Gamified Flipped Classrooms

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Abstract. In order to improve the learning efficiency of students and the teaching effect of teachers, the teaching mode of flipped classroom has always been widely loved by teachers and students, but there are also some problems, such as students' enthusiasm is not high, and they do not really improve their abilities, which is more obvious in secondary vocational education. Gamified teaching is an innovation, so this paper uses flow experience as the theoretical basis, quizziz and Chinese university MOOC as a platform to explore the combination of games and flipped classrooms to solve these problems. In the course "Fundamentals of Web Design", two teaching models are adopted: traditional flipped classroom and gamified flipped classroom. Finally, research proves that gamified flipped classrooms can increase student engagement, ensure student agency, and improve students' abilities.

Keywords: gamified flipped classrooms; secondary vocational education; engagement; flow experience

1   Introduction

In the face of increasingly fierce competition and the urgent need for talents, the Decision of the Central Committee of the Communist Party of China on the Reform of the Education System proposes to "adjust the structure of secondary education and vigorously develop vocational and technical education"[1]. The main purpose of secondary vocational education is to cultivate applied talents, and in secondary vocational classrooms, "task-driven" learning is generally adopted, allowing students to actually solve the projects created by the teacher[2]. In the traditional flipped classroom, in order to allow students to have enough time in the classroom to complete the project and master skills, students are often allowed to watch the teaching video provided by the teacher before class, and the students conduct cooperative exploration in the class, communicate and evaluate and display the completed project, and the teacher is next to give guidance. After class, students fill in the gaps, and teachers improve the teaching videos according to the students' learning situation. Looking at the current learning of secondary vocational students under the flipped classroom, there are the following problems:

1. Secondary vocational students are not highly involved in learning. Most secondary vocational students are not strong in learning motivation and interest, the quality of videos watched by students before class is generally low, students cannot really devote themselves to learning, and students' autonomy is not strong, so that the mastery of knowledge is uneven.

2. Student subjectivity is not strong. Because students don't understand what they want to learn, students get confused and inefficient when they collaborate on projects in class. Teachers will spend time working as a team to explain the basics.

3. Students' ability to complete projects is not internalized. In class, the completion of student projects is not high, and students cannot improve their interest in learning the content of the next section.

Therefore, this section examines the following questions:

1. Can gamified flipped classrooms increase student engagement in learning?

2. Can gamified flipped classrooms improve students' subjectivity?

3. Can gamified flipped classrooms internalize students' abilities?

2   Literature review

2.1   Flipped classroom

In the flipped classroom, before the class, students watch the teaching videos uploaded by the teacher according to their needs, and in the lesson, students listen to the lecture with purpose based on the knowledge they have learned in advance. Compared with the traditional classroom, the flipped classroom has become the center of the classroom from passive acceptance of learning to active inquiry in terms of role, independently acquiring knowledge, expanding and creating in-depth knowledge[3]. Teachers become facilitators of student learning, providing scaffolds for students. In terms of time allocation, knowledge transfer is transferred to pre-class completion, and knowledge internalization is transferred from traditional after-class to in-class completion.

2.2   Gamified flipped classrooms

Richard Battelle, a pioneer in online multiplayer gaming, conducted research and pioneered the concept of "gamification." Gamification refers to the application of games to non-game situations. Gamification is practiced in two forms in education: one is in the learning process, and games are used as an auxiliary to learn; The other is to use game elements to transform traditional learning activities into a game[4]. The gamified flipped classroom mentioned in this article refers to embedding elements of the game into the classroom. Through the game platform, it breaks away from the traditional one-way preaching mode and transforms it into an interactive mode, so that students can learn in a relaxed and pleasant environment, respect the student subject, and cultivate students' creativity [5]. Through games, students can respond to exercises and receive timely feedback, which in turn facilitates the learning of procedural knowledge. A study shows that gamified learning performance is not necessarily better than traditional paper-based learning, but gamification improves students' classroom participation and interest in learning[6], and gamified flipped classrooms are beneficial to improve students' self-efficacy and learning motivation, which in turn affects teachers' sense of professional achievement[7]. Hu Xiaoling et al. reviewed the literature on gamification teaching through meta-analysis and quantitative systematic evaluation, and proposed that in primary school, gamification teaching in English, physical education and other subjects improved academic achievement more obviously, but there was too little literature in middle school and later high school, and the results of the analysis were different from the results of other scholars[8]. Shen Yu also pointed out that the classroom in secondary schools does not pay enough attention,

