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Analysis of the Teaching Effect of Virtual Reality Training Courses Designed Based on a Learning Experience Model

Yang Liu*

Tianjin Sino-German University of Applied Sciences, Tianjin, China
**Corresponding author*

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Abstract: Based on the learning experience model, instructional design focuses on the four aspects of learners' learning experience: Attention, Relevance, Confidence and Satisfaction. By combining situational cognition, virtual reality training courses can stimulate learners' interest and motivation in learning. After the experimental teaching activity is completed, data is collected through questionnaires and interviews. Through the analysis of test data, the learning effectiveness of learners is analyzed from the above four aspects to verify the satisfaction of learning participants with the teaching mode, improve the teaching design of practical training courses, and enhance the teaching effectiveness of the courses.

1. Introduction

Professor Keller from the University of Florida proposed an instructional design model in the 1980s, which aims to awaken students' learning interest and motivation through instructional design. Enhance learners' interest and motivation in learning by focusing on four aspects of their learning experiences. These four aspects are Attention, Relevance, Confidence, and Satisfaction[1,2]. Attention refers to the ability of instructional design to attract and maintain students' attention, and strategies to enhance attention can be achieved by using novel events to attract or maintain students' attention. For example, in order to deepen students' experience, people have moved a class on leaf classification from the classroom to the small forest in the school, allowing learners to have a firsthand experience while also moving people's teaching environment from the classroom to nature. Stimulate students' interest in information exploration by asking questions or allowing them to discover problems; Relevance refers to the connection between teaching activities and students' background knowledge, personal needs, and life experiences. In teaching, by combining students' existing knowledge system and using clear language, examples, concepts, values, etc., teaching objectives and learning content are clarified, helping students integrate new learning knowledge and enabling them to independently establish their own learning goals; Confidence refers to teaching activities that can enhance students' confidence in learning and maintain their desire for success. Expecting success enables students to have a clear understanding of learning requirements and evaluation criteria, as well as understanding their family and social expectations. Challenge the

situation by setting multiple performance dimensions, allowing students to set their own learning goals and performance standards, so that each student can experience success and improve their confidence. Attribution method, providing information feedback and telling students that the reason for their successful learning is that they have relevant skills, and combined with hard work, they will inevitably achieve good results, that is, if they have relevant abilities and put in effort, they will definitely have good results. Strategies to enhance students' confidence are often used in daily teaching, such as giving students an appropriate example to encourage them to explore and pursue, and providing targeted feedback; Satisfaction refers to allowing students to feel the value and joy of learning, and to gain a sense of satisfaction in their studies. Create opportunities for students to use newly acquired knowledge or skills to practice or solve certain problems in real or simulated situations, in order to stimulate their internal learning motivation. Positive praise and incentive measures can maintain students' learning motivation and good learning behavior. Evaluation of students' learning must be based on relevant standards, and the evaluation must be fair and impartial, allowing learners to feel that what they have learned is useful, and at the same time, providing limited rewards.[3-5]

This article uses virtual reality technology to create an immersive learning experience, which can provide an immersive experience in teaching. It conforms to the learning laws of this teaching mode and can effectively improve students' learning effectiveness. Exploring the teaching effectiveness of VR training courses based on virtual reality not only focuses on the four aspects mentioned in the above teaching model: Attention, Relevance, Confidence, and Satisfaction, but also combines educational laws such as situational cognition to analyze and evaluate the teaching effectiveness of VR training courses.

2. Teaching Design for Practical Training Courses

The teaching of practical training courses is mainly based on the laws of situational cognition and constructivism, following the educational philosophy of student-centered and practice. The teaching of practical training courses is completed through teaching design. The practical training course "Base Station Operation and Maintenance" involves installation experiments of base stations. The operation site requires climbing a 50 meter high iron tower, and also involves electricity safety. Real equipment is expensive, and it is difficult for students to go to the engineering site for actual operation. Therefore, the application of virtual reality technology in the installation process of virtual base stations breaks through time and space limitations, allowing students to "transform time and space" feel the real effect, ensuring safety, This has further deepened the students' understanding and understanding of the installation and operation of base stations. The specific teaching design of practical training courses can enable students to master the basic skills of practical training operations through simulation software, demonstration videos, and virtual reality experience operations. Through simulation software for teaching, students can install the software on their own computers and practice anytime and anywhere, achieving the goal of mastering base station configuration and maintenance skills without damaging real devices; Virtual reality teaching design involves experiencing the installation and operation process of engineering sites through VR virtual reality technology, enhancing the practical experience of teaching space dimensions through virtual reality, and conducting teaching practice of the practical training course "Base Station Operation and Maintenance" through virtual reality interactive technology.

