

An Innovative Teaching Application and Research of the Game-Based Learning in the Game Design Essentials Course



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Abstract. Game-Based Learning allows students to observe, explore, and learn through the learning process through media such as computers, mobile phones, and digital games. In recent years, relevant literature has found that Game-Based Learning is considered to be a high-input and high-learning activity that can enhance students' motivation for learning. This research course is a basic theory and framework that leads students to understand game development design. The purpose is to let students understand how the game is constructed and the correspondence between the game's role and the rules. This research object is the first-year students of the five specialties. This is the first method to break the traditional classroom teaching method and integrate the game-based learning innovative teaching strategy into the classroom. It develops the first knowledge theory foundation during the course implementation, and leads the students to learn the knowledge through multimedia interactive APP editing software. After absorption, the application is supplemented, allowing students to create experience learning in the process of learning by doing. In order to ensure the quality of teaching and the effectiveness of students' learning, the learning degree questionnaires were conducted at the beginning and end of the period, and the knowledge theory was written and tested. Finally, the game APP creative works were completed with the knowledge and skills of the classroom professors.

Keywords: Game-Based Learning, innovative teaching, Interactive Multimedia Apps Design

1 Introduction

Game Design Essentials is a basic theory course that leads students to understand game development. The traditional teaching mode generally adopts one-way knowledge transfer method. With the change of the times and the advancement of science and technology, teachers use traditional teaching methods to teach the contents and transmission of textbooks. Memory information causes students to become bystanders of knowledge, while ignoring the learning objectives of identifying features and problem solving, so that learning outcomes cannot be effectively improved [21]. Learning motivation is the main source of motivation for students to learn effectively. If the learning content does not have enough attention and interest, it will greatly reduce the learning effect [1, 8]. Therefore, we must abandon the limitations of the traditional classroom teaching method, and move towards a variety of innovative teaching method design to enhance students' learning outcomes, become the teacher's biggest challenge, and one of the motives of this research.

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Game design is a cross-disciplinary professional design that needs to be combined with professional skills such as art, programming, planning, marketing, and sound effects. This research course is a basic theory and framework that guides students to understand game development design, helping students to observe, analyze and understand games from the perspective of design developers, and then to grasp the trend and direction of future game development. The goal of Game Design Essentials teaching is to let students know how the game is constructed, including how the elements of the game work, that is, the relationship between the game's characters and rules, and a good game needs to include the game plot design. Teaching methods and learning material planning can enable students to learn in a relaxed and enjoyable way, and thus obtain good learning results, and finally acquire target knowledge [9-10].

Game-Based Learning is task-oriented and rule-driven, allowing learners to learn and explore knowledge in a game-like learning process [22]. Looking at the related game-based learning literature in recent years, game-based learning is considered to be an activity with high input and high learning, which can enhance students' motivation for learning [14-15, 25]. Game-based learning is to enable students to solve problems and solve challenges in the game through computers, mobile phones, digital games and other media to achieve learning results, and then to achieve a sense of accomplishment, students can stimulate themselves through the process of learning, improve students' learning performance [26]. It can be seen that if the teacher can plan and design a teaching method with teaching content, learning style and strategy through the learning goal, the students can start thinking and actual game trial from the perspective of the game designer through the game learning process. Through the practice and project exercises, the basic concepts of game development and design are enhanced to enhance students' learning achievements.

This research is aimed at the first-year student of the junior college of five-year program. In order to enable students to learn the learning achievements through the spirit of learning game-like learning during the learning process, this study will use game-based learning as a teaching guidance and application strategy in the classroom. The use of multimedia interactive APP editing software allows students to create experience learning in the process of doing middle school, guiding knowledge and technology to promote learning motivation and improve learning outcomes. This course is the first to integrate the game-based learning innovation teaching strategy, so that teachers can use multimedia interactive APP editing software to guide students to develop their creativity, strengthen their professional ability and enhance their motivation.

In order to ensure the quality of teaching and the effectiveness of students' learning, during the course of the course, the learning degree questionnaire was conducted at the beginning and end of the course, and the knowledge theory was tested by the written test. The knowledge theory was divided into "Game industry development trend" and "Game development team". The three major themes such as organization division and structure and Game design and development process are used for basic classroom teaching, and multimedia interactive APP editing software is used to let students understand how the game is constructed and the game during the middle school practice. Correspondence between the role and the rules, and finally through the analysis of the questionnaire to examine the effectiveness of the implementation.

