The Teaching Method of "Virtual-Real Integration" Used in the Practical Courses of Colleges and Universities

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Abstract. To improve the efficiency of practical teaching and students' practical ability, the teaching mode of practical training courses in colleges and universities was discussed. First, regarding the lack of teaching resources in colleges and universities, it is proposed to share the teaching resources through the network platform, thereby improving the students' practical training resources. Second, for the single teaching mode of practical training courses in colleges and universities, virtual technology was combined with practical training process, thus improving the vitality of the practical teaching work. Third, to solve the limitation of the experimental site and the high cost of resources in the traditional teaching experiments, the practical teaching method of virtual-real integration was proposed to improve the utilization rate of resources. The research results showed that: using network platform could achieve the sharing of resources, so that the available resources of colleges and universities could be effectively expanded. To sum up, the virtual-real integration can change the single practical teaching mode and improve the vitality of the classroom. Additionally, the virtual-real integration can reduce the maintenance cost of the training course resources, and let the students' training courses no longer be limited by the venue. Moreover, the virtual-real integration can effectively improve the teaching efficiency of colleges and universities, and enhance the practical ability of students.

Keywords: virtual-real integration; colleges and universities; training courses; curriculum resources.

1. Introduction

The experiment course is one of the important parts of the courses in colleges and universities, which aims to train students' practical ability through the practical training course. As the science and technology continuously develops, to solve the high maintenance cost of experimental curriculum resources in colleges and universities, and due to the limitation of site, it is difficult to achieve the ideal results of some practical training courses. Hence, the use of virtual technology combined with practical training method has aroused many scientists' discussion. Foreign research on the combination of virtual technology and experimental platform started earlier. For example, Massachusetts Institute of Technology, University of Houston, Texas, Columbia University, Spain, University of Stuttgart, Germany and other famous universities have studied the method and introduced it into their training courses [1]. Most of them have established their own remote-control laboratory, and used it to control the laboratory parameters in the training course, and control the completion of the experiment to get the experimental results [2]. Some scholars in Italy have proposed a teaching method for automatic and remote control of laboratory. Students can use internet technology to access the server to help students in experiments in different places, and the laboratory is equipped with cameras to feed back the experimental scenes of students, thus teaching students practical courses [3].

Compared with foreign countries, the domestic research on the construction of the virtual-real integrated experimental platform is much later. In recent years, the use and research of this method in China has been discussed. In China, some colleges and universities have explored the teaching methods of the training course. Dalian University of Technology has developed a 3D experimental platform by using 3dsMex and Unity3D technology. The platform is built for digital circuit experiment, which is controlled by C language [4]. Jilin University has used B/S to build the framework of the remote experiment system, used MySQL as the database of the experiment system, and successfully constructed a virtual platform applied to the X-ray diffraction experiment.

Moreover, it has realized the sharing of data resources, strengthened the interaction process between data, and also realized the interaction of video and voice, which can support the report upload and other services. Meanwhile, a series of universities in China, such as Harbin University of Technology, Zhejiang University, Nanjing University of Science and Technology, have developed a teaching system of "virtual-real integration" training course by combining virtual technology with real experiment conditions. On these systems, the problem of high cost of students' training resources has been solved, and the experimental data resources can be shared and data interaction is implemented on the network [5]. Using this training method, students can no longer be limited by space and resources. Through the virtual platform, students can complete the whole experimental process and get the corresponding experimental data.

Based on the existing research basis, this experiment continues to explore the application of the "virtual-real integration" training teaching method in the practical courses of colleges and universities. Taking Unity as the development platform, BTV Vive is used as the experimental platform development tool to realize the data interaction. Then, the platform is applied to the actual training process of colleges and universities. Aided by the platform, students can complete the whole training process, and get the corresponding experimental data. Finally, it can help the teachers of colleges and universities to complete the task of practical teaching and improve the teaching efficiency of practical courses.

2. Method

The practical teaching method of "virtual-real integration" can be divided into four aspects: theoretical basis, teaching objectives, teaching conditions, and teaching activities.