and suggested that teachers should consider the type of knowledge, curriculum and game format applicable to students when designing games[9]. At the same time, there is little literature examining the impact of gamified flipped classrooms in computer courses, especially in secondary vocational education.

3   Theoretical basis: flow experience

Flow experience refers to the learner's full engagement during the learning process, reaching extreme levels of pleasure, concentration, and engagement. Finnish scholar Kiili has proposed an experiential game learning model. The model is like a circular system that allows players to take on challenges, improve their skills, and continuously create a flow experience[10]. One study showed that teachers designed contextualized game designs and students could have flow experiences. Flow experience regulates the relationship between behavior and emotion and engagement in gamification, and the gamification design mediates a high level of flow experience to increase participation[11], which helps improve students' academic performance and learning satisfaction[12]. Based on the heart flow experience, designing the gamified flipped classroom makes up for the low participation of students in the traditional flipped classroom.

4   Quizzizz Platform

quizzizz It is a relatively popular teaching platform in Europe and the United States, which integrates the elements of the game. The core elements of the game include: goals, rules, conflict, competition and cooperation, time, reward structure, feedback, level []. In the gamified flipped classroom, the teaching is designed according to the above core elements. In the design of this section, the quizzizz platform is used, which embodies other core elements besides the goals and rules, which are designed by the teacher and informed to the students. Integrating games into learning, the most important thing is how to integrate competitive game scenarios into learning, so as to promote students' learning.quizzizz The platform does just that. In this platform, the test enters as a teacher, and the test is edited based on the videos learned by the students before class. The form of the test has multiple choices, dragging, filling, etc. Teachers can set the test as a group or individual test. After creating the test, the teacher can send it to the students' game code through the mailbox or copy connection. After the students input the game code, the students can start the test. During the test, the students can be immersed in it with background music.As the students take the test, the students receive the feedback, which can increase the opportunities for interaction between students and between students and teachers. After completing the test, students can see their accuracy and ranking, and teachers can also see the students' answers.quizzizz The platform is very compatible, and teachers and students can operate it on their mobile phones or computers.

5 Study design and analysis of results

5.1 Research methodological design

1. Scales method: Scales developed by Reeve will be used to assess learning engagement. The scale includes three dimensions: behavioral engagement (four), cognitive engagement (four), and emotional engagement (four). Each item is scored on a scale from 1-7, 1 (strongly disagree) to 7 (strongly agree). The reliability and validity of the scale have been verified. Cronbach'sAlpha coefficient showed internal consistency of 0.87, 0.72, and 0.91[13] for behavioral engagement, cognitive engagement, and emotional engagement, respectively, it can be seen that the coefficients are greater than 0.7, therefore, the questions have a high internal consistency.

2. Quasi-experimental method: the experimental group and the control group were tested before and after experiments, the experimental group adopted gamified flipped classroom teaching, and the control group adopted traditional teaching. Use final grades to analyze the impact of gamified flipped classrooms.

5.2 Instructional resource design

The resources of the micro-video are selected from the Chinese university MOOC platform, "Fundamentals of Web Design" produced by Guo Jiandong and Huang Peiquan. The textbook for students is "HTML5+CSS3 Web Design and Production Case Study Tutorial (2nd Edition)", which designs the teaching resources of the first unit. This is shown in Table 1.