2.1. Technical Analysis

Virtual reality technology is a new learning method following multimedia and computer education. Users feel like entering another time and space, bringing more immersive experiences.

The "time and space transformation" and "immersion" of virtual reality are in line with the "scene construction" in the field of education. In the field of education, virtual reality technology can be an educational technology that presents abstract scientific knowledge in an interesting way. This has the following characteristics: firstly, it is interesting. Utilizing virtual reality technology to create a realistic immersion, fun operating experience, rich conceptualization, easy to carry, low-cost, and easy to promote, can better attract students, improve their attention, stimulate their imagination and innovation ability. The second is scientific nature. Combining virtual reality technology with learning knowledge, replacing abstract language teaching with virtual reality, matching situational cognition with personal life experience, making learning enjoyable and in line with the current situation and future learning trends of scientific theory for experiential learning. Thirdly, practicality. The presentation form is presented through virtual reality scenes, eliminating a large amount of physical objects and avoiding safety risks. Students can confidently repeat operations, achieve good learning results, and have low production costs and high application value. The product can be reused after completion, saving space and expenses, and has good economic benefits, making it easy to promote.

Virtual reality technology is mainly includes simulation environments and sensor devices that perceive human movements. Interactivity and autonomy are the main characteristics of virtual reality technology. At present, virtual reality technology has entered the stage of widespread adoption. With the arrival of 5G mobile imaging technology, 5G+virtual reality technology has broken through the bottleneck of technological development, and in the future, virtual reality technology will be more widely applied.

Common virtual reality software includes Unity, VRP, Quest3D, etc. Among them, Unity 3D is a mature cross platform application development engine. The hardware devices used in virtual technology are generally divided into perceptual capture devices and perceptual feedback devices. The commonly used virtual technology hardware devices include gloves, helmets, head trackers, motion capture devices, etc.

In addition, there are locators and virtual reality technology glasses. Currently, there are many professional VR glasses brands, including HTC Vive, Facebook Oculus Rift, Sony PlayStation VR, Samsung Gear VR, Google Cardboard.[6-8]

Interaction mode: The interaction mode of virtual reality is considered as the main technological mode of future interaction. Its interaction is more extensive and diverse than the forms of ordinary flat graphic interaction. There are nine main interaction modes of virtual reality technology: eye tracking, motion capture, EMG simulation, tactile feedback, voice, direction tracking, real site, gesture tracking, and sensors.

Technical solution determination: Reproduce the installation and training scenario of the base station through virtual reality technology, and display the experimental stage, experimental results, and key technical points through virtual means. Every step, skill point, and production safety knowledge from the preparation and selection of training equipment to practical operation can be designed into this system. At the same time, the main consideration is the fun, scientific, and functional aspects of system design. By performing practical training tasks set in virtual scenes, learners' basic knowledge and skills in base station installation and debugging are subtly enhanced.

Based on the above technology and considering cost factors, it is determined to use virtual reality technology to achieve base station installation and debugging, including using Unity software for program development and using HTC vivo glasses to display virtual training. The design process includes using MAX to create a model and importing Unity, setting the basic view, scale, and structure through the Unity menu, designing camera code, creating scenes, designing UI, and building.[9,10]

2.2. Practical Operation

The base station installation training process is completed through the LTE base station engineering VR training system. Students can wear virtual reality glasses to reproduce spatiotemporal scenes and multi-dimensional displays of objects that are difficult to observe with the naked eye. The experience of installing a base station can be completed through the operating handle. The "immersive" and "scenario construction" theories of virtual reality technology coincide, playing a good promoting role in students' mastery of base station installation technology and skills. At the same time, virtual reality scenes are a special attraction for students, improving their learning interest.

