



The effectiveness of a flipped-classroom instructional model developed by using a practice platform with gamification

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ABSTRACT

In recent years, the flipped classroom, as an emerging and popular teaching strategy, has been widely used in teaching in major universities. Its scope of influence and application has been quite wide. This research was one part of a bigger study, and only the results of phase II are shown. Its purpose was to study the effectiveness of using a flipped-classroom instructional model developed by using a practice platform with gamification effects for improving the learning performance of Chinese undergraduate media students through their learning processes. Students practiced on a platform with gamification effects. The sample was 39 undergraduate students majoring in media in China, selected by using a specific random number method. Three research tools were used: the flippedclassroom instructional model developed by using a practice platform with gamification effects, lesson plans and a student learning performance test. The statistics used were mean, S.D. and t-test. From the results, it was found that the use of this instructional model improved students' learning performance; after the experiment, achievement scores were higher than before the experiment with statistical significance (* $p < 0.05$).

Keywords: flipped classroom , gamification, instructional model , learning performance, practice platform

INTRODUCTION

As people's understanding of the film and television industry and technology has changed, the media, film and television industry has developed rapidly. However, as it has changed, in order to improve cooperation and its quality, a new profession has emerged in the film and television industry – composer of film and television scores. Courses on film and television scoring belong to the professional music field and are professional courses with comprehensive and mixed characteristics. These courses involve strong professional performance and strong practicality. Courses on film and television scoring are art courses that match film and television art. This is an art that combines sound and pictures, and takes into account the dual professional fields of "music" and "film and television"(Wang et al., 2020) . Many colleges and universities have opened film and television scoring courses or similar courses. In the process of creating film and television scores, students can select appropriate music, use music rationally, accurately grasp the rhythm, create a harmonious relationship between music and video, and ultimately achieve the desired the artistic effect, improving students' professional abilities and qualities in film and television score creation (Hou,2017) . However, in the process of this research, we gradually discovered certain shortcomings and thorny problems in today's film and

television scoring courses. For example, many curriculum and teaching studies in this area are aimed at recording engineering students in music disciplines, while there have been few studies on teaching methods in film and television scoring courses for media majors. However, certain teaching shortcomings and loopholes in this type of media major course have come to light. In addition, the researcher has observed through her many years of teaching this course that due to the strong professionalism of this course, most students, who have no basic knowledge of the subject, lack interest in this course and are not proactive in understanding and participating in the class content. Media majors also lack a platform for self-training and practical training for daily practice, which has become an important way that students can effectively improve their academic performance and abilities (Feng, 2022). To this end, researchers believe that new teaching models should be adopted to make classroom changes in order to enhance the effective impact on students.

The flipped classroom is a student-centered teaching strategy. This teaching model, with the rapid development of the information age, allows the pre-teaching of the core content before class and allows students to conduct theoretical independent networked learning, thereby improving the quality of the classroom efficiency to improve students' learning results (Ching-Yi, Chang et al., 2022). However, in the face of such a new teaching strategy, the teaching feedback displayed has been both positive and negative. The flipped classroom is a teaching strategy that can be universal, is effective and can be agreed upon (Guo, 2019). It improves student achievement and can lead to increased student engagement and critical thinking (Florence et al., 2021). However, with the increase in online independent learning time, many students with poor early learning foundations have become burned out due to the distance between teachers and peers and the alienation of students regarding the classroom atmosphere, which has reduced the learning effects. Therefore, compared to traditional teaching, there has been no significant improvement in students' academic performance under the conditions of flipped-classroom teaching, which also shows that the flipped classroom is not necessarily universal to some extent (Sommer et al., 2018).

Many researchers have tried to integrate the flipped-classroom teaching model with digital education technology in order to make the practical application effects of the flipped classroom rich and flexible. The research results of multimedia technology is not only a manifestation of the modernization of teaching methods but also an important step in teaching reform (Dai, 2022). The rapid development of educational technology has also spawned many related educational platforms, such as China's MOOC platform. This online educational technology has many branches to meet the different needs of different majors and courses as well as the actual situations of students and teachers. Through practice in the question bank, independent online practice can be achieved to consolidate and improve knowledge and skills (Luo et al., 2021).

