Research on the Practical Teaching Mode Based on Competitive Project

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Abstract. The purpose of vocational education is to cultivate high-quality skilled talents suitable for the needs of society. Practice teaching is an important teaching method to improve students' practical ability and operational skills, and it is the process of testing students to apply theoretical knowledge to practice. In order to comprehensively improve the practical ability of students majoring in software technology in higher vocational colleges, aiming at the deficiency of the current practical teaching mode, this paper puts forward the mode of integrating competitive projects into the practical teaching of professional courses, and verifies the mode with a practical project case. The verification conclusion is that the practical teaching mode can effectively improve the students' ability of comprehensively applying various knowledge and teamwork ability. The practical ability, independent learning and thinking ability play a positive role in enhancing students' employment competitiveness and improving teachers' teaching and research level, which provides a new idea for the practical teaching of software courses.

Keywords: competitive project · practical teaching model · software technology

1 Introduction

The purpose of vocational education is to cultivate high-quality skilled talents suitable for the needs of the society. The software technology majors are highly practical. For the students of software technology majors, solid professional skills and certain innovation ability are essential qualities for them to enter the actual jobs, and practical teaching is an important teaching method to cultivate students with these qualities [1, 2]. However, the survey found that under the traditional practical teaching mode, most of the students' practical ability, operational skills and innovation ability are relatively poor, while the students who have participated in the skills competition have generally good practical ability, operational skills and innovation ability, and are often more popular with enterprises when they are employed.

In recent years, with the increasing number of skill competition projects and the integration of skill competition projects with the actual production projects of enterprises, vocational colleges have paid more and more attention to skill competition. Each college has invested a lot of manpower, material resources, financial resources and energy, and the number of students participating in the competition has also increased year

by year, The results of the competition have gradually become a recognized important indicator to measure the teaching level and talent training quality of a school [3, 4]. Therefore, considering from the direction of "promoting learning through competition and combining learning with competition", it is imperative to take skill competition as the starting point, integrate skill competition with practice teaching, and build a practice teaching mode of competition and training integration.

2   The Defects of the Existing Practice Teaching Mode

2.1   Lack of Targeted Practical Projects

At present, the practical teaching of software technology courses is basically based on the knowledge points taught and supplemented by one or two small examples. Students can easily grasp each knowledge point after learning, but when they encounter practical problems, they have no way to start, and there is no way to solve or deal with problems.

2.2   The Situation of Valuing Theory Over Practice Still Exists

In the traditional teaching process, the situation that practice teaching depends on theory teaching has not been fundamentally changed [5]. Usually, teachers assign practical tasks in advance, and students can complete the tasks according to the requirements of the task. The interaction between teachers and students is not strong, and the degree of attention to practice is not enough, which leads to this model is difficult to fully mobilize students' enthusiasm for learning, and is not conducive to stimulating students' innovation ability and cultivating students' ability of independent thinking.

2.3   The Examination Form of Practical Teaching is Single

Most of the current practical teaching assessment is results-oriented, that is, students will be given grades based on their final completion of practical assignments. Therefore, some students plagiarize or copy the results of other students in order to pass the assessment, so this assessment method cannot reflect the real level of each student.

3   Thoughts on the Realization of Practical Teaching Mode of Competitive Project

Practical teaching is one of the important links in vocational colleges to cultivate high-quality skilled talents, which plays a vital role in improving students' practical ability and innovation ability and cultivating talents needed by the society. Skills competition, on the other hand, is a comprehensive assessment of students' comprehensive ability. It involves a wide range of knowledge and requires students to have a strong ability to comprehensively apply knowledge [5, 6].

3.1 The Practical Teaching Design of Competitive Projects

Competitive project are generally comprehensive and involve different professional courses, so it is particularly important to extract sub-items suitable for a certain professional course, which requires in-depth and detailed analysis of each competition item, as well as in-depth analysis of the professional courses involved, so as to integrate competition standards into curriculum standards, competition content into teaching content and competition items into practical teaching items. Therefore, competition projects of different forms, levels and directions should be integrated into the teaching plan, and some comprehensive designs, thematic designs and classic cases in the competition should be taken as practical teaching projects.

As the leading national information technology competition, the "Blue Bridge Cup" has attracted more than 1600 colleges and universities, more than 650000 students in total and well-known enterprises such as IBM and Baidu to participate in the competition because of its authority and professionalism in the computer field. Therefore, it has won the deep recognition of colleges and universities and industry. The winning results of the competition have not only become an important embodiment of the teaching reform of higher education and the cultivation of innovative talents, It is also an important reference for recruitment of internationally renowned technology enterprises. Because the test questions of this competition mainly examine the contestants' ability to solve practical problems, focusing on the flexible use of algorithms and data structures. For the programming problems, the contestants can only solve them by programming, and there are many programming languages that the contestants can choose, such as Java, C/C++, Python, etc. Among them, Java programming is one of the most popular object-oriented programming languages at present [8] and is also the core course of software technology major. Therefore, it is more appropriate to select the corresponding cases from the competition and integrate them into the teaching of Java Program Design.

