention to use gamification, due to the limitations of the research conditions and various factors, the actual behaviour of teachers using gamification was not included in the model. Therefore, future research can further verify teachers' use of games. The action path and influence relationship from behavioural intention to actual behaviour. According to qualitative findings, one aspect that affects teachers' subjective norm levels is the willingness of school administrators.

Perhaps paying more attention to the impact of school administrators' intentions on teachers' subjective norms can be a future research direction.

In addition, this study used a sampling survey in second-tier cities, and the conclusions may only be representative of some regions. In the future, the scope of the survey can be expanded. For example, by adding surveys of teachers in first-tier cities to compare with the surveys of teachers in second-tier cities to provide a richer and more comprehensive research perspective and conclusion.

5.5 Summary

This chapter has discussed the findings from the quantitative and qualitative results, explained the theoretical and educational applications of this study's findings, and revealed limitations and relevant future research directions. In general, the quantitative and qualitative research results support the previously proposed hypotheses, while the qualitative research findings have mainly provided a deeper explanation for the quantitative research findings and demonstrated a more comprehensive phenomenon. This chapter first discussed the findings of the quantitative research and some connections with related contemporary cutting-edge research. The main finding of the quantitative study was that attitude, subjective norms, and perceived behavioural control significantly affect the intention to use gamification through the mediating role of commitment. This is a new finding worth discussing because it confirms that commitment can be used to explain intention. Moreover, attitudes, subjective norms, and perceived behavioural control are also related to commitment. Subsequently, this

chapter proceeded with a discussion of interesting and representative phenomena in the qualitative research findings. The qualitative research results provide many details, that is, how these three factors affect teachers' use of gamification when they use gamification. There are many phenomena and opinions worthy of drawing attention. The next chapter will provide the conclusions and recommendations of this study, including a summary of the research objectives and findings, the significance of the findings, and concluding comments.

Chapter 6: Conclusion and Recommendations

This chapter will introduce the strategies and suggestions based on the research findings, respond to the research questions and objectives, and summarise the main findings and concluding comments of this study.

6.1 Recommendations

The deepening curriculum reform requires teachers to use innovative teaching methods and enrich different teaching methods. As a cost-effective teaching tool, gamification can stimulate students' learning motivation. It is of practical significance to encourage teachers to use gamification in teaching. Understanding the factors that influence teachers' behavioural intentions to use gamification can provide more targeted and effective strategies and suggestions for reference by schools and teachers to promote their greater use of gamification. This study found that attitudes, subjective norms, and perceived behavioural control influence teachers' intentions to use gamification through commitment. Therefore, the following will give corresponding recommendations based on these three aspects.

6.1.1 Recommendations for attitude towards using gamification

According to the findings, it was found that teachers' attitudes toward using gamification influence behavioural intentions through commitment. Regarding attitude, teachers are most concerned about teaching effects and student learning. In other words, for teachers to have a more positive attitude towards gamification and thereby enhance

their intention to use it, they need to be more recognised for the teaching effect of gamification and its benefits to student learning. Schools can conduct exchange seminars or introductory lectures on innovative teaching methods with the gamification theme and show teachers visually how gamification can help teaching and its impact on students' learning. Firstly, it deepens teachers' understanding and recognition of gamification, and secondly, it also allows teachers to receive richer knowledge and opinions about gamification in a more open environment. As long as teachers realise the functional value of gamification and believe it can improve their teaching effectiveness and promote students' learning, they will spontaneously and continuously carry out gamification for teaching. In addition, it is also suggested that creating more incentive mechanisms. Furthermore, the school-related department can use incentives to increase teachers' enthusiasm for using gamification and reward teachers who actively carry out gamification teaching and achieve results, thereby enhancing teachers' intention to use gamification.

6.1.2 Recommendations for subjective norms

This study confirms that subjective norms significantly influence teachers' intention to use gamification through commitment. Leadership willingness was found to be the central aspect that affects teachers' subjective norms. Therefore, to promote gamification teaching in schools, principals and other leaders play an exemplary role in encouraging and supporting teachers to use gamification in teaching. Leaders can disclose their views on gamification in daily meetings and show practical examples for

teachers' reference. School policymakers and leaders should pay attention to their influence to advocate the use of gamification, and it is recommended that they build and carry out gamification teaching in a planned and focused manner, for example, by promoting teachers to use gamification as the main form. Promoting and providing appropriate support in-class hours and other aspects will enable teachers to not need to worry about affecting their overall teaching progress.

Moreover, it can also pay attention to creating a communication atmosphere for teachers using gamification for teaching. Relevant policies can also be established in schools to guide teachers to use gamification or formal instructions can be produced to create an overall atmosphere for using gamification. This action can also improve teachers' subjective norm levels and thereby enhance their intention to use gamification.