Many researchers have found that gamified teaching strategies and methods, carried out in order to more accurately enable the educational practice platform and flipped classroom to serve students and produce better learning effects, can significantly improve students' learning results, study status and study performance (Chen, 2020). Digital gamification can present graphics, and some textual, musical and verbal expressions (Tobias et al., 2014). Students like to play games, but as their age and level change, they gain a deeper understanding of the form of gamification. Therefore, the development of virtual environments for digital games has obvious advantages over traditional teaching methods (Tan & Biswas, 2007; Hickey et al., 2009). Even now, some scholars propose more interesting dynamic adaptive gamification frameworks to meet the needs of gamification. For example, the dynamic adaptive gamification framework is a gamification framework that integrates player types and gamification elements (Shabadurai et al., 2024). For this reason, many researchers have said that if components with gamification effects, including gamification elements, such as badges, etc., and gamification mechanisms, such as incentives, interactions, etc., are applied to online learning, such an environment can be more effective and easily enable students to achieve their goals, for example, by enhancing students' independent inquiry abilities and participation (Jaftha et al., 2020; deMarcos et al., 2014).

This article will describe a teaching experiment conducted by applying a flipped-classroom instructional model developed by using a practice platform with gamification effects to detect the impact and changes of this instructional model on students' learning performance (including academic performance, independent inquiry ability, classroom participation, and music perception).

LITERATURE REVIEW

Film and television scoring courses

As an indispensable part of influencing art and film, television scores occupy a very important position. Their role is not only to provide the background but also to exaggerate the atmosphere and to portray the characters and personalities. They are the main carrier used to deepen the film and television themes and carry the embodiment of national music (Bai & Fang, 2020). Due to the rise of film and television scoring, many music

conservatories as well as various comprehensive universities and media schools have opened courses related to film and television scoring. The teaching content and technical difficulty focus of film and television scoring courses differ based on the school type and type of major. For example, at Hebei University of Communication in China, there are some practical difficulties with the current development status of film and television scoring courses in media majors, as (Xie,2020) points out. Therefore, a film and television scoring course is not only a professional course which provides strong professional skills but also an auxiliary course which helps students improve their emotional literacy in music. We should pay more attention to its characteristics and problems so as to reduce the differences between schools and differences in film and television scoring courses among majors. This requires continuous and in-depth research and practice by many researchers.

Flipped classroom

The most important turning point in the process of flipped classroom learning theory was the book *Flip Your Classroom: Talk to Every Student in Every Class Every Day*, co-authored by Bergman and Sams. In 2013, the flipped classroom was defined as “the use of videos to learn self-made content and exercises as homework outside the classroom. This homework can be before class, after class, and in class. Problems are discussed and solved through group discussion and cooperation.” After research by many experts and scholars, most of them now believe that teaching and learning through the use of flipped classroom forms and strategies can more effectively improve students' academic performance, and at the same time, it also has a relatively positive impact on the learning outcomes of college students (Lax et al., 2017). Using flipped-classroom teaching methods and strategies can improve students' cognition, which is a significant change from the results of traditional teaching methods (Balaban et al., 2016; Wasserman et al., 2017). However, although there are many research arguments that illustrate the advantages of the flipped classroom, some experts and scholars have pointed out that a more traditional and single flipped-classroom strategy and method is not enough to support improvement (Qin et al., 2020). Students must have a deep understanding of learning content and knowledge points to actively participate in class. In some literature and papers on cooperative learning, it has been pointed out that many students have encountered some challenges in group work (Lo C.K. et al., 2017). For example, if students do not have any guidance and prompts from teachers on course content, and they study on their own and conduct group discussions in class, this will directly affect some students with poor performance (Sun et al., 2017). Due to poor foundations and poor understanding, class discussions cannot be kept up with, resulting in self-abasement. Then, some students with low grades and slightly lower abilities may not be able to keep up with the issues discussed in class, and may react with anxiety or self-defeat. Therefore, in order to ensure the effective use of the flipped classroom and thereby enhance students' participation and independent learning ability, researchers must use flipped-classroom teaching methods and strategies while designing teaching activities that are suitable for students' actual situations and using methods which improve students' interest.