2.1 Theoretical Basis

The theoretical basis of "virtual-real integration" can be divided into three aspects: situational cognitive theory, blended learning theory, and professional ability development theory. The situational cognitive theory refers to human beings' continuous perception and activities in the situation. Through continuous learning in the real situation, they can acquire skills and knowledge, and further grasp these knowledge and skills, continue to learn knowledge and skills. It shows that the situational cognitive theory attaches great importance to people's practical activities, and believes that knowledge exists in situations. Only continuous experience of practical activities can transfer knowledge for learning and further master knowledge [6]. Blended learning advocates that teachers can introduce information technology into teaching activities, and communicate with students through internet technology. Teachers and students can complete the discussion process of learning, and combine the face-to-face real teaching between offline teachers and students, thus improving the efficiency of teaching. However, there is no unified definition of blended learning theory. Combined with the research direction of this paper, the blended learning theory can be temporarily understood as the online process of the training, which combines virtual technology in the teaching process of the training course. The training course is carried out in the realistic situation environment, and taking the face-to-face communication between teachers and students as the offline process, the whole training process is completed through the online and offline combination. The combination of the two can complement each other's advantages, make full use of the existing resources, and make the practical learning of the students reach the best. Under the research direction of this paper, the concept of vocational ability development refers to that under the practical training course of the "virtual-real integration", students can gradually become mature and professional in the specific work situation.

2.2 Teaching Objectives

Before carrying out teaching activities, it is urgent to understand the teaching objectives, which are the guiding rods of teaching activities that guide the direction of teaching activities and what kind of teaching effect the teaching activities will ultimately achieve. Combined with the research

content of this experiment, under the practical teaching method of "virtual-real integration", it achieves the goal of training talents for the society through the practical training process of virtual online and offline reality. The teaching objectives of practical training can be divided into general objectives, teaching objectives, and three-dimensional objectives. The general objective is to establish the corresponding training objectives according to the nature and tasks of colleges and universities. It is the guidance of teaching objectives and three-dimensional objectives, which also plays the role of overall teaching task constraints. The teaching objective is the elaboration of the general objective, which aims to complete the task of the general objective. The three-dimensional objective is the concretization of teaching objective, which mainly includes three dimensions: knowledge and skills, process method, and emotion, attitude and value. The three-dimensional objective should be designed and optimized according to the content of practical teaching, students, and the characteristics of circulation [7].

2.3 Teaching Conditions

The teaching conditions studied in this paper refer to the teaching conditions required under the practical teaching method of "virtual-real integration". As the method is based on the combination of virtual and reality, it can be divided into two conditions: software and hardware or divided from the implementation conditions: virtual conditions, real conditions, and learning resources [8]. This paper studies from the implementation conditions. In the part of virtual conditions, it needs enough training space, virtual training equipment, such as computer and VR equipment. The real condition is the test instrument required by the whole training process. Learning resources refer to courseware, task book, and training instruction manual. The implementation conditions required under the condition of "virtual-real integration" are shown in Figure 1 below.

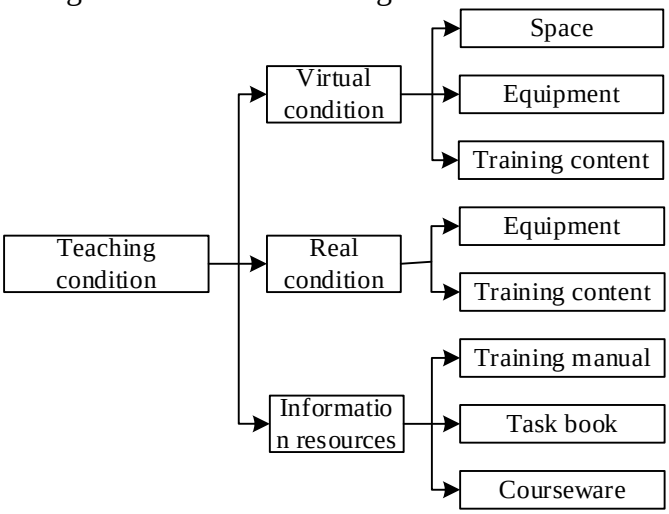

Figure 1. The implementation conditions of the teaching method of "virtual-real integration"

