Application Analysis of Virtual Reality VR Technology in Art Design Teaching

Sijia Du*
Dalian Neusoft University of Information, Dalian, Liaoning, China
*Corresponding author e-mail: dusijia@neusoft.edu.cn

Abstract. The rapid growing of Internet promotes the emergence and application of teaching methods and new teaching media. When multimedia is widely used in teaching, teaching technology is updated very quickly, and virtual reality technology, a new teaching media, has emerged. Traditional environmental art design creation and expression methods cannot fully satisfy the development requirements of the digital period, and new technical forces are needed to enrich and expand the content and tension of art design, the art design industry also needs VR technology, which should have more new vitality. This article will study virtual reality technology from the perspective of educational technology, as a new educational technology, and on this basis, put forward a new research field related to educational technology-virtual reality VR technology teaching. After studying the types of VR technology characteristics and actual teaching cases, the concept of desktop VR technology intervening in experimental model making courses is proposed, a virtual learning environment is constructed, and the objective reality generated by the use of knowledge is reproduced, thereby imparting knowledge points It is provided to students and guides them to use their own senses such as vision and hearing to receive information in the virtual environment, which enhances students’ interest in learning and their own sense of innovation, enhances students’ ability to actively exert their own imagination, and greatly reduces The hardware cost improves the learning effect of users.

Keywords: Virtual Reality Technology, Art Design Teaching, Virtual Teaching, Immersive VR

1. Introduction

1.1. Background and Significance
Well-developed virtual reality technology covers a wide range of fields. The technology can not only help designers better observe the characteristics of the world, but also inspire designers in an interactive environment. Then create new ideas and creativity, expand the means of design, enrich the language of creativity, and play a role from the initial stage of design to the final stage of presentation. The user can enter the virtual environment through the computer and interact with the objects in the environment [1]. Teaching art design requires students to be able to self-analyze 3D space, and the use
of VR technology can meet the requirements of this teaching art design ability. The ultimate goal of this technology technology to environmental art design is to make the design more humane [2].

Zeming L introduced the design and implementation of a foreign language teaching system. In order to improve the efficiency of the teaching process and increase students' interest, virtual reality technology is applied to the system. The results show that virtual reality technology can change the traditional teaching mode, stimulate students' interest in learning, and improve the quality of Korean language teaching, which can promote the further application of VR technology in the field of education [3].

This article discusses the growing of VR technology, detailed analysis of the combination of VR technology and the classroom and its impact on art design, and shows the current situation of virtual reality technology from the aspects of technology and teaching. This article first analyzes and summarizes the development and abroad by studying the current situation of teaching, expounds the research purpose and the main content of the paper, and outlines the organization and standard of the content. This paper analyzes the VR technology in detail, combines the shortcomings of the current art design modeling course, proposes complementary methods, and perfectly constructs a teaching tool that has a good effect on stimulating students' spatial thinking and practical modeling process.

2. Virtual Reality VR Technology Teaching Method

2.1. Virtual Reality Technology

VR is presently the top simulation and virtual reality. The function of virtual reality is first reflected in the fact that virtual reality technology should enable participants to have a more realistic experience. This real experience is a sense of immersion or devotion, which means that participants can devote themselves to the virtual environment created by virtual reality, and can produce hallucinations in the virtual world. Ideally, may even be more real than the reality that exists in the real world. The principal target of this immersion is to allow clients to concentrate [4]. In order to achieve this goal, virtual reality must have basic technical elements, as shown in Figure 1.

![Figure 1. Elements and characteristics of virtual reality VR technology](image)

Virtual reality technology has strong interactivity and quickly integrates with various fields. At present, in the fields of military, medicine, film and television, and its integration with education and teaching is getting closer [5].

2.2. Virtual Teaching

Virtual teaching is a new education concept that combines traditional education and information technology based on modern talent training concepts. This is a form of people entering virtual space for education and teaching activities, and it is the modernization of education. Important media also have extensive application potential in the education field. Practice has proved that teaching simulation is an important tool for upcoming education. By displaying the knowledge image that teachers expect to express, teaching imitation can show the authentic education framework [6-7]. Both give full play to their respective advantages can broaden teachers' teaching horizons, expand teaching space, and expand teaching resources. Virtual teaching infiltrates the time and fixed-point teaching methods in traditional teaching methods, and uses simulated scene teaching. Virtual teaching can not only provide related products and services for teaching, but also accelerate the development of education in a better direction [8].
2.3. Application of Virtual Reality Technology in Art Design Teaching
Virtual reality technology not only has good effects in the field of conventional teaching, but also can stimulate all-round emotions, achieve the integration of thinking and emotion, and enhance the ability and sensitivity of ordinary students or special learning. For special students with a sense of lack or loss, virtual reality technology can be enhanced through another experience, and teaching goals can also be achieved [9].