6.1.3 Recommendations for perceived behavioural control

In addition to teachers' attitudes and subjective norms, teachers' level of perceived behavioural control in using gamification also significantly affects their behavioural intentions. This study found three main aspects that affect teachers' perceived behavioural control level: the difficulty of using gamification, the impact on workload after using gamification, and related training conditions. Correspondingly, it is recommended that schools establish a public platform for sharing gamification resources so that teachers can upload their gamification-related teaching resources and materials on the forum, including teaching courseware or lesson plans. Teachers can also leave feedback and comments on the platform, such as some precautions and

classroom implementation processes. This action can reduce teachers' lesson preparation time before using gamification or reduce their workload. It can also reduce their perceived difficulty in using gamification and enhance their intention to use gamification. Moreover, schools can also carry out systematic training on gamification to help teachers obtain systematic training, improve their mastery of gamification, and increase their confidence in using gamification. Doing this can increase teachers' perceived behavioural control levels and subsequently enhance their intention to use gamification.

6.2 Conclusion

This study aimed to motivate students' learning by exploring the factors that influence teachers' use of gamified teaching based on TPB. The main research questions of this study were based on the factors that influence school teachers' use of gamification based on TPB and how they specifically affect it, and whether commitment has a mediating effect between attitudes, subjective norms, and perceived behavioural control and intentions. To address these research questions, this study adopted a mixed research method. The quantitative research method was used to answer the main research question: whether the influencing factors and commitment that influence teachers' use of gamification play a mediating role in intention and the three antecedents. During the quantitative research process, 152 questionnaires were collected, the least partial squares method was used for structural equation modelling, and SPSS 27 and WarPLS 7.0 were used for the data analysis. In terms of qualitative

research, this part was mainly to answer the research question of the specific manifestations of factors that affect teachers' use of gamification. This study used an in-depth interview method during the qualitative research process, and 22 teacher interviewees were selected as the research subjects. The qualitative research results were analysed using thematic analysis. This study found that attitudes, subjective norms, and perceived behavioural control significantly affect teachers' intention to use gamification to teach through commitment, and commitment significantly impacts intention. According to the interview results, teaching effectiveness and students' learning are the main aspects that affect teachers' attitudes. Teachers' subjective norm level is mainly affected by school policies, leaders' willingness, teaching content, and grades. Leadership encouragement and support are essential and valuable to encourage teachers to use gamification for teaching. It is also worth noting that the pressure teachers face for further studies and public examinations will affect their subjective norm level. The main factors influencing teachers' perceived behavioural control level are the difficulty of using gamification, workload, teaching effectiveness, and training situations. With the advancement of educational technology informatisation and the deepening of curriculum reform, teachers' use of innovative teaching methods is increasingly encouraged. As a cost-effective and innovative teaching method, enabling teachers to use it more can promote innovative teaching development. It can also enrich teachers' teaching methods to stimulate students' learning. Teachers' teaching is a crucial part of students' learning. Therefore, it is also essential to understand and discover teachers' intentions to use gamification so that it can effectively promote

gamification as an innovative teaching method. Moreover, based on the TPB model, this study discovered that the factors influencing teachers' intention to use gamification, confirmed that commitment can explain intention, and effectively expanded the TPB model. Furthermore, this study provides a richer perspective for deepening the research on gamification teaching and giving the TPB model an abundant view.

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Appendices

Appendix A: The questionnaire of teacher's use of gamification for teaching

Dear Teacher:

Greetings! First, thank you very much for taking the time to complete this questionnaire during your busy work. I am a doctoral candidate in social sciences at The Education University of Hong Kong. I am currently working on my doctoral thesis. My research topic concerns teachers' intention to use gamification for motivating school students' learning. I hope to learn more about the situation from you, and your answers will be very helpful to my research. This questionnaire is filled out anonymously and takes about 10 minutes to complete. It is only used for academic research and will not be used for other purposes. Please answer carefully. Thank you so much!

School:

Your email address:

Subject:

Chinese

Math

English

Science

Politics

History

Geography

Biology

Art

Physical Education

Music

Others

Have you ever used gamification or not?

1- Yes

2- No

If yes, how many years have you used it?

No

less than 1 year

1-2 years

more than 2 years

*Gamification is different from the game. Using games for teaching refers to teachers carrying out entertaining and educational game activities based on specific educational purposes during teaching.

*The definition of using gamification for teaching is using game-based mechanisms, aesthetics, and game-thinking in teaching situations to attract students, motivate their actions, and promote their learning and problem-solving.