Digital technology practice platform

Digital technology is a technology that supports and influences others with network and computer technology (Wu,2018). Nowadays, with the support of digital technology, more and more educators are able to innovate and reform teaching methods by using digital technology. The online education platform is a new type of educational technology derived from the rapid development and theory of digital technology. The online education platform is a set of platforms or software that provides distance education services with online teaching resources as the core (Luo,2014). For example, the "Tike" online practice system was created using China's WeChat applet (Luo,2021). This creation provides teachers and students with a lot of convenience and benefits in the process of doing exercises, and improves students' interest and efficiency in doing exercises. Based on the strong support of digital technology in the construction of online teaching and the powerful function of educational communication, online education platforms have been applied to class-based teaching models, teaching strategies, classroom activities, and extracurricular activities. They supplement the traditional classroom and effectively change the current talent-training model of various schools. Many researchers believe that based on the functional attributes and types of network platforms, more targeted question banks that meet the needs of various courses should be created. In addition to being integrated with various teaching models to improve students' learning effects and classroom teaching, the platform should also be improved and innovated in various aspects, such as visual effects and experience to highlight and emphasize student-centered teaching strategies.

Gamification

Gamification refers to an effective motivational method that uses game elements and game mechanism strategies and thinking in a non-game environment to attract and motivate students, change learning behaviors, and help solve some difficult problems and problems in the real world regarding thoughts and behavior. Teaching gamification is what we call gamified teaching, that is, using gamification to teach in the classroom (Wang,2019). Improving students' learning interest through gamification will generate good

learning motivation, and at the same time, it will induce good learning behaviors, thereby producing good learning effects. Prensky proposed six key structural elements of games, namely, "rules", "goals and objectives", "results and feedback", "fiction/competition/challenge/opposition", "interaction" and "representation or story". Discuss the elements of mimification, including rating scales (scores, badges, people, etc.), storytelling, game controls, instant feedback, and participation opportunities (Randall et al., 2013). Learning issues are addressed by increasing challenges, improving knowledge and social connections. In addition, also verify that the game-based learning environment can promote students' autonomous learning and participation (Chen et al., 2014; Yang & Chang, 2013). From the research results of many researchers, it can be seen that gamification strategies are applied in learning scenarios and displayed through digital network technology in the form of pictures, level-breaking mechanisms, badges, points accumulation, etc., thereby improving and motivating students to learn, affecting participation, inquiry ability, etc.

E-learning performance

E-learning performance refers to the learner's performance during the learning process, including learning ability, learning behavior, academic performance and other learning-related content. Good learning performance is good interaction and communication between learners, teachers and students, providing a good learning environment, thereby improving learners' performance and obtaining a different sense of accomplishment (Hao, 2006). The momentum factors that affect learning performance are dominated by independent inquiry ability, perceptual ability, classroom participation, learning motivation, etc. (Sun et al., 2018). One comparative study of students' classroom participation in the interaction models used in different types of classrooms proves that learning should be task-driven and make full use of emotional experience to regulate classroom participation so that students are motivated to participate, and students' classroom participation is effectively improved. Student motivation is directly proportional to the level of participation. However, the cultivation of perceptual abilities is also an important manifestation of learning performance, including students' ability to perceive and understand learning materials, the learning environment and teaching content. Through effective perception, students can better understand and absorb the learning content to improve their learning performance.

Therefore, based on the above literature and proven research, in order to improve students' learning performance, teachers need to adopt different, or curriculum-specific teaching methods and strategies or innovative teaching models to change the way students learn the curriculum, processes, activities, etc., thereby improving many students' learning performance.