According to the research motivation, the purpose of this research is as follows:

1. Learn to explore the game development trend and design theory foundation, and enrich the professional knowledge of students.
2. Integrate into the game-based learning and teaching strategies, and stimulate the ability to learn and solve problems.
3. Lead the students to absorb the knowledge they have learned and then apply them through "Doing Middle School", and use the multimedia interactive APP editing software to design the game and implement the learning outcomes of the secondary school.
4. Explore the feasibility and possible issues of applying Game-Based Learning to the Game Design Essentials Course.

2 Literature Review

2.1 Game-Based Learning

The primary purpose of teachers' teaching aims to arouse students' motivation and interest in learning. Game-Based Learning is to enable learners to actively participate in the active participation of the learners through adaptive and challenging tasks under the visual and graphical interface. Learning goals in a fun environment, improving learning motivation and learning outcomes [2, 14]. Compared with the traditional learning environment, Game-Based Learning can not only use the knowledge acquisition, but also provide opportunities for exploration, observation and learning from mistakes, so that students can apply the knowledge they have learned to the spirit of "Learning by doing". In turn, the tacit understanding of teamwork is promoted [17].

Game-Based Learning allows students to solve their problems and achieve challenges in the game through computers, mobile phones, digital games and other media to achieve learning results, and students can stimulate themselves through the process of learning [26]. In order to enable learners to practice middle school in the practice of game tasks, this research design focuses on the construction of learning activities in combination with games. Prensky[14] believes that designing an attractive game requires the following features, including Fun, Play, Rule, Goals, Interactive, Outsides and Feedback, Adaptive, Win States, Conflict / Competition / Challenge / Opposition, Problem Solving, Interaction, Representation & Story [1, 14], allows students to learn from the game development process.

Games have always played an important role in our lives, as well as in the educational learning environment [3-4, 12]. In recent years, many domestic and foreign scholars have conducted game-related learning research, Chang Nai Fang [16] in An Investigation of the Remedial Teaching Outcomes on Using Game-Based Learning System, with the RPG type of large online multiplayer PagamO game learning platform action version, combined with the second function of the online graphics, let the students who drop out of learning to integrate into the situation In the middle of the game, we can build a game-based learning and build a student's self-confidence and achieve the purpose of remedial teaching. Yang Kawas Lejen [13] and others used Digital Game-based learning to develop a Taroko hunting game to help students learn the traditional hunting culture of the Turku's people, and it is effective. Through the Game-based learning design, Tseng and Weng [5] designed the use of board games cards to conduct network security teaching, allowing students to use the concept map assessment method to improve students' learning motivation and learning effects. Scholars Rosas et al. collated game-related learning research and pointed out that game-based learning has significant benefits in terms of learning achievement, cognitive development, learning motivation, and learning concentration [19], while teachers are most important in teaching. How can students' interest and motivation be aroused? The traditional method of telling and conveying memory information has not attracted students' interest. How to design effective teaching strategies has become the biggest challenge for teachers. Therefore, this study is for students to learn. In the process, through the spirit of learning game-based learning, we will explore how to induce students to learn to create a niche game from the perspective of instructional design, and hope to enhance students' learning achievement through innovative teaching strategies.

2.2 Multimedia Interactive APP Technology

APP, Application, acronym for Mobile App, which is designed to run on smartphones, tablets, and other mobile devices, as designed by Wikipedia. Users can connect to the mobile app store via wireless network. Downloading a mobile software application for free or for a fee is a separate operating system. Currently, APP's mainstream mobile device platform includes Google Android and Apple iOS as the two main market development platforms. iOS is launched by Apple, is a closed development environment, all design creation must be in accordance with Apple's rules of the game, the development software has iOS APP-specific development IDE Xcode, and iOS SDK, programming language using Objective-C Language. Android is a mobile device operating system launched by Google. It is a Java-based open environment. Unlike Apple iOS, Google publicly licenses hardware devices to develop their mobile devices. The required development software includes Java Runtime. The Eclipse IDE, Android SDK, ADT Plugin, etc., the programming language is mainly Java. Although Android and iOS are both mobile device development platforms, this is the biggest problem because programs cannot be shared across

platforms. Therefore, software vendors in the market have seen the pain, needs and business opportunities of programmers, and have launched rapid development. The design tool of the mobile device allows the programmer to not only shorten the learning time of the program development tool, but also to meet the benefits of one design and two platforms through tools. Currently, common development tools include:

1. **MIT App Inventor**¹ is a completely online development program environment, which abandons complex code and allows users to use the LEGO stacking puzzle mode to combine program syntax to complete Android device applications.