3. Evaluation of Teaching Effectiveness

The purpose of teaching effectiveness analysis is to explore the differences in teaching effectiveness between teaching models and traditional classroom teaching models through classroom teaching, and to verify the effectiveness of this model. Analysis can be conducted on the overall satisfaction, attention, correlation, confidence, satisfaction, and other aspects of the teaching experiment results, with a focus on the following practical issues: firstly, the recognition level of the teaching model; the second question is whether this teaching model can improve students' attention, correlation, confidence, and satisfaction. In his Introduction to Educational Research Methods, William Wellsman pointed out that experimental research is an important method of empirical research. Teaching experiments should be treated randomly to enhance the randomness of the sampling distribution of experimental objects. After the subjects are selected, the following two negative effects should be avoided: the first is the Hawthorne effect. The "Hawthorne effect" refers to the tendency of individuals who are aware that they are being observed by others to change their own behavior. Once students in the experimental class learn that they are participating in teaching experiments, they will perceive the attention from the teacher, which will lead to psychological and behavioral differences and to some extent affect the validity of the experiment. The solution to this is to not disclose the experimental results in advance and allow students to participate in teaching experiments under normal circumstances; the second is the Pygmalion Effect. Pygmalion effect refers to the expectation or prediction formed by people based on their perception of a certain situation, which will make the situation produce the effect of adapting to this expectation or prediction. In classroom teaching, teachers' beliefs can affect their expectations of students, and students become more responsive to the teacher's expectations through their perception, thus making the teacher's expectations a reality for students. In this study, to avoid this effect, teachers avoided showing great admiration and exaggeration for the use of VR teaching mode, in order to reduce adverse effects.

In this experimental study, data collection was conducted in the form of questionnaires and interviews. The surveyed teachers and students generally believed that the teaching design of such courses was vivid, easy to understand, and conducive to the digestion, absorption, and mastery of knowledge and skills, all of which were given positive evaluations. In order to further obtain more detailed evaluations and feedback, a questionnaire survey was conducted after the course to analyze the learning impact of the experimental and comparative classes. This analysis is mainly conducted from the perspectives of attention, correlation, confidence, and satisfaction. Through the collection and organization of test data, the learning effectiveness of learners was analyzed and summarized from the above four aspects.

In order to further verify the teaching effectiveness of virtual reality training for base station installation, teaching experiments and questionnaire surveys were conducted in the vocational group, undergraduate group, and teacher group. Based on the analysis of the teaching process and relevant

teaching theoretical foundations, combined with the design and implementation of teaching experiments, the survey questionnaire design was completed. Distribute the survey questionnaire to 30 students in one class of vocational college students conducting teaching experiments, 30 students in one class of undergraduate students (applied technology undergraduate), and 10 professional teachers in their communication department. The respondents independently completed the survey questionnaire, it mainly focuses on five aspects: "overall feeling, learning interest (attention), situational effect (correlation), enhancing confidence (confidence), and learning effect (satisfaction)". The questionnaire is divided into three groups: vocational college students, undergraduate students, and teachers. The evaluation scores are "1, 2, 3, 4, and 5", representing five levels: "Worst, poor, average, good, best". Then, the average score of each group is calculated.

30 effective survey questionnaires were collected from vocational college students, and indicator classification and data analysis were conducted. The scores were calculated based on the average score (out of 5 points), with "overall feeling"=4.4 points, "situational effect"=4.3 points, "learning interest"=4.1 points, "enhancing confidence"=4.3 points, and "learning effect"=4.47 points. Vocational college students have a relatively high recognition of virtual experiments.

Collect 30 effective survey questionnaires from undergraduate students for indicator classification and data analysis. The score statistics are based on the average score (out of 5 points), with "overall feeling"=4.4 points, "situational effect"=4.5 points, "learning interest"=4.5 points, "enhancing confidence"=4.4 points, and "learning effect"=4.73 points. Undergraduate students have a high recognition of virtual experiments.

Collect 10 effective survey questionnaires from teachers for indicator classification and data analysis. The score statistics are based on the average score (out of 5 points), with "overall feeling"=4.5 points, "situational effect"=4.4 points, "learning interest"=4.6 points, "enhancing confidence"=4.2 points, and "learning effect"=4.57 points. The teacher group also has a relatively high recognition of virtual experiments. Conduct questionnaire statistics and organize the results as shown in table 1:

Table 1: Statistical results

score	overall feeling	situational effect	learning interest	enhancing confidence	learning effect
vocational college students	4.4	4.3	4.1	4.2	4.47
undergraduate students	4.4	4.5	4.5	4.4	4.73
teachers	4.5	4.4	4.6	4.3	4.57

Through the data, it can be found that everyone's ideas are basically the same, and the scores for each indicator are generally above 4. This shows that this experimental method is acceptable and can improve learning effectiveness. Finally, everyone expressed their hope to promote this learning method to more subjects.