Color is very important for the art design profession, and the final color formed by different degrees of color can be different. Because image editing is usually based on grayscale images, in order to standardize the subsequent extraction and editing of features, the image must be grayscale. The scale of a grayscale image is the process of equalizing each element in the color space. In an image, pixels with higher gray values have higher brightness, and pixels with lower gray values have lower brightness. Taking the RGB space as an example, there are three common ways to gray an image:

- **Average method.** Use the values of the three colors on average, and then reassign the new value to each element to make the resulting image softer. The formula is:
  \[ R = G = B = \frac{R + G + B}{3} \]  

- **Maximum method.** Converting the values of the three color components to the maximum value of the three colors will make the values of the three colors relatively high, and the corresponding grayscale image has a high brightness. The formula is:
  \[ R = G = B = \max(R, G, B) \]  

- **Weighted average method.** The three components in the color space first correspond to different weights, and then the component values are multiplied by the weights and added together, and then averaged, the formula is:
  \[ R = G = B = \frac{\alpha_R R + \alpha_G G + \alpha_B B}{3} \]  

According to the research, \( \alpha_R = 0.299, \alpha_G = 0.578, \alpha_B = 0.144 \) is the best.

2.4. Significance of VR technology in Teaching
From the initial blackboard to the new media room to the current VR teaching, each method has problems that can solve and achieve goals that were impossible in the past. From the analysis of the four concepts of virtual reality technology teaching, virtual reality education is suitable for the education of technical colleges, including experimental centers, museums, cultural centers, and certain educational bases and professional courses in university vocational schools. Compared with other majors, it is more suitable for comprehensive physical sciences, chemistry and medical laboratories or a wide range of humanities, history and art fields [10].

VR technology also has guide conditions for repetitive skill optimization and particular guidance. Compared with traditional guidance, these conditions are complex and difficult to solve. The applicability in the field of education stems, which is foremost embodiment. The teaching goals of each VR course are different. Therefore, the resulting teaching results will also be different.

3. Virtual Reality VR Technology Teaching Experiment
This article uses software architecture to realize students' independent projection options, which is different from the traditional three-projection model construction. The product details are perspective views, and the angles can be freely selected to construct three detailed angles. In the traditional three-projection model where a single part cannot reach the isometric reference, the use of VR auxiliary tools on the desktop can effectively avoid this problem.
3.1. Test Subject
Traditional image interpretation has been replaced by the creation of virtual teaching tools. All students who use this technology can interact with it through the computer mouse and touch devices in the classroom. When the modeled object under study is not clear, any geometric transformation can be carried out in all directions, without being restricted by experimental equipment and experimental location.

3.2. Test Design
The experimental modeling course focuses on teaching means and ways to show students. Apply this teaching method to the classroom, students can obtain more complete spatial modeling ideas. Take the RHINO 5.0 software widely used in large-scale product design companies in universities and art universities as an example, the following will make course teaching aids.

1) Design the basic product basic spline according to the basic product structure.

2) RHINO5.0 is a software that uses points, lines and lines to construct curved surfaces. The line should be as simple as possible, with fewer structural points, and both ends should be symmetrical and uniform.

3) Create a surface, and create a surface on the basis of ensuring high-quality spline curves. Commands are mainly dual rails, used to limit the complete shape of the surface. Using the surface chamfering command can reduce the trouble of modeling. Therefore, the modeling trend of rounding is the main part that opticians need to pay attention to.

4) Finally, enrich the model details. First create a detailed view and use the extrude and fillet commands to draw different shapes and surfaces at different levels.