Please choose the appropriate option for the following questions based on the situation:

1. Using gamification for teaching would improve students' learning performance.

2. Using gamification for teaching would encourage students to spend more time studying.

3. Using gamification for teaching would encourage students to ask more questions in class.

4. Using gamification for teaching would result in more discussion among students.

5. Using gamification for teaching would attract students to focus more on their studying.

6. Using gamification for teaching would improve teaching.

7. Using gamification for teaching would enhance the interaction between the teacher and students.

8. The 'school subject group' or 'teaching and research section' assumes that I should use gamification for teaching.

9. The teachers who teach the same subject think that I should use gamification for teaching.

10. Educational authorities or schools believe that teachers should use gamification for teaching.

11. School leaders encourage teachers to use gamification for teaching.

12. I think that people who are important to me would like me to use gamification for teaching.

13. I would use gamification because people who are important to me think that I should do it.

14. I think that people whose opinions I value would encourage me to use gamification for teaching.

15. People who are important to me think that gamification is good for teaching.

16. I know some people who are important to me have used gamification for teaching.

17. I have time to design my teaching with gamification.

18. I have learned how to use gamification for teaching.

19. It is easy for me to design the elements of gamification for teaching.

20. I do not know how to incorporate gamification into teaching.

21. If I tell my supervisor (panel head) that I will use gamification for teaching, my supervisor (panel head) will fully support me.

22. If I tell my students that I will use gamification for teaching, my students will fully support me.

23. I am confident about using gamification for teaching.

24. I am able to use gamification for teaching.

25. To me, using gamification to teach is not a challenge.

26. It would be difficult for me to use gamification in teaching.

27. Whether or not to use gamification is entirely up to me.

28. If I want to, it is easy for me to use gamification for teaching.

29. I need to put a lot of effort in using gamification for teaching.

30. The idea of using gamification for teaching is challenging.

31. I would be very happy to use gamification for teaching.

32. I enjoy discussing about gamification with others.

33. I feel comfortable in using gamification for teaching.

34. In general, I am dedicated to use gamification for teaching.

1-34 Answers are the following:

Strongly disagree		Disagree		Somewhat disagree		Neutral		Somewhat agree		Agree		Strongly agree

35. I feel that using gamification for teaching is

Extremely unhelpful/ Unhelpful/ Somewhat unhelpful/ Neutral / Somewhat helpful/ Helpful/ Extremely helpful

36. I feel that using gamification for teaching is

Extremely inappropriate/ Inappropriate/ Somewhat inappropriate/ Netural / Somewhat appropriate/Appropriate/Extremely appropriate

37. I feel that using gamification for teaching is

Extremely boring/ Boring/ Somewhat boring/ Neutral / Somewhat interesting/ Interesting/ Extremely interesting

38.I feel that using gamification for teaching is

Extremely unfavourable/ unfavourable/ Somewhat unfavourable/ Neutral/ Somewhat favourable/ Favourable/ Extremely favourable

39. I feel that using gamification for teaching is

Extremely useless/ Useless/ Somewhat useless/ Neutral/ Somewhat useful/ Useful/ Extremely useful

40. I feel that using gamification for teaching is

Extremely ineffective/ Ineffective/ Somewhat ineffective/ Neutral/ Somewhat effective/ Effective/ Extremely effective

41. I feel that using gamification for teaching is

Extremely bad/ Bad/ Somewhat bad/ Neutral/ Somewhat good/ Good/ Extremely good

Appendix B: The interview questions

Attitude towards the behaviour

1. What do you think about using gamification for teaching?
2. Do you find gamification for teaching useful?
3. Do you support promoting the use of gamification for teaching?
4. Do you think the use of gamification in teaching is effective?
5. Do you find it helpful to use gamification for teaching?

Subjective norms

6. What is your school's policy on gamification for teaching? Does it have any effect?
7. Does it support and encourage the use of gamification for teaching?
8. What aspects influence your decision to use gamification or not in teaching?
9. Do your colleagues or teachers who teach the same subject as you impact your use of gamification in teaching?

Perceived behavioural control

10. Do you think it is difficult to use gamification in teaching? What is the biggest difficulty in using gamification?
11. Will using gamification for teaching increase your workload? Do you have enough time to design gamification for teaching?

12. Compared with traditional teaching, what are the changes and differences in the classroom teaching effect of using gamification?