2. **iBuildApp**² uses HTML5 language to create cross-platform web apps, support text, RSS feeds, video, audio (Video) and video (Video) files, as well as magazines, newspapers, e-book layouts for you to publish electronic publications on the iPad., turn your blog or catalog into a beautiful and vivid iPad Apps

3. **iGenapps**³ allows users to create Apps on iOS or Android mobile devices through a simple drag and drop action interface.

4. **AppMakr**⁴ is a simple iPhone app generator that supports multimedia content and has analysis tools to let you know the popularity of the app.

5. **Smart Apps Creator**⁵ has a simple editing interface similar to Office. Users can develop apps by using the briefing typography concept, which can be widely used in interaction, quiz, photo album, navigation, and animation games. At the same time support mobile phones, PCs, smart TVs and other devices, one edit and development can be distributed across multiple platforms such as iOS, Android, Windows.

In summary, there are many App development tools. The purpose of this research course is to enable students to learn the skills of learning and learning from the perspective of instructional design by learning the spirit of game-like learning in the learning process, and in the absence of APP programming language. Complete game production quickly. Smart Apps Creator is a new and simple app creation software. Developers can develop apps by simply using the newsletter layout concept. Therefore, this research course will guide students to use Smart Apps Creator as a research tool for game creative design learning.

2.3 Innovative Teaching

Innovative teaching is a teacher-centered classroom teaching method in different traditional teaching. It uses different creative teaching methods to inspire students' creative thinking, stimulate students' interest in learning, and improve student learning and teacher teaching effectiveness [20, 24]. Innovative teaching is not a fixed teaching mode or method, but a process in which teachers use knowledge or information technology to make changes to the current teaching methods. The purpose is to improve students' interest in learning and learning, and teachers get better teaching results. Tseng [18] pointed out that innovative teaching refers to teachers using the teaching concepts, methods or tools that others have developed in order to achieve the goal of teaching. In the era of information technology, teachers should be able to integrate information into teaching, assist learning, and integrate Technology tools and materials to support teaching can enhance teaching and promote student learning.

The scope of innovative teaching includes: teaching purpose to lead students to actively pursue new ideas, teaching design theory, teaching design mode, class management, teaching media, teaching content and teaching materials, multiple flexibility and diversity, multi-teaching evaluation, etc., to enhance students' Learning effectiveness and teaching effectiveness for the purpose [6]. Teaching innovation does not have to use information technology tools, but information technology can promote and accelerate the possibility of teaching innovation [23]. For a long time, the traditional Game Design Essentials Course content design is mainly based on briefing knowledge transfer teaching strategies, resulting in students lacking the concept and relationship of active thinking and understanding of game development. Innovative teaching is based on the idea of stimulating students' interest in learning. With the changes of

¹ MIT App Inventor, <http://appinventor.mit.edu/explore/>

² iBuildApp, <http://ibuildapp.com/>

³ iGenapps, <http://igenapps.com/site/Home.htm>

⁴ AppMakr, <http://www.appmakr.com/>

⁵ Smart Apps Creator, <http://www.u-smart.com.tw/>

the times, how to make good use of various teaching resources to assist teaching and help students use information tools to help them understand the learning content, effectively learn and enhance the diversity of teaching is a big challenge [11, 18]. Therefore, this research course aims to effectively achieve the teaching objectives and improve the teaching efficiency, and make innovative adjustments in teaching. Innovative teaching design takes students as the main body of learning, allowing students to use information tools to learn in the learning process, and actively explore and learn the theme development activities related to game development. Innovate and develop new technologies to cultivate students' active learning spirit.

3 Research Design

This research course is a basic theory course that leads students to understand game development. The curriculum development focuses on how students can develop game development, industry awareness, game types, design techniques, development processes, development tools, team organization and division of labor during the learning process. And other theoretical foundations. The goal of teaching is to let students understand the basic theory and structure of game development design, to help students observe, analyze and understand the game from the perspective of design developers, and then to grasp the trend and direction of future game development.

The research objects are the first-year student of the junior college of five-year program, with a total of 47 students. In the curriculum planning and design, the focus is on letting students think and practice the game from the perspective of the game designer, and through the homework and thematic exercises, through the Game-Based Learning process to develop the basic concepts of game development design, and then enhance Student achievement.