In order to increase the interest of learning, the programming problems related to algorithms and data structures in the Java direction of the "Blue Bridge Cup" software individual contest were analyzed, sorted and extracted, and finally integrated into a small game project of "eliminating bubble gum". The project is divided into nine functional modules, focusing on the basic syntax of Java, object-oriented programming technology, and application skills of Java API, as shown in Table 1.

The operation effect of the first function module is shown in Fig. 1.

3.2 The Implementation of Practical Teaching Model

Next, take the practical teaching implementation of the first functional module "Bubble gum is displayed randomly" as an example to elaborate.

1. First of all, the complete function of the whole project is shown to students, and the relevant documents provided by the project are introduced. Since the project is a game, it can stimulate students' interest in learning. In the demonstration project, the level of the module of "Random display bubble gum" is mainly explained, and the skills and knowledge points involved are analyzed and summarized according to its functions, as shown in Table 2.

Table 1. Project function module

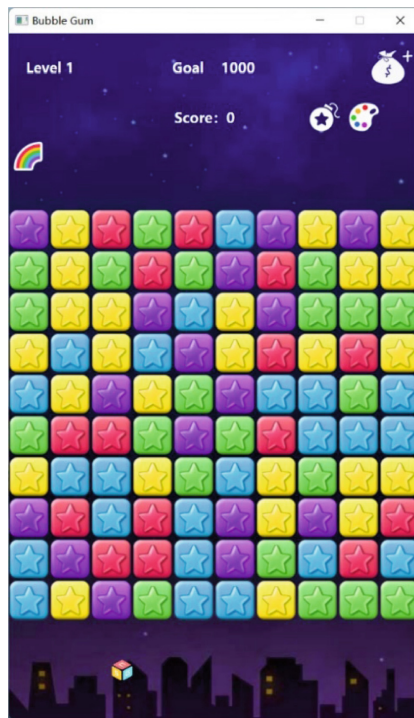| Index	Module Name
1	Bubble gum is displayed randomly
2	Get the bubble gum to be eliminated
3	Encapsulate bubble gum to be moved
4	Decoupling characteristics and isolation of interfaces
5	Reasonable use of exceptions and logs
6	Move the bubble gum
7	Update the level clearance score
8	Realize the integral rule of bubble gum
9	Thread Delay Load

Fig. 1. Operation effect of Level 1

Table 2. Skills and knowledge points involved in the module of "random display of bubble gum"

Practical Skills	Knowledge Points Involved
Java object-oriented programming skills	Use classes to define objects
	Use object
	Member methods of class
	Member variables of class
	Constructor call
	Circular nesting use
	Mathematical functions and mathematical operations
	Random function

2. Overall idea of module implementation

The first step requires "display bubble gum with specified color at specified position" on the interface. The second step is to improve the scene on the basis of the first step, that is, display a 10*10 random color bubble gum matrix on the interface. We use the Star class to describe the bubble gum, and the type and color of the bubble gum are generated by the random function to achieve the random effect, and use the StarList class to save the generated 100 random color bubble gum (i.e. 10*10 random color bubble gum matrix). The game business class StarServiceImpl is responsible for producing 100 random colored bubble gum. Each bubble gum has an independent coordinate determined by the row value and column value of each bubble gum. (This can be done using a nested for loop, where the outer for loop determines the row value of the bubble gum. The inner for loop is used to determine the column values of bubble gum), and the game interface is implemented by the MainForm class, which is responsible for converting 100 bubble gum in StarList into a 10 * 10 display matrix, as shown in Fig. 2.

1. Method design of core class

The core class of this module is game business class StarServiceImpl, which is responsible for game-related logical calculation, such as bubble gum movement, elimination, score calculation and other operations. The design of this class is shown in Fig. 3.

The member variables and methods of the class are described as follows:

- The member variable logger is used to record the operation log.
- The member method createBubbleMatrix implements the creation of screen canvas and random display of 10 * 10 bubble gum matrix.
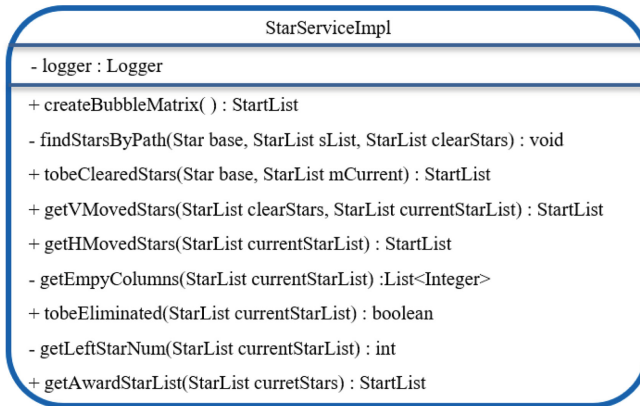

Fig. 2. Implementation process

Fig. 3. The design of StarServiceImpl

- The implementation of the member method findStarsByPath method is based on the given bubble gum (user clicked). It searches for the same type of bubble gum from left to right, up and down paths in turn.
- The member method tobeClearedStars enables users to obtain the list of bubble gum that meets the elimination conditions when they click on the bubble gum.
- After the member method getVMovedStars implements the elimination of bubble gum, the list of bubble gum to be moved (only for bubble gum in the vertical list) is obtained. This function is fixed to run after the click of bubble gum is eliminated.
- After the member method getHMovedStars implements the elimination of bubble gum, it obtains the list of bubble gum to be moved (only the bubble gum in the horizontal list). This function is fixed to run after the bubble gum in the vertical list.
- The member method getEmpyColumns implements to obtain the column number of all the cleared bubbles.
- The member method tobeElimited is used to determine whether there are still undeleted bubble gum.
- The member method getLeftStarNum implements to obtain the number of remaining bubbles.