Methodology

Participants

This article documents the results of phase II of the research. Its main purpose was to study the effectiveness of using a flipped-classroom instructional model developed by using a practice platform with gamification effects for improving the learning performance and processes of Chinese undergraduate media students. The sample was 39 undergraduate students majoring in media in China, selected by using a specific random number method.

Research Tools

This study used three research tools: the flipped-classroom instructional model developed by using a practice platform with gamification effects (abbreviated as GaF-PELL model), lesson plans, and student learning performance test. Each research tool was approved by the IOC experts, and the result values reached the standard in a range of 0.67-1.00.

Data Collection

This GaF-PELL model covered 8 weeks, with a total of eight chapters of teaching content, and a total of four classes per week.

Before-class (on-line) preview materials were sent through WeChat to strengthen students' independent inquiry skills and learning ability. Teachers prepared course content framework PPTs, course content videos, and additional copies of course materials. During classes (on-line and off-line), classroom teaching and practice were performed to improve students' classroom engagement capabilities; the teaching links included videos, PPTs, and audio (asking questions, face-to-face discussions in groups, speaking, answering, expanding knowledge, and summarizing), and there was a practical link (using the gamification effect platform for practice). The after-class (on-line) review consolidated the practice session; improved students' independent inquiry learning and music perception ability; included assigned practice assignments (platform and other assignments, reports and summarizing practice results); put forward requirements for the review; and

required students to independently explore and learn to expand knowledge, and summarize the knowledge and send it through WeChat to the teacher. At the same time, the teacher made an evaluation summary. After the course content in the 8th week had been completed, students' learning performance was tested through knowledge and ability test questions and learning performance questionnaires, and data was collected.

Data Analysis

The data analysis used mean, S.D and t-test methods for detection. This study adopted GaF-PELL model, as shown in Figure 1:

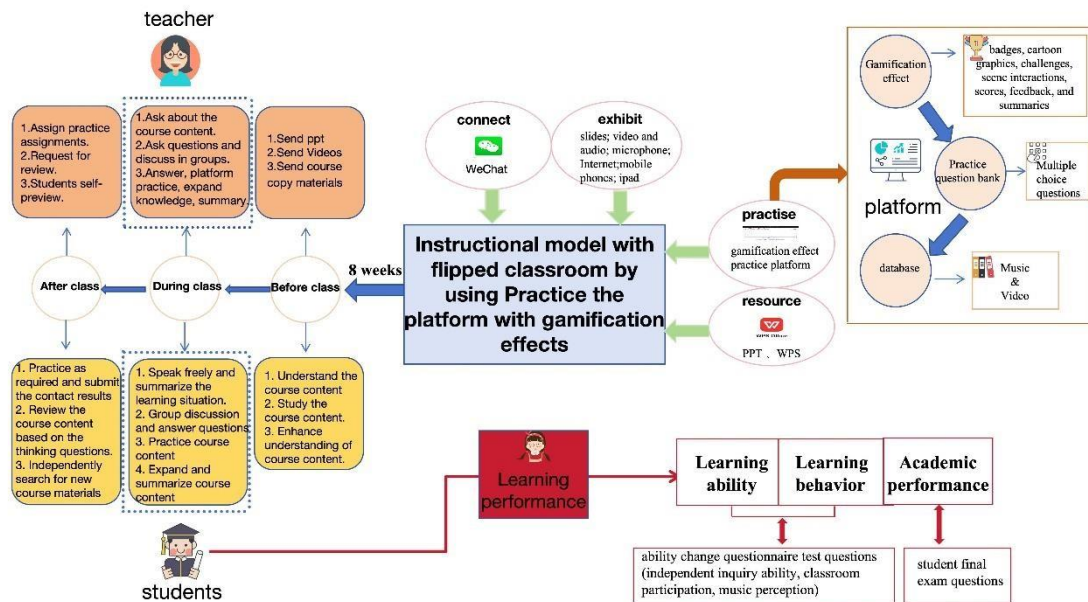


Fig.1. GaF-PELL model reaserch framework

RESULTS

The results of the effectiveness of this study are divided into two parts:

Part I: The analysis results of test data collected before the experiment and after the experiment, namely, mean, S.D. and t-test values of part 1 of the student learning performance test questions (student knowledge and skill test scores), which are shown in Table 1:

Table 1 Analysis of student test scores before the experiment and after the experiment(n=39)

| Experiment time | Student number | \bar{x} (100) | S.D. | t-test |
|-------------------|----------------|--------------------|-------|----------|
| Before experiment | 39 | 77.46 | 9.147 | -10.571* |
| After experiment | 39 | 88.30 | 6.542 | |

*Statistical significance: * p<0.05

Table 1 shows that by comparing students' scores before the experiment and after the experiment, it could be verified that the GaF-PELL model was effective. The mean score after the experiment (\bar{x} = 88.30, S.D. = 6.54) was higher than that before the experiment(\bar{x} = 77.46, S.D. = 9.14), which was highly statistically significant (* p<0.05).

Part II: Part II of the student learning performance test questions included questions on students' independent inquiry ability, classroom participation and music perception. Test data were collected and results were analyzed to produce mean, S.D. and t-test values before and after the experiment, which are shown in Table 2, 3, 4 and 5:

Table 2 The analysis results of test data collected before and after the experiment based on students' independent inquiry ability, classroom participation and music perception(n=39)

| Experiment time | Student number | \bar{x} | S.D. | *-test |
|-------------------|----------------|-----------|------|----------|
| Before experiment | 39 | 2.61 | 0.18 | 25.997 * |
| After experiment | 39 | 4.18 | 0.32 | |

*Statistical significance: * p<0.05

Table 2 shows that by comparing students' scores before the experiment and after the experiment, it could be verified that the GaF-PELL model was effective. The mean score after the experiment ($\bar{x} = 4.18$, S.D. = 0.32) was higher than that before the experiment ($\bar{x} = 2.61$, S.D. = 0.18), which was highly statistically significant (* p<0.05).

Table 3 Results of independent inquiry ability(n=39)

| Student Learning Performance Test: Part Before experiment | After experiment 2: Student | | | Student | | | | |
|--|-----------------------------|------------|-------------|-------------|------------------|-------------|-------------|--------------|
| | Questions | experiment | | Questions | experiment | | | |
| | | | \bar{x} | S.D. | Meaning | \bar{x} | S.D. | Meaning |
| 1. I am willing to try to find information related to the class content myself. | | | 2.66 | 0.66 | Sometimes | 4.18 | 0.64 | Often |
| 2. I began to organize the course content in an organized and logical way. | | | 2.59 | 0.67 | Seldom | 4.23 | 0.70 | Always |
| 3. I began to be able to more accurately grasp the focus of the classroom content and learning purpose. | | | 2.66 | 0.57 | Sometimes | 4.15 | 0.67 | Often |
| 4. I would like to start trying to learn content and problems that are more difficult than the course content. | | | 2.59 | 0.49 | Seldom | 4.00 | 0.60 | Often |
| 5. I can set regular learning goals according to my own learning needs. | | | 2.56 | 0.59 | Seldom | 4.18 | 0.60 | Often |
| 6. I am willing to use the gamified practice platform to train and do the exercises repeatedly, and to reflect on the reasons for wrong answers. | | | 2.61 | 0.59 | Sometimes | 4.12 | 0.69 | Often |
| Independent inquiry ability: | | | 2.61 | 0.59 | Sometimes | 4.14 | 0.65 | Often |
| overall average value | | | | | | | | |