13. Have you been trained in gamification teaching? If so, would you like to participate?

Commitment to the behaviour

14. Are you committed to using gamification for teaching? (And the reason?)

15. What will affect your commitment to using gamification in teaching?

Intention to use gamification for teaching

16. Have you ever used gamification for teaching?

17. Would you like to use gamification for teaching?

Appendix C: The questionnaire of teacher's use of gamification for teaching (Chinese version)

关于教师使用游戏化教学的问卷调查

敬爱的老师：

您好！首先非常感谢您能在忙碌的工作之余能够抽出时间来填写这份问卷。我是香港教育大学的一名教育社会学的博士在读生，现在正在进行博士论文的研究工作，我的研究主题是关于教师使用游戏化教学—以促进学生学习的行为意识研究。希望能向您了解相关情况，您的回答将对我的研究很有帮助。本次问卷调查为匿名填写，仅用于学术研究，不作其他用途，请您放心作答。非常感谢！

您工作的学校是？

您的性别是：

（男/女）

教授年级：

（一年级/二年级/三年级/四年级/五年级/六年级/七年级/八年级/九年级）

教授科目：（语文/数学/英语/科学/政治/历史/地理/生物/美术/体育/音乐/其他）

***游戏化教学的定义是，在教学情境下使用基于游戏的机制、美学和游戏思维来吸引学生、激励他们的行动、促进他们学习和问题的解决。**

你有使用过游戏化进行教学吗？

有/没有

如果有，那你使用了多少年？

（少於一年

1-2 年

多於 2 年）

以下问题请根据真实情况选择适当选项：

1. 使用游戏化教学会提高学生的学习表现。

非常不同意 不同意 比较不同意 一般 比较同意 同意 非常同意

2. 使用游戏化教学会鼓励会鼓励学生花更多的时间学习。

非常不同意 不同意 比较不同意 一般 比较同意 同意 非常同意

3. 使用游戏化教学会鼓励到学生在课堂上问更多的问题。

非常不同意 不同意 比较不同意 一般 比较同意 同意 非常同意

4. 使用游戏化教学可以给学生之间增加更多的讨论。

5. 使用游戏化教学会吸引学生更加专注于他们的学习。

6. 使用游戏化教学有助于教学。

7. 使用游戏化教学会增加教师与学生之间的互动。

8. 学校的学科教研组和级组认为我应该用游戏化教学。

9. 教同一个科目的老师们认为我应该使用游戏化教学。

10. 教育专家或学校认为老师应该使用游戏化教学。

11. 学校领导鼓励老师要用游戏化教学。

12. 我认为那些对我重要的人会想要我使用游戏化进行教学。

13. 我会因为对我重要的人认为我该用游戏化教学而使用。

14. 我认为那些我认同的人会鼓励我用游戏化教学。

15. 那些对我重要的人认为游戏化有利于教学。

16. 我知道有些对我重要的人有使用过游戏化教学。

17. 我有时间在设计游戏化进行教学。

18. 我曾经学过怎样在教学上使用游戏化。

19. 对我来说设计游戏化教学的各种要素很简单。

20. 我不知道怎样把游戏化融入到教学中。

21. 如果我告诉我的上级领导，我将要使用游戏化教学，他/她会全力支持我。

22. 如果我告诉我的学生，我将要使用游戏化教学，他们会全力支持我。

23. 我很有信心去使用游戏化教学。

24. 我有能力使用游戏化教学。

25. 对我来说，使用游戏化教学并不是个挑战。

26. 对我来说，使用游戏化教学将会很困难。

27. 是否使用游戏化教学完全取决于我。

28. 如果我想的话，使用游戏化教学对我来说是很简单的。

29. 我需要投放很多精力当我使用游戏化教学时。

30. 使用游戏化教学这个想法充满了挑战。

31. 我很开心若我要使用游戏化教学。

32. 我很享受与别人讨论游戏化教学。

33. 我觉得使用游戏化教学很舒适。

34. 通常来说，我致力于使用游戏化教学。

（1-34 选项均为：非常不同意 不同意 比较不同意 一般 比较同意 同意 非常同意）

35. 我觉得使用游戏化教学：非常没帮助 没帮助 比较没帮助 一般 比较有帮助 有帮助 非常有帮助

36. 我觉得使用游戏化教学：非常不合适 不合适 比较不合适 一般 比较合适 合适 非常合适

37. 我觉得使用游戏化教学：非常无聊 无聊 比较无聊 一般 比较有趣 有趣 非常有趣

38. 我觉得使用游戏化教学：非常不喜欢 不喜欢 比较不喜欢 一般 比较喜欢 喜欢 非常喜欢

39. 我觉得使用游戏化教学：非常没用 没用 比较没用 一般 比较有用 有用 非常有用

40. 我觉得使用游戏化教学：非常没效果 没效果 比较没效果 一般 比较有效果 有效果 非常有效果

41. 我觉得使用游戏化教学：非常不好 不好 比较不好 一般 比较好 好 非常好