Research on Virtual Immersive Teaching Model Based on "Pseudo-environment"

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Abstract. With the progress of science and technology, virtual technology has introduced new teaching environment and experience to the classroom. Virtual reality technology, including VR virtual reality technology and AR augmented reality technology, creates a "pseudo-environment" in the classroom with the effect of simulation, and provides virtual immersive teaching environment close to real experience for students. With the aid of virtual technology, the classroom puts the monotonous teaching and learning into dynamic state, helps students improve visual experience and situational awareness by means of deep participation in the virtual process, and finally enhances students' identification and preference toward learning. Thus, educators greatly optimize the teaching environment and enhance students' subjective initiative.

Keywords: Pseudo-Environment · Virtual Technology · Virtual Immersive Teaching · Immersive Teaching

1 Introduction

With the progress of high-tech, virtual technology has been applied in various fields such as work, life and study. Especially in teaching area the virtual technology has brought new environment and experience to the classroom. With the help of virtual technology, the "pseudo-environment" plays an important role in achieving better result in classroom teaching.

Virtual immersive teaching is the extension and application of the theory of immersive communication. It provides learning environment close to reality by means of virtual reality technology. With its help, learners improve their skills by highly engagement in interaction and exercise.

Li Qin concluded in his book *Immersion Communication—Communication Paradigm in the Third Media Era:* Immersion communication is a new mode of information communication, which is ubiquitous based on the human-centered environment that connects all forms of media [4].

Based on the concept of "pseudo-environment", virtual immersive teaching has changed the traditional teaching concept and becomes a more advanced teaching approach with high technology and high experience as the core. It better mobilizes students'

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subjective initiative and further changes the status and relationship between teaching and learning. It betters the construction of learning platforms for students, especially VR (virtual reality technology) application and AR (augmented reality) make the teaching situation of classroom more realistic, which strengthens the interaction between teachers and students. Besides, it stimulates students to take the initiative to explore, to learn actively, to communicate punctually, and mobilizes students' creativity and imagination.

2 The Construction of Classroom "Pseudo-environment" Based on Virtual Technology

Walter Lippmann once put forward in his book *Public Opinion:* We must pay special attention to a common element, that is, the insert between people and the environment – pseudo-environment… Because, on the level of social life, the so-called adjustment of human beings to adapt to the environment is carried out through the medium of fiction [5]. That is to say, there is a pseudo-environment between people and reality. The environment is shaped by media or information transmission agencies, and people tend to react to the pseudo-environment. And the pseudo-environment is often the copy, mapping or virtual reproduction of the objective environment.

Through electronic visual influence, virtual technology creates a kind of simulation scene, endowing the scene with spiritual connotation, and then constructs a unique "pseudo-environment". The image has the function of situation reproduction, and the visual environment is the artificial reconstruction of the situation, that is, human beings achieve the real situation reproduction through "pseudo-environment". Visual information can reproduce the reality through images and thus expresses the potential meaning of the reality through reconstruction or reproduction. The existence form of the material reality shown on the image is not the material reality itself, but a hypothetical real world reproduced through the image, and the audiences respond to the virtual mirror images. Images can represent reality or they can be represented by a fictional storyline. However, no matter it is a fictional or non-fictional visual story situation, the first thing it appears in front of the audiences is an image symbol. The images are elaborately designed, and the images make the audience intoxicated, overlapping themselves with the images of the characters in the picture, creating the situation through the expression of the meaning, and generating emotional communication. Therefore, the "pseudo-environment" has the role of emotional rendering [7]. In communication, "pseudo-environment" is an important means of constructing image story, arousing students' sense of scene, and realizing visual impact and guidance. Communicator, whether through the composition of images or the creation of visual content of the story, can prompt students to produce emotional response.

The key to the application of virtual immersive teaching is to create a situation according to the teaching task. The so-called "pseudo-environment", also known as the information environment, is not a mirror-like reproduction of the real environment, but the environment that can be suggested to people after the selection and processing of symbolic events or information through virtual technology and re-structuring. In the teaching activities and in the virtualized mimicry environment, teachers' teaching

objectives are realized by means of scene or virtual simulation. Pseudo-environment constitutes a vivid teaching situation, stimulates students' learning emotions, leads students into the situation. It effectively unifies the students' conscious or unconscious psychological activities, rational activities and emotional activities, and provides them with good learning environment.

3 Classification and Advantages of Virtual Immersive Teaching

Nowadays, virtual immersive learning has been widely applied, such as simulation training, 3D virtual operation training, game learning, real-time strategy game, massive multiplayer online game (MMOG).