According to the file survey results of the above three groups of respondents, relevant evaluation index radar chart can be obtained by importing data, as shown in figure 1:

In most survey questionnaires, the indicators of "overall feeling", "learning effect", and "situational effect" are scored higher, especially the two indicators of "learning effect" and "situational effect" reflect the obvious advantages of virtual technology. At the same time, we also see that due to a lack of understanding of virtual training systems, there is not enough confidence in the learning completed through VR training courses. Therefore, the scores of each group in the "confidence enhancement" indicator are not very high, and everyone still lacks confidence in on-site physical operations. Overall, the survey questionnaire gave full recognition to the four indicators of virtual training courses, namely learning interest (attention), situational effectiveness (correlation),

confidence enhancement (confidence), and learning effectiveness (satisfaction), all of which were rated between 4-5 points.

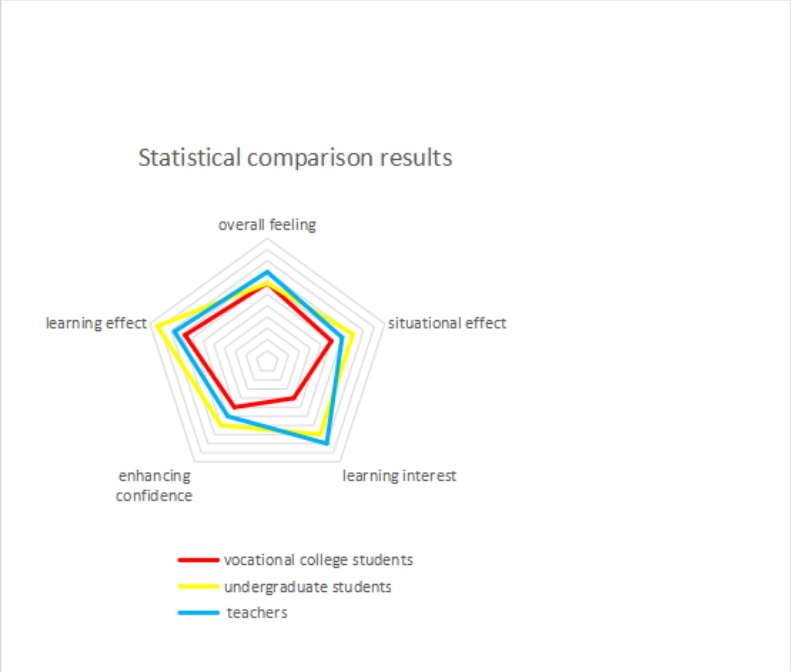

Figure 1: Statistical comparison results

4. Conclusions

In short, for the field of education, virtual reality technology has changed people's learning methods. Although virtual reality technology may not seem complete enough at present, such as the problem of dizziness for learners who use it for too long, I believe that with the improvement of technology, such problems can be solved quickly. In the future, virtual reality technology will eventually enable more natural interaction between people and virtual intelligent laboratories, play a unique role in the field of teaching, become a sharp tool for people's classroom learning, and change the relationship between people and technology. At the same time, the diversity and randomness of teaching methods also increase the time students spend on learning. Individual tutoring and collective Q&A by teachers can deepen understanding, digestion, and absorption of knowledge. In the teaching process, imparting knowledge is a process of internalizing knowledge, and the effectiveness of learning is a prerequisite for students to have a sense of gain. Whether students recognize themselves as the masters of learning throughout the entire learning process is closely related to their satisfaction with the teaching mode. Therefore, when implementing the VR teaching mode, in addition to providing students with an educational platform with a friendly interface, rich functions, convenient interaction, and rich materials, teachers should truly establish a student-centered learning concept, adapt to teaching progress, meet students' learning needs, pay attention to students' learning experience, innovate teaching methods, organize active and effective teaching activities, and organize practical teaching Implement and promote VR teaching models.

The traditional teaching method usually uses theoretical teaching to complete, mainly because the training cost of base station operation and maintenance is high. A set of base stations is worth millions, and the equipment cost required for teaching dozens of students at the same time is too high. Generally, vocational colleges cannot bear the teaching cost, and the working scene of base station installation is usually on a few tens of meters high iron frame, which poses high safety risks during operation, Real operation requires the operator to have a climbing certificate, which is not

realistic for students who have just participated in base station operation and maintenance learning. Therefore, traditional teaching can only complete the explanation of practical training content through the teacher's oral description. Therefore, virtual reality technology is very suitable for playing a role in practical course teaching. On the basis of completing the design of the training operation, and so on, virtual reality technology can also be further applied to the development of other courses.

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