3.3. Experimental Results
This lab class makes full use of desktop virtual reality technology. According to experiments, safety risks and training costs have been greatly reduced. The single traditional teaching safety risk is reduced from 86% to 21%, which greatly reduces the hidden safety hazards for schools, and also reduces the education cost, from 73% to 26%, and at the same time, they are continuously reduced to varying degrees. The interest of students and teaching efficiency have been greatly improved. The application of VR technology in teaching has greatly enhanced students' interest, from 14% to 82%, which also positively affects teaching efficiency, from 15% to 78%, To achieve multiple goals in one fell swoop. This teaching tool can be used to stimulate before class and review after class. It has a good teaching effect and can help students quickly master the modeling process and create spatial modeling thinking. As shown in Table 1.

| Teaching form         | Security Risk | Student interest | Education cost | Teaching efficiency |
|-----------------------|---------------|------------------|----------------|---------------------|
| Single media          | 86%           | 14%              | 73%            | 15%                 |
| Composite media       | 55%           | 49%              | 51%            | 33%                 |
| Highly immersive media| 21%           | 82%              | 26%            | 78%                 |

4. Analysis on the Application of Virtual Reality VR Technology Art Design Teaching

4.1. Teaching Features of Virtual Reality VR Technology
Due to the uncertainty in traditional teaching practice, the cross-temporal communication capability of virtual reality technology can circumvent this uncertainty, thereby helping to ensure the smooth and
normal progress of practical activities. In addition, multiple virtual reality sensor channels can be active simultaneously. It can effectively enhance the sense of immersion, presence and realism that experts obtain in the process of use, thereby effectively enhancing students' interest in learning and experience. Although virtual reality cannot completely replace traditional teaching practice activities, it can well assist teaching practice activities and to a certain extent ensure the normal progress of teaching practice, as shown in picture 2.

![Figure 2. Teaching characteristics of virtual reality VR technology](image)

4.2. Virtual Reality Technology Teaching Application Effect

The application of virtual reality technology in teaching has created a new field of virtual teaching. Practice has proved that teaching simulation is an important tool for future teaching work. Research shows that virtual reality technology has brought great advantages in teaching. In terms of security risks, traditional media teaching risks are as high as 86%, while VR teaching is only 21%, and it is continuing to decrease. In terms of student interests, VR teaching accounts for 82%. It can be seen that students like it very much. In terms of teaching efficiency, traditional teaching is only 15%, but after using VR teaching, it increases to 78%. As shown in Figure 3.

![Figure 3. The effect of virtual reality VR technology teaching application](image)
4.3. VR Teaching System

The three basic technical characteristics of VR technology are also called the triple I characteristics of VR technology, because the first letter is I (Immersion, Imagination, Interactivity). In addition to these three functions, VR technology also has many different functions. Among them, autonomy and multi-sensor functions are also more important functions of VR technology. The autonomy feature means that the user has the right to make decisions in the virtual environment and can move autonomously in the virtual world according to the operating rules of the VR world. The multi-sensor function means that in addition to traditional acoustic listening simulation, VR technology can also simulate the taste, smell, and other human emotions that humans can perceive in real life. As shown in table 2.

Table 2. Classification of VR teaching systems

| Types of VR equipment            | Description                                                                 |
|---------------------------------|------------------------------------------------------------------------------|
| Desktop virtual reality         | With the display as the visual window of the virtual environment, interactive devices are connected using computers, mice, keyboards, handwriting pads, force devices and tracking devices. |
| Immersive virtual reality       | Immersive devices temporarily isolate users from the real world. Users mainly operate through head-mounted displays and related interactive devices. |
| Augmented virtual reality       | Both the real world and virtual world information can be displayed superimposed. Users can operate in the real world to trigger a simulated reaction in the virtual world. |
| Network distributed virtual reality | This system is a comprehensive application of the above three systems. Additional network technology, when used, is not limited to one or more virtual environments. |

5. Conclusion

VR and other technologies have penetrated into the field of art design, and are changing the methods of modern design, and their applications will be more in-depth. Art design will become more abundant, and it will also bring endless creative inspiration to designers. In this article, the author analyzes the influences of VR technology in various stages of environmental art design, and then makes a more specific exploration according to the different characteristics of screen design and interior design. Analyze landscape design and design planning based on specific cases. The all-round combination of virtual reality technology and art design brings new vitality, and the production methods, lifestyles. However, regardless of the type of technology, the target of design is to serve the people. VR technology gives full play to its own performance, which can take into account users who "put themselves in place", thus shortening the distance between design and people.

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