In practical application, the virtual reality system can be divided into four typical types: immersive virtual reality system, desktop virtual reality system, enhanced virtual reality system, distributed virtual reality system. They are as follows [1]:

- Immersive VR. Immersive virtual reality system mainly uses various hardware devices, such as spatial locator, data gloves, data clothing, etc., so that all the users' senses are surrounded by the system, from which a sense of immersion and reality can be generated, and input and output devices are used to interact with the system. Objects interact with users in a virtual environment just as they do in the real world.
- Desktop VR. Desktop virtual reality system mainly relies on software to build a virtual environment. It relies on the computer's simple input and output equipment to achieve the operation of the virtual reality system and builds a simple virtual interaction with low cost and simple functions. It is mainly used in CAD, CAM and other fields by application software.
- Augmented VR system. Augmented virtual reality system is a system that combines real environment and virtual environment, so that users can feel and see the real world as well as the virtual world shaped by the system. With the rapid development of Internet of Things technology, AR system combined with Internet of Things can not only interact with information objects in a virtual environment, but also use virtual information to make up for users' delay and incomplete acquisition of real operation information, so as to realize accurate operation of real objects.
- Distributed VR. Distributed virtual reality system broke through the regional restriction. The development and application of 5G technology makes the immersive virtual reality system highly immersive. It uses network technology to build a common platform for users in different regions, so that users can interact in the same virtual environment, which has a qualitative leap in depth and breadth.

Virtual immersive teaching brings teachers and students into a fully immersive interactive virtual reality world, which will mobilize more sense organs of teachers and students to participate in learning. In the immersive virtual world, students can communicate with students or teachers from different places. Under these circumstances, students can participate in learning and interaction more directly. On this base, virtual immersive teaching shows many advantages. The details are as follows:

- The integration of multi-media.

Virtual technology teaching is the deep application of digital technology with new media as the carrier. Because of such an advantage of new media as open ports, it carries a variety of media applications, such as graph, text, audio and high-tech application access, which has greatly upgraded the traditional system of teaching assistance. The ideal state of immersive teaching is to build an "immersive ecosystem" and complete "deep and thorough media integration", so that learning has no boundaries and students can truly immerse themselves in the learning environment.

- The enhancement of interactivity.

Also, because the underlying technology of virtual technology comes from the new media, it naturally inherits its interactive characteristics. In the traditional teaching, the vertical teaching mode that teachers unidirectionally convey knowledge to students has been broken with the application of new media. Virtual reality technology creates and simulates a three-dimensional interactive virtual environment through computers, so that the audiences are immersed, so as to obtain the interactive experience of a dynamic real scene. Especially applied in the learning of practical skills, virtual reality technology provides a very good interactive environment. With the new media as the basic bridge between virtual and reality, students in the virtual environment can mobilize vision, hearing, touch to feel the world, simulate the human body movement perception, control and feedback, and truly participate in the teaching practice, which is more conducive to stimulate the imagination and creativity of students.

- The improvement of students' classroom experience.

Because of the application of virtual simulation technology, the teaching environment is very close to "pseudo-environment", which creates a "story structure" for students, who become part of the curriculum. In the teacher's "story structure", the emotion of students fluctuates with the content of the class, and their personal emotion and experience are greatly mobilized. The image constructed by the "pseudo-environment" in class arouses the students' "emotional attention". At the same time, the use of virtual technology achieves visual impact and guidance. Through the composition of images or the creation of visual stories, teachers gradually encourage students to produce emotional reaction, and students' classroom experience is highly improved.

- The students' initiative to play.

The immersive teaching avoids the embarrassment of cramming teaching. It brings both teachers and students into the "pseudo-environment" and becomes actors or actresses of the "story" of the course. Moreover, it gradually embodies the initiative of students. Immersive virtual technology builds knowledge and information into richer and more realistic specific situation, and emphasizes students complete immersion and active behavior in the learning process. Immersive teaching is concerned with students' physical and psychological experience, so that learning becomes something happy. Through active contact with media, students enter into deep and active learning, so that students can immerse themselves in the scene, obtain education in an imperceptible way, and achieve good teaching results.

4 The Path to Realize Virtual Immersive Teaching Based on "Pseudo-environment"

With wide use of virtual technology, the application of virtual reality, augmented reality, artificial intelligence and other virtual technologies in the field of education has been strengthened, and the successful construction of "pseudo-environment" has enhanced the effect of teaching. Some famous companies and universities have made many beneficial attempts respectively.

4.1 Enhance Teacher-Student Interaction Through Immersive VR

Immersive VR systems provide experiencers with brand-new sensory experience and create the illusion that they are in the virtual world. Users of immersive virtual reality systems need to wear a variety of sensing and tracking devices such as helmets and data gloves to interact with the virtual world. The advantages of this system is that the user's vision, hearing and other senses are closed in the pre-designed virtual space, and the user is isolated from the real world. He is not able to hear and see the real world, so that the interference from the outside world is eliminated, which makes him fully immersed in the virtual world.