2.4 Teaching Activities

Practical teaching activities include the whole process from the beginning of teaching tasks to the results. In the training course of "virtual-real integration", first, students need to know and be familiar with the current training environment. At this stage, teachers need to upload the practical operation process prepared in advance to the students so that students can be familiar with the process of this training activity and do a good job in theory learning and reviewing. Second, teachers need to group and distribute corresponding teaching tasks according to the training content and students' characteristics. Then, teachers need to let the students operate the training process, but the operation process is to let the students operate in the virtual environment with the help of VR equipment, let the students be familiar with and master the training operation method, and complete the training task. Next, let the students operate the training course in the real environment through the training skills mastered in the virtual environment. Finally, according to the performance of

students in the whole training process, teachers evaluate students and complete feedback. The teaching process under the "virtual-real integration" training teaching method is shown in Figure 2.

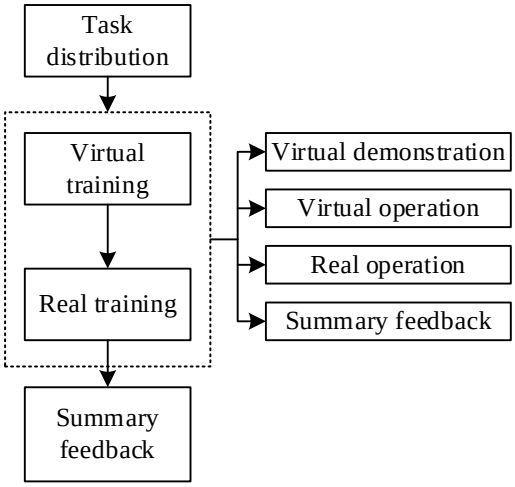

Figure 2. The teaching flow under the practical teaching method of "virtual-real integration"

3. Results and Discussion

To study the application effect of the "virtual-real integration" teaching method in the practical training course activities in colleges and universities, this paper makes a comparative analysis of the teaching effect of the practical training course under the teaching method with that without the method from several aspects. The students under the "virtual-real integration" training teaching method are taken as the experimental group, and the students without virtual technology are taken as the control group.

3.1 Teaching Objectives

The teaching objective is the premise and guarantee for the smooth implementation of the training process, so when students carry out the training course, the first thing to be clear is the objective of the training activity process. The experimental group and the control group are compared to analyze the clarity of teaching objectives, and the analysis and comparison are shown in Figure 3.

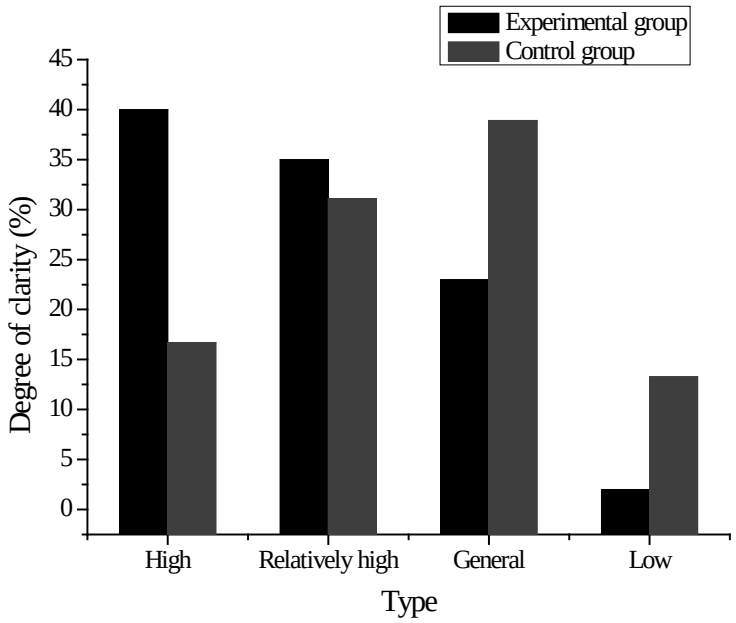

Figure 3. Analysis and comparison of the clarity of teaching objectives

Figure 3 suggests that the clarity of teaching objectives in the control group is lower than that in the experimental group. It shows that the teaching method of "virtual-real integration" can improve the clarity of students' teaching tasks.