From the results in Table 3, it can be seen that by comparing the questionnaire scores of students' independent inquiry ability before and after the experiment, it could be verified that the GaF-PELL model was effective. The overall mean score after the experiment ($\bar{x} = 4.14$, S.D. = 0.65) was higher than that before the experiment ($\bar{x} = 2.61$, S.D. = 0.59). Among the questionnaire items, the three items on independent inquiry ability with the most significant changes after the experiment, from highest mean to lowest mean, were as follows: The highest one was "I began to organize the course content in an organized and logical way;" with a frequency level of 'always' ($\bar{x} = 4.23$, S.D. = 0.70); the second was "I am willing to try to find information related to the class content myself;" with a frequency level of 'often' ($\bar{x} = 4.18$, S.D. = 0.64); and the last one was "I can set regular learning goals according to my own learning needs;" with a frequency level of 'often' ($\bar{x} = 4.18$, S.D.=0.64).

Table 4 Results of Class Participation Assessment(n=39)

| Student Learning Performance Test: Part 2: Questionnaire Questions | Before experiment | | | After experiment Student | | | | |
|--|-------------------|------------|-----------|--------------------------|------------|-----------|------|---------|
| | Questions | experiment | | Questions | experiment | | | |
| | | | \bar{x} | S.D. | Meaning | \bar{x} | S.D. | Meaning |
| 1. I can actively answer the questions raised by the teacher in class. | | | 2.59 | 0.63 | Seldom | 4.20 | 0.69 | Always |
| 2. I can keep up with the class schedule. | | | 2.51 | 0.64 | Seldom | 4.20 | 0.69 | Always |
| 3. I can take the initiative to have face-to-face group discussions and do research with my classmates, and clearly express my views and opinions. | | | 2.56 | 0.55 | Seldom | 4.12 | 0.65 | Often |

| | | | | | | | |
|--|------------------------------|-------------|-------------|---------------|-------------|-------------|--------------|
| 4. I can take the initiative to communicate feedback to teachers on problems I do not understand. | 2.59 | 0.59 | Seldom | 4.10 | 0.71 | Always | |
| 5. I can maintain a happy, more relaxed mood to participate in the classroom learning environment. | 2.48 | 0.55 | Seldom | 4.02 | 0.58 | Often | |
| 6. I can participate in every part of the classroom learning. | 2.53 | 0.60 | Seldom | 4.35 | 0.58 | Always | |
| Class Participation Assessment: | overall average value | 2.54 | 0.59 | Seldom | 4.16 | 0.65 | Often |

From the results in Table 4, it can be seen that by comparing the questionnaire scores of students' classroom participation before and after the experiment, it could be verified that the GaF-PELL model was effective. The mean score after the experiment ($\bar{x} = 4.16$, S.D. = 0.65) was higher than that before the experiment ($\bar{x} = 2.54$, S.D. = 0.59). Among the items, the three classroom participation items with the most significant changes after the experiment, from highest mean to lowest mean, were as follows. The highest was "I can participate in every part of the classroom learning;" with a frequency level of 'always' ($\bar{x} = 4.23$, S.D. = 0.70); the second highest were "I can actively answer the questions raised by the teacher in class;" and "I can keep up with the class schedule;" with a frequency level of 'always' ($\bar{x} = 4.20$, S.D. = 0.69); and the last one was "I can take the initiative to have face-to-face group discussions and do research with my classmates, and clearly express my views and opinions;" with a frequency level of 'often' ($\bar{x} = 4.12$, S.D. = 0.65).

Table 5 Results of the Perceptual Ability Assessment (n=39)