Next, students will design and implement all the functions of the module according to the project documents provided and the above overall ideas and method design of core class, and teachers will guide or guide students in the process of practice.

3.3 Practical Teaching Assessment

By integrating the competition evaluation standard into the practice evaluation standard, the practice evaluation system is divided into four links, namely, preparation, practice, summary and expansion. Among them, the preparation stage is the preparation work for students before practice, including the construction of development environment, reading of project documents, etc., to assess students' ability of document reading and project needs analysis; The practice link is the learning situation of students in the practice

process, which is guided by the process assessment. The assessment content should try to reflect the students' mastery of theoretical knowledge, theoretical application, practical skills and the comprehensive application of knowledge when analyzing and solving problems [8], focusing on the examination of students' practical ability in design, coding and testing; The summary link is to write a practice summary report to assess students' ability to write documents; The expansion link refers to the students' perception and harvest of the practice process, or the divergent task assigned by the teacher according to the practice link to assess the students' innovation ability. In addition, according to different practice processes, dynamic evaluation links are added to the evaluation system [9], and the competition results are included in the evaluation system to solve students' worries about the poor performance of professional courses due to the preparation for the competition.

4   Implementation Effect of Practical Teaching Model

Through the introduction of the practice teaching mode of competitive projects, students' interest in the program design course has been stimulated. Students can practice independently and actively participate in various competitions. The main competition projects and awards that students have participated in in the past three years are shown in Fig. 4.

From the analysis of the above student competitions, it can be seen that the introduction of the practice teaching mode of competitive events can effectively improve the comprehensive practical ability of students [10], which is embodied in the following aspects:

1. Cultivate the consciousness of innovation

Software development needs a large number of innovative and creative talents. In recent years, the software professional competition has emphasized the embodiment of creative ability in the theme of the competition, and has built a platform for the participating students to show their creative ability and stimulate their creative enthusiasm.
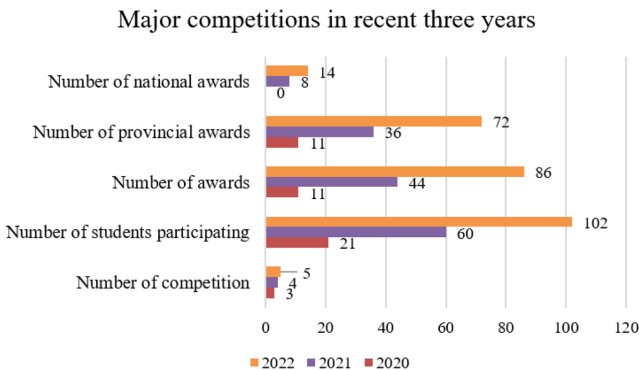

Fig. 4. Major competions in recent three years

This requires the participating students to have a certain depth and breadth of thinking, so as to achieve the establishment of students' divergent thinking and creative thinking.

2. Practical ability has been greatly improved.

Through the training of the competition project, students need to consider comprehensively on the basis of understanding the needs of the project, and finally determine how to design and implement the system. This is a great test for students' ability to analyze, understand and use the project documents, while the implementation of coding is the exercise of students' practical ability, which can greatly improve students' practical ability after the completion of the whole project.

3. Enhance the quality of teamwork.

For some competition projects, the team is the way to participate. To achieve ideal results, we must give full play to the subjective initiative of the team and the individual strengths of the players. In the normal project-based teaching process, through continuous communication between teachers and students, team cooperation ability and team cohesion can be increased.

5 Conclusion

Integrating competitive projects into the practical teaching process is conducive to enriching the teaching contents and methods of professional courses, and improving the authenticity and interest of professional courses. Under this practical teaching mode, for the instructor, the instructor needs to be familiar with the process, rules and contents of the relevant skills competition, and the competition items change every year, which has higher requirements for the theoretical level and actual code writing ability of the teacher, so as to promote the teacher to constantly study the teaching methods, apply new knowledge and new technology to the practical teaching process, and constantly improve their practical teaching level. For students, because most of the competition items are close to reality, their theoretical knowledge and practical skills can be systematically trained through the study of practical courses, so they can enhance their ability to solve practical problems, find problems, research problems, and solve problems in practice, which is conducive to the improvement of students' professional skills and comprehensive quality, and further improve their innovative and practical ability. At the same time, students can participate in the competition, Obtaining spiritual and material rewards has greatly enhanced students' sense of gain and achievement, and stimulated students' stronger thirst for knowledge.

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