Table 1. Instructional resource design

Chapter	Teaching content	Teaching objectives	Teaching methods
Section I	Development platform software download and installation instructions	The student successfully downloads the software	The MOOC platform is the main platform, and the project training is carried out offline
Section I	Overview of site and web page knowledge, creating sites and web pages	Students master the basics and create websites and web pages flexibly	The MOOC platform is the main platform, and the project training is carried out offline
Section II	Text and HTML elements in web pages	Students are familiar with a variety of texts and elements	The MOOC platform is the main platform, and the teachers in the class give expansion
Section II	Set text and paragraph styles, CSS base styles	Students can create a beautiful page collaboratively or independently	The MOOC platform is the main platform, and the project training is carried out offline

5.3 Instructional design

The teaching process is divided into before, during and after class. At each stage, teachers and students have their own goals to achieve, and the overall instructional design is shown in Figure 1.
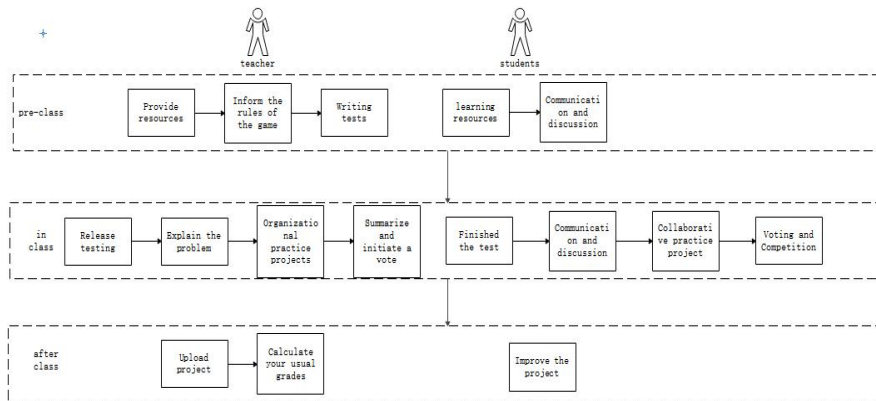

Fig. 1. General diagram of instructional design

5.3.1 Pre-class instructional design

Teachers organize students to watch micro-videos in the MOOC platform independently, and teachers send teaching goals to students through QQ groups, so that students can preview with purpose. Teachers should inform the rules of the game and the use of the game platform in advance. If students encounter problems, they can communicate with their classmates and teachers in the QQ group, and if they still have doubts, they can stay in class and discuss with their classmates in the same group.

Teachers should write tests on the quizzizz platform based on the micro-videos watched by students before class, because it is the content that students are previewing, so the difficulty of the questions written by teachers should be moderate. In order to immerse students in the game, teachers should create game scenarios for students, such as adding background music or pictures or videos.

5.3.2 In-class instructional design

Students are required to complete a test written by the teacher on the quizzizz platform before attending class. Students can visit the quizzizz website through their mobile phones and enter the game code provided by the teacher to enter the game. Because this test is designed to test the effectiveness of students' pre-lesson preparation, teachers set it to the classic mode, where students compete alone. Students will have timely feedback in the process of doing the test, correct answers will add points, incorrect answers will not add points, the page will feedback to students correct answers, students can also choose "props" according to their own needs to play the game. After the students are completed, the teacher can show the ranking of the students and the students' tests, and the teachers can summarize the topics with a high error rate and display them in the quizzizz platform, so that students can discuss, and those that

cannot be solved can ask questions to the teacher and let the teacher guide. After the teacher fills the student's knowledge gap, according to the learning objectives, the project is published for the student, and the student can freely combine and complete the project in a team. After the student completes the project, submit the project to the teacher's mailbox, the teacher will sort out the received project, add points according to the speed of submission, and finally display the project on the quizzizz platform, and the student will vote for the excellent project, and the teacher will add points to the excellent project. The teacher adds up the scores of the students who completed the test before class and the scores of the cooperation according to the proportion, lists the rankings, and calculates the usual grades for the students according to the rankings.

5.3.3 After-school instructional design

Teachers upload excellent projects to the QQ group, and students can download them by themselves to improve their own projects. Teachers can encourage students to upload videos of projects for other students to learn from. Teachers should do a good job in the process evaluation of students after class, and the evaluation of students should be fair and just. The process evaluation index and weight table refer to the process evaluation index and weight table of internal medicine nursing blended learning drawn by Liang Shaoying et al.