| Student Learning Performance Test: Part 2: Student Questionnaire Questions | Before experiment | | | After experiment | | |
|---|-------------------|-------------|------------------|------------------|-------------|---------------|
| | \bar{x} | S.D. | Meaning | \bar{x} | S.D. | Meaning |
| 1. I can master the basic knowledge of music. | 2.69 | 0.73 | Sometimes | 4.25 | 0.67 | Always |
| 2. I can master more basic knowledge of film and television. | 2.94 | 0.75 | Seldom | 4.55 | 0.55 | Often |
| 3. I could gradually tell the style and type of each music I heard. | 2.64 | 0.66 | Sometimes | 4.12 | 0.61 | Often |
| 4. I can gradually feel the musical emotions of different types and styles. | 2.53 | 0.50 | Seldom | 4.23 | 0.70 | Always |
| 5. I can more accurately perceive and analyze each type of basic content in the music. | 2.69 | 0.61 | Sometimes | 4.15 | 0.63 | Often |
| 6. Gradually, I can more accurately combine the feelings and emotions expressed by the music that I hear with the film content and emotions that I see. | 2.69 | 0.61 | Sometimes | 4.33 | 0.66 | Always |
| 7. I can start to complete the music classification and film and television classification independently. | 2.61 | 0.63 | Sometimes | 4.20 | 0.65 | Always |
| 8. I accelerated my perception of music and television. | 2.51 | 0.50 | Seldom | 4.20 | 0.61 | Always |
| Perceptual ability assessment: overall average value | 2.66 | 0.62 | Sometimes | 4.20 | 0.63 | Always |

From the results in Table 5, it can be seen that by comparing the questionnaire scores of students' (music) perception ability before and after the experiment, it could be verified that the GaF-PELL model was effective. The overall mean score after the experiment ($\bar{x} = 4.20$, S.D. = 0.63) was higher than that before the experiment ($\bar{x} = 2.66$, S.D. = 0.62). Among the items, the three items with the most significant changes after the experiment, from highest mean to lowest mean, were as follows: The highest one was "Gradually, I can more accurately combine the feelings and emotions expressed by the music that I hear with the film content and emotions that I see;" with a frequency level of 'always' ($\bar{x} = 4.33$, S.D. = 0.66); the second was "I can master the basic knowledge of music;" with a frequency level of 'always' ($\bar{x} = 4.25$, S.D. = 0.67); and the last was "I can gradually feel the musical emotions of different types and styles;" with a frequency level of 'always' ($\bar{x} = 4.23$, S.D. = 0.70).

DISCUSSION

Through the display and analysis of the research results, the changes in students' learning performance in the film and television scoring course through the use of the GaF-PELL model were studied.

From the results, it was found that the learning performance of the Chinese undergraduate media students could be effectively improved by using the GaF-PELL model. Overall, this study measured the learning performance of 39 students under the same conditions before and after the experiment using the GaF-PELL model. It was found that there was a significant difference between the results before and after the experiment. Learning performance had improved with statistical significance.

The improvement in academic performance may have been due to the fact that students used the GaF-PELL model to be trained on course-related content. The practice-question bank in the platform not only covered game strategy, but also provided motivation, interaction, badges, points and other gamification mechanisms and elements to improve students' practice mentality and emotions. At the same time, the question bank was exercise content specially designed by teachers based on relevant course content and students' actual abilities, which satisfied the requirement to consolidate students' knowledge points and proficiency, which improves the accuracy of student training and strengthens students' practicality. Of course, this was also inseparable from the on-line and off-line hybrid- teaching activity design of the flipped classroom. For example, gamified teaching strategies and methods can significantly improve students' learning status and academic performance

(Chih-Hung Chen,2020). And as through class time, the design of flipped-classroom teaching activities such as group and cooperative learning and discussion has been used to solve problems, thereby improving students' performance(M.K.Kim et al., 2014).

The improvement in independent inquiry ability may have been due to the fact that the GaF-PELL model could meet the criteria of the "student-centered" teaching concept. Through online methods, the course content was front-loaded to promote students' pre-class preparation through self-learning. After class, through online training, knowledge review and knowledge expansion teaching activities on new content, and learning environment design, students once again received independent learning training and conducted independent inquiry, improving their independent inquiry ability. This was consistent with the teaching strategy through the core concept of the flipped classroom in terms of the expansion of before-class and after-class teaching practices, and for students' independent inquiry learning before class, teachers test students' learning effects and put forward opinions and answers, and students make "modifications" after class. This breaks the limitations of the classroom teaching time and space in traditional teaching, thereby improving students' independent inquiry ability (Xu,2022) .