The implementation of this research course is carried out in a way that is both lectured and practical. In the lecture part, the emphasis is on the establishment of the foundation of knowledge theory. The course content is based on the three themes of "Game industry development trend", "Game development team organization division and structure" and "Game design and development process". In the implementation section, in order to let students know how the game is constructed, how the elements of the game work together, and the two themes of "multimedia interactive APP editing and production" and "multimedia interactive APP creation application" are integrated into the Game-Based Learning innovative teaching strategy, combined with multimedia interactive APP editing software, with mobile device related applications as the development goal, the whole class is divided into several groups, and the project-based learning mode is adopted to organize student-centered activities so that students do not need Have professional programming knowledge or skills, only need to have the concept of general multimedia software editing, guide students to actively participate in the learning by doing process, through the spirit of Game-Based Learning, from design, problem solving, decision making Practice with the practice, create experience and learn, and finally complete the finished product.

In order to enhance students' creative thinking and interest in learning, to obtain good learning results, and finally to acquire target knowledge, this research course is conducted in the classroom part by means of slides, films, and example explanations, and the practical application part leads the students. Operational exercises, training students' multimedia interactive APP design and production capabilities, so that students finally combine the multimedia interactive APP editing software to actually present creative works. Therefore, this research course develops five unit courses based on the teaching objectives in the teaching type design, which are described as follows:

1. **Game industry development trend**, the content covers the game market, game overview, game industry business model, game player introduction.
2. **Game development team organization division and structure**, covering the establishment, organization and division of game development teams, game development tools, game concept planning
3. **Game design and development process**, covering game design, game platform and type, story theme, character identity creation, game interface and level.
4. **Multimedia interactive APP editing and production**, covering multimedia interactive APP editing software Smart App Creator environment introduction, editing functions, multimedia object applications.
5. **Multimedia interactive APP authoring application**, covering template design, animation, interactive events, page design, real machine test generation.

Finally, in the student learning effectiveness, through the questionnaire for the three major themes of curriculum knowledge theory to conduct overall learning growth satisfaction analysis, in the Game-Based Learning achievement part, combined with multimedia interactive APP editing software to obtain students' actual creative works.

4 Research Results

The results of this study are mainly discussed in the learning satisfaction questionnaire and game-based learning achievements. The game-based learning achievement is presented in combination with the multimedia interactive APP editing software to obtain the students' actual creative works.

First of all, the three major themes of curriculum knowledge theory are taught to analyze the overall learning growth satisfaction. The research results show that 89.23% of the students have no information about the development trend of the game industry at all, and 10.77% of them have heard of it; After the study, 21.58% of the students clearly knew that 72.04% knew the information about the development trend of the game industry, and 6.38% of the same said that they had heard it, as shown in Fig. 1.

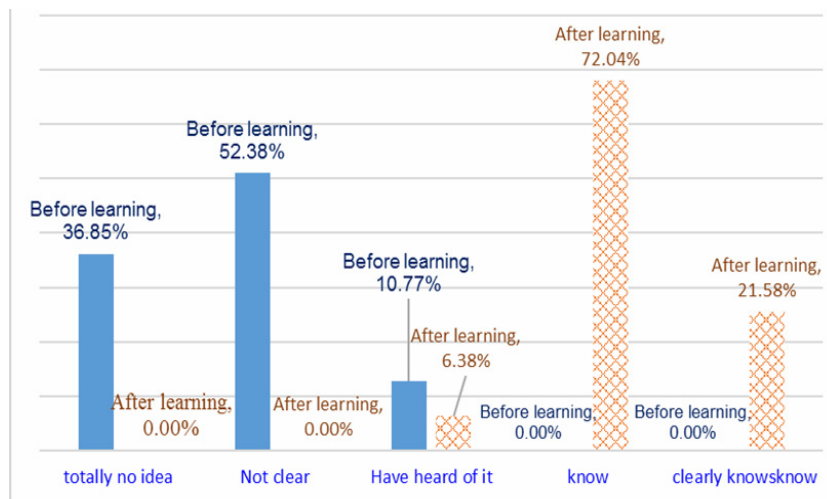


Fig. 1. Game industry development trend

In the game development team organization division of labor and architecture related theory research shows that 76.44% of students do not know the relevant theory, 23.56% said it is unclear; after learning 35.21% of students expressed their clear knowledge, 56.28% know the game development team organization division and According to the architecture-related theory, 8.51% of the same representation has been heard, as shown in Fig. 2.