5.4   Data analysis

Data were collected after class, and learners completed questionnaires and collected final scores.Data analysis with SPSS24.0 software.Conduct a qualitative analysis of the data in the questionnaire, and first analyze whether the obtained data meet the normality test. After conforming to the normal distribution, one-way ANOVA was used to analyze whether the scale results of the two groups were significantly different. The independent sample T test was used to analyze whether there was a significant difference in final results between the two groups.

5.4.1 Scale analysis results

In the data analysis, 40 samples were entered. There are two ways to test normality, the K-S test and the S-W test ,and the S-W test prevailed, this is shown in Table 2, Table 3, and Table 4 , the Sig values were all greater than 0.05,. so the samples were normally distributed, and the one-way ANOVA can be used after passing the homogeneity test of variance, and it can be seen from the one-way ANOVA that the significance of the two teaching modes in behavioral participation, emotional participation and cognitive participation is less than 0.05.Therefore, it can be seen that the gamified flipped classroom model has significant effects in behavioral, emotional, and cognitive engagement. Greatly increased engagement. Among them, the most significant is in emotional participation, indicating that the gamified flipped classroom stimulates students' internal motivation and improves their subjective willingness.

Table 2. Behavioral engagement normality test

	statistics	degree of freedom	Salience	statistics	degree of freedom	Salience
When I was in class, I listened very carefully	.164	40	.008	.909	40	.003

	statistics	degree of freedom	Salience	statistics	degree of freedom	Salience
I pay attention in class	.163	40	.009	.913	40	.005
In class, I try to do well	.158	40	.013	.913	40	.005
In class, I work as hard as I can	.165	40	.008	.911	40	.004

Table 3. Normal test for emotional engagement

	statistics	degree of freedom	Salience	statistics	degree of freedom	Salience
I was intrigued when we were doing something in this class	.163	40	.009	.898	40	.002
The class is interesting	.145	40	.033	.898	40	.002
I love learning new things in this class	.151	40	.022	.905	40	.003
I felt good when I was in this class	.164	40	.008	.920	40	.008

Table 4. Cognitive engagement normality test

	statistics	degree of freedom	Salience	statistics	degree of freedom	Salience
I try to relate what I've learned to my own experiences	.163	40	.009	.898	40	.002
I try to combine different ideas to make sense	.151	40	.022	.905	40	.003
I try to connect what I've learned with what I already know	.145	40	.033	.898	40	.002
I wrote my own examples to better understand the concepts I learned	.164	40	.008	.920	40	.008

5.4.2 Results of the final performance analysis

The final grades of the two classes were tested for uniformity of variance , become conscious of F=1.469, Sig.=0.233, and the values were greater than 0.05, which shows that the variance of the two sets of data is the same. Next, reading the result of the previous row, we can see the two-tailed significance probability Sig. (double-tailed) = 0.030<0.05, so the two sets of data are significant and statistically significant. The results show that gamified flipped classrooms are better than flipped classrooms.

6   Conclusion

Nowadays, the teaching mode is gradually diversified, and this section is taught through the quizzizz platform, combined with the model of flipped classroom. It is found that the gamified flipped classroom can improve students' participation, establish students' dominant position, and promote the internalization of students' abilities, which solves the problems arising from

the middle vocational computer proposed in this paper. By comparing the final grades of the two groups of students, it can be seen that this teaching model has a positive impact on performance. Although this model improves students' enthusiasm for learning, attention should also be paid to the following issues: (1) In the process of combining games and learning, the teacher's design should distinguish between priority and priority. We cannot blindly pursue games while ignoring the systematic nature of knowledge, nor can we make the proportion of games in teaching too small to achieve their effects. (2) As the frequency of application of this model increases, how to ensure the durability of students' interest. (3) Whether the teaching model can be used in other main subject teaching, and the necessity of using it in the main subject.

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