The interaction of immersive virtual reality in classroom requires a good interactive interface, which makes people feel happy after entering the class. Moreover, students must wear virtual reality devices to operate the interface system by gesture and voice. Teachers and students communicate with the virtual environment through dialogues. In immersive virtual reality class, the communication between students and teachers will be more intuitive and convenient. With the help of virtual reality technology, teachers and students can answer questions and give lectures face to face on line.

Every student in Harvard's HBX Live virtual classroom sits in the front or center. The classroom uses online learning platform for interaction and visualized learning. The high-resolution video wall simulates the amphitheatre-like seating of a university lecture hall and show more than 60 participants simultaneously (see Fig. 1). Each student has a unique student-to-professor video feed that simulates typical conversational perspectives, with the added advantage provided by multiple indoor cameras. Students also get another view of the professor from either side of the main video wall (facing the professor and the

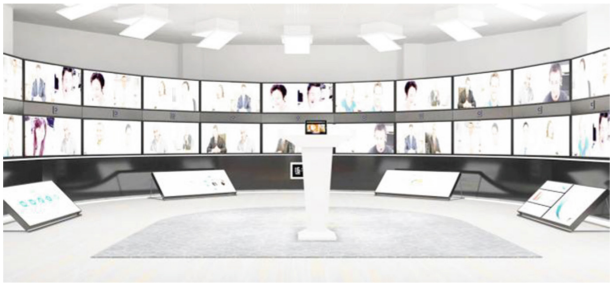

Fig. 1. HBX Live Virtual Classroom at Harvard University

teaching wall), a panoramic view facing the video wall, or a high-definition view inside the teaching wall. Inside the studio, the professor is both independent and interactive. The size of each participant can be shown to be close to or slightly larger than the life size of each student. The best resolution can be obtained from any location on the TV wall. The high-tech, collaborative teaching wall features two 80-inch touch screens that students can see from its perspective camera and personal user interface. If the professor wishes, the content can be controlled and created from a central lectern that is connected to a standard laptop, with control panels and integrated display [2].

4.2 To Apply VR "Mimicry Simulation" Technology to Design and Skill Training

The native language environment can be created through VR technology, which enables learners to connect with people from all over the world and improve their language skills by interacting with others in the virtual world. Virtual reality has great advantages in fields such as art design and architectural. Students are able to use VR to build a building model and virtualize the building prototype. This gives full play to the imagination and creativity of students, so that they have no obstacles to explore and correct errors.

VR laboratory for skill training allows students to conduct simulation operations in virtual reality. Direct audio-visual experience helps learners to be more involved in the learning situation. Gamified control and design can also stimulate students' interest in learning, and meanwhile avoid meeting risks in the unpredictable environment of reality. Google launched the virtual reality education program of Google Expeditions. It creates a virtual situation by means of technology, which can send students to any place on the earth to explore, and even land spaceships around the moon [3].

For another example, geography is a course that explores the universe and nature, and the classroom space is a limitation for such a grand exploration. While when wearing VR head display, students can incarnate as astronauts, roam in space, enjoy the vast beauty of the universe. At the same time, through 3D modeling, the earth structure can be analyzed layer by layer and the geographical knowledge can be grasped more intuitively (see Fig. 2) [6].

These attempts are closely aligned with students' interest, focusing on ability development and practical application of knowledge. It helps the interaction between students

Fig. 2. The experience the universe through the VR head display

and students, teachers and students form an instant, multi-directional, open and healthy flow, and enhances the pertinence and effectiveness of practical teaching.

4.3 To Apply AR Technology to Innovative Education

AR augmented reality technology is an extension of VR virtual reality, which seamlessly embeds computer-generated virtual objects and real world scenes into teh class and produce a special visual environment. Learners interact with the real world through wearing special equipment, such as AR glasses and data gloves. The University of Washington in the United States has developed an augmented reality system named "Magic Book", which transformed the graphic description of traditional published books into three-dimensional imaging, and initiated the application of augmented reality technology in education and teaching. The AR map launched by Niantic, a startup backed by Google, uses its huge user base to help build large-scale surreal image, which is considered to be a major push to help AR technology become mainstream [3].

5 Conclusion

Through VR virtual reality and AR augmented reality technology, immersive virtual teaching realizes the "pseudo-environment" in class more realistically. Virtual technology breaks the monotonous form of traditional teaching and gives full play to the advantages of immersive teaching. Whether it is content expansion or scene rendering, the teaching effect will be brought to the extreme. In the simulation scene, the interaction between teachers and students is enhanced, and the students' creativity and imagination are brought into play, and students' subjective initiative is further mobilized. Virtual technology provides more personalized and experiential teaching to classroom, constructs more ubiquitous and interactive learning concepts, and also provides more possibilities for cultivating innovative and entrepreneurial talents. The construction and utilization of virtual technology will bring about the innovation of teaching mode, the extension of teaching connotation, the improvement of teaching quality and the enhancement of students' enthusiasm.

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