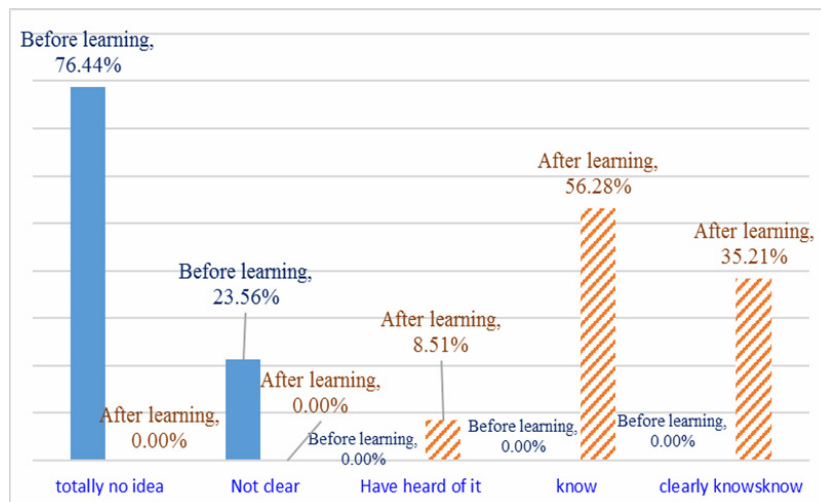


Fig. 2. Game development team organization division and structure

In the theoretical research on game design and development process, 90.24% of the students did not know the relevant theory, 5.83% were unclear, 3.93% said they had heard it; after learning, 23.40% of the students expressed their knowledge clearly, 70.22% know the theory of game design and development process, and 6.38% of the same expressions have been heard, as shown in Fig. 3.

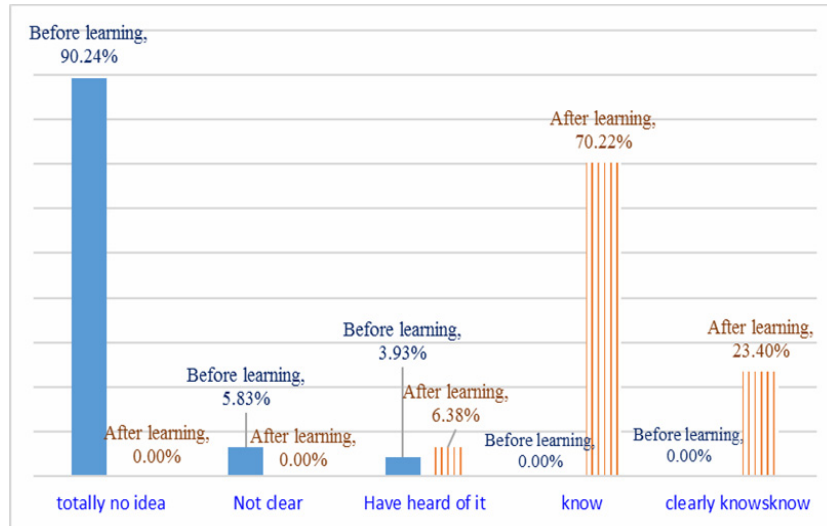


Fig. 3. Game design and development process

In the overall learning effect (average learning effect) as shown in Fig. 4, there are up to 70.92% of students with an average score of 80 points or more, 21.28% of students in the 71-80 points, 4.26% of students in the 61-70 points, The overall learning results have grown significantly, showing that student learning is affirmative.

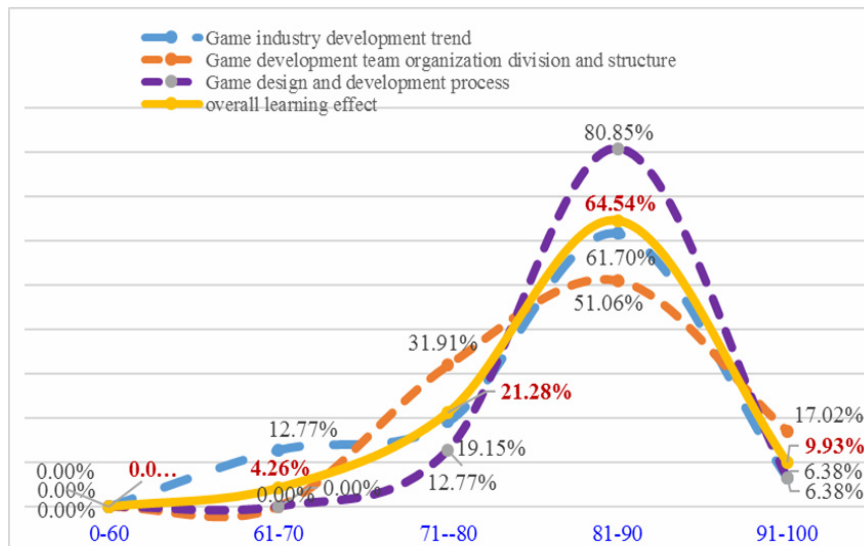


Fig. 4. Students' overall knowledge theory has achieved an average effect on learning outcomes