The improvement in (music) perceptual ability may have been due to the gamification effects of the practice platform in the instructional model playing a very important role. Through gamification elements and mechanisms, students' enthusiasm and interest in learning are mobilized. At the same time, targeted training exercises that are suitable for the course content are added to satisfy students' interest in doing exercises and the need to consolidate course content knowledge, thereby improving students' understanding of the course and perception of key points of knowledge. Such research findings are consistent with the use of gamified teaching design in courses , so as to give full play to the advantages of games and the characteristics of students' interests so that students can use information technology and games in activities,the research results of experts and scholars are consistent with the integration of influences, the realization of self-exploration, the ability to discover and solve problems by oneself, and the skills of mastering relevant knowledge and improving the perception of professional knowledge during the learning process (Mao,2013) . As another example, pointed out that gamification can result in consistent acquirement of knowledge and improvement in basic abilities such as decision-making, cooperation, perceptual skills, and communication(Dicheva et al.,2015) .

The increase in classroom participation may have been because the GaF-PELL model allowed teachers to incorporate more questions, group discussions, Q&A, and practical training by using a gamified practice platform in the classroom, thereby mobilizing students' enthusiasm and positivity, encouraging real-time communication and exchange between students and teachers and students, which stimulates students' thirst for knowledge in the classroom. For example, incorporating game elements into the implementation process of re-education improves classroom participation, whether that be in an offline flipped classroom or an on-line class. The idea of integrating games was used to make people feel excited and interested, while at the same time improving students' intrinsic enthusiasm for participating in activities and producing other results that were similar and consistent(Azmi et al.,2015).

CONCLUSION AND RECOMMENDATION

The GaF-PELL model could effectively improve students' learning performance, which mainly included changes in students' academic performance, independent inquiry ability, classroom participation and perception. There were three processes; these processes took place before class, during class, and after class. This research lasted for 8 weeks.

The use of the flipped-classroom concept changes the teacher-led teaching method of traditional classrooms to one which focuses on students. The course content is used for pre-course learning through videos and other methods so that students can make full use of the time before class for independent learning. This way, the teaching method reduces the teaching time in class and effectively improves students' independent inquiry

ability. At the same time, during the class, the teacher will organize students so that they can ask questions, perform group discussions, practice platform exercises, expand their content knowledge and follow other classroom links. This kind of teaching activity design enables students to actively participate in the class and interact in class, and it could give students more time for practical exercises to consolidate content knowledge and identify problems in the classroom. Real-time interaction between teachers and classmates could be carried out to solve practical knowledge problems in a targeted and efficient manner. At the same time, the platform's exercise training improves students' (music) perception abilities. In addition to the use of the platform in the practice session during class, after class, students can still use the practice platform with gamification effects independently to strengthen and consolidate content knowledge, and report learning results to the teacher to obtain feedback and evaluation from the teacher. This kind of teaching method still greatly improves students' independent inquiry ability, (music) perception ability and academic performance. At the same time, the gamification effects on the practice platform promote students' psychological changes during the practice process. For example, students use the cartoon gamification elements and gamification rewards, points, and interactive mechanisms on the practice platform to mobilize students' curiosity and creativity. The excitement of the exercises, the effects of digital gamification, etc. attempt to relieve the excessive monotony and boredom that students feel when doing exercises, promote and mobilize students' enthusiasm for learning, and improve students' classroom participation, independent inquiry ability and (music) perception ability. Therefore, when students' abilities and behaviors in learning performance are comprehensively improved, their academic performance will also improve.

In summary, the GaF-PELL model was found to be worthy of use in the classroom and further research. For future work and research, I recommend that we will conduct more research and discuss whether we can improve more aspects of students' learning performance, such as metacognition and other aspects.

CONFLICT OF INTEREST

The authors declare no conflict of interests.

AUTHOR CONTRIBUTIONS

In this article, author 1 mainly conducted research and development. Author 2 and author 3 were author 1's mentors, assisting author 1 in revising and discussing the research content. All authors approved the final version.

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