3.2 Classroom Atmosphere

The classroom atmosphere is conducive to the implementation of practical training activities. A good teaching atmosphere is more beneficial for the efficient teaching, but also conducive to the learning and mastery of knowledge. Similarly, the classroom atmosphere of the experimental group and the control group under different teaching methods is compared and analyzed, and the analysis and comparison are shown in Figure 4.

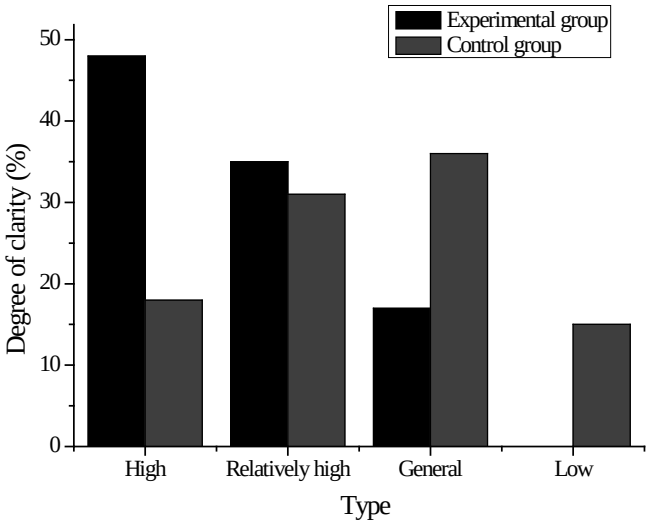

Figure 4. Analysis and comparison of classroom atmosphere of practical training courses under different teaching methods

Figure 4 shows that the classroom atmosphere of the experimental group applying the "virtual-real integration" training teaching method is appropriate, which is more conducive to the teaching task of teachers and the learning of students. Therefore, it shows that the "virtual-real integration" teaching method can improve the classroom atmosphere of the training course.

3.3 Teaching Efficiency

Teaching efficiency is an evaluation index to measure the teaching effect of teachers, and to a certain extent, it shows the students' mastery of the course. The teaching efficiency of the two groups under different teaching methods is analyzed and compared, and the results are shown in Figure 5 below.

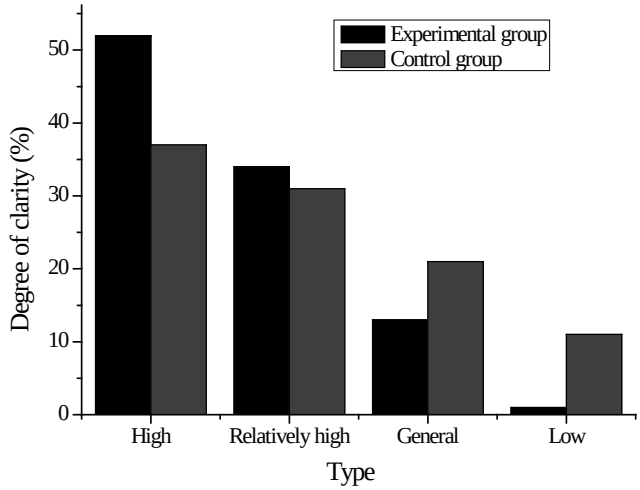

Figure 5. Analysis and comparison of teaching efficiency under different teaching methods

Teaching efficiency is the focus of teaching tasks, which directly determines the usefulness of the course. Using the teaching method of "virtual-real integration" can effectively improve the teaching efficiency and promote the teaching quality of colleges and universities.

4. Conclusion

Through the above research, it is found that using the teaching method of "virtual-real integration" training course can effectively improve the clarity of students' teaching objectives of the training course, help to improve the classroom atmosphere of the training course, and to a certain extent, improve students' interest in the training course, thereby promoting students' enthusiasm for learning. Ultimately, the method makes the teaching effect of the training course effectively improved. This shows that the application of the practical teaching method of "virtual-real integration" to the practical classroom of colleges and universities can promote the teaching efficiency and improve the students' mastery of knowledge.

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