Then, in terms of game-based learning achievements, this study is to let students further understand how the game is constructed, including how the elements of the game work, that is, the correspondence between the role of the game and the rules, and the organization of the game development team. The division of labor and architecture experience, using multimedia interactive APP editing software, allowing students to learn the spirit of game-based learning in the middle school practice process, and the knowledge and technology to create experience and learning from the production experience. Fig. 5 is selected for this research course. One of the best-performing case outcomes presents the creative works that students actually produce after the end of the course. It can be said that the essence of integration into the game-based learning and innovative teaching strategies is effective.



Fig. 5. Student game learning achievement creative representative works

Based on the above findings, it was found. In the basic part of knowledge theory, more than 85.30% of the students in the early stage did not know or understand the theory of game theory. After class teaching, 92.91% of the students expressed their knowledge or knowledge of relevant knowledge theory. Among them, 71.13% of the students have the greatest growth in the relevant information about the “Game industry development trend” and the “Game design and development process”, and they know that the relevant theoretical learning results in the Game design and development process are integrated into the Game-Based. The Learning strategy makes students more aware of the knowledge theory acquired by the Learning by doing process. The results of the “Game development team organization division and structure” theory are relatively small. 56.28% of the students expressed their knowledge. The main reason is the course production organization and division of labor. The scope is small, so there are some Minor limitations in learning knowledge and implementation applications. In the Game-Based learning achievement section, students also use the multimedia interactive APP editing software to actually present creative works. Although the planning time of the practical application course is limited, the students’ creative ideas are only produced in the simple game concept, but the students still the output of actual creative works can be described as the essence of the innovative learning strategies of Game-Based Learning. Finally, in the overall learning effect average, there are as high as 70.92% of the students’ average scores of 80 points or more, 21.28% of the students in the 71-80 points, 4.26% of the students in the 61-70 points, the overall learning results can be seen that the students are learning With affirmation.

5 Conclusion and Discussion

1. This teaching research is the first in the traditional teaching textbook content and the memory-memory information teaching method incorporates the Game-Based Learning teaching strategy, so that students can integrate into the theoretical curriculum in the project-based learning mode, let students understand the basis of game development design. Theory and architecture. The course implementation is carried out in two phases. The first phase is developed on the basis of knowledge theory, and the second phase uses multimedia interactive APP editing software to enable students to create experience learning in the process of Learning by doing, from the aforementioned teaching content design to students. The learning performance shows that the integrated teaching mode is helpful for the development of students' core competencies and skills. It can also see the spirit of teamwork and the realization of creative ideas from the actual works of students. The effectiveness of students' motivation and interest in learning also enriches students' professional knowledge.

2. This research course teacher changes the traditional teaching method, establishes an innovative curriculum teaching mode, integrates the Game-Based Learning innovative teaching strategy into the course, leads the students to absorb the knowledge they have learned and then apply, and through multimedia interaction The APP editing software for game creative design not only greatly enhances the teaching achievement and curriculum interaction of the instructors, but also allows students to enjoy the fun and achievements of developing the game app, and can provide relevant curriculum planning for the future teachers.

3. This research course uses Game-Based Learning's innovative teaching strategy, which is a learning method that can complement the traditional teaching method. It is a student-centered learning method. However, the study course is taught for 2 hours per class per week. Innovative teaching strategies for game-based learning, leading students to use the multimedia interactive APP editing software for game creative design, lack of learning time, suggesting that in the future, the curriculum planning and design can extend the weekly course for 3 hours per class to slow down the students. The dissatisfaction of learning.

4. Teaching research is a process of continuous accumulation. This research course is the first to incorporate the Game-Based Learning teaching strategy into the theoretical curriculum. Although the student's ability can be seen in the single semester course, there is still a statistical analysis of the learning questionnaire. In the future, it is suggested that the experimental design can be based on the experimental group and the control group in the future. The statistical analysis of the students' performance at the start of the same course will be used to make the evaluation of students' attitudes and attitudes more reference.

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