

Research Article

Application of VR in the Experimental Teaching of Animation Art

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As computer technology advanced, VR has emerged. It is a virtual environment based on high-tech computer technology that can bring people a sense of reality and sensory experience. Through specific devices or equipment, it uses unique means to interact and communicate with the target object in the virtual environment, so that the professor can get a sense of reality and immersive experience. In order to increase students' interest in teaching content, and at the same time to develop the education industry to achieve technology, this article combines virtual reality technology with experimental teaching. The paper discusses the use of VR in animation art experimental teaching and plans to provide thoughts and instructions about the fresh way in animation experimental teaching. This paper proposes the application research methods of VR in animation experiment teaching, including literature research method, expert interview method, questionnaire survey method, VR animation art teaching based on image method, and VR animation teaching evaluation clustering algorithm, which is used for conducting research experiments on the utilization of VR in animation art experimental learning. The experimental results in this article show that 96.25% of students like animation art VR experimental teaching system, which is helpful to the development of the teaching work.

1. Introduction

VR refers to the simulation of real or nonreal 3D scenes through computers and is usually called VR. VR is an advanced technology capable of VR. In virtual simulation, it must be based on Internet technology, computer software and hardware, etc., so that users can conduct dynamic human-computer interaction, thereby forming a virtual real scene. The virtual space formed by this technology can fully embody the deep thinking and rich imagination of human beings, and people can study, live, and work in this space.

Animation art experimental education occupies a significant position about talent training. It assumes a necessary position in the development of teaching and research, education reform, and knowledge innovation. It is a bridge and tie for transforming knowledge into practical ability. Since the traditional experimental education methods cannot fit the objective needs about experimental education

development, it is necessary to explore the combination of brand-new experimental methods and educational education theories for experimental education to meet the actual and development needs of experimental education. It has significant theoretical and practical meaning.

Based on the use of VR technique in animation art experimental teaching, some domestic and international researchers have conducted related research. Lv et al. proposed a kind of VR-based immersive glasses for studying elementary geographic knowledge, while synthesizing many of the latest information technologies, including multimode human-computer interaction, VR, 3D geographic information system, and GIS. The cost of this research is relatively high, and it is difficult to popularize in practice [1]. Chen et al. presented the latest development of all-round video streaming processing in his research. This research is not practical [2]. Zhou believes that as higher education popularized, the teaching model of a single subject cannot apply

to the increasingly developed condition anymore, so universities need to adopt corresponding education models for different subjects. Zhou proposed that the scores are supposed to be evaluated by students' abilities in all aspects. The theoretical basis of this method is relatively good, but it has not been applied in experiments and lacks scientificity [3].

This article is on the essential discussion of using of supposed reality technology in the animation art experiment learning. In the method part, the article methods used in this article, namely, the document research way, the expert interview method, the questionnaire survey method, the VR animation art teaching based on the image method, and the VR animation teaching evaluation clustering algorithm are introduced, and an application system in the experimental part was designed. The innovations of this paper are as follows: (1) proposed VR animation art education based on image method; (2) proposed measures to deal with the relationship between VR animation art experimental education and traditional experimental education; (3) designed VR animation art experimental education system.

2. Application Research Method of VR in Animation Art Experimental Teaching

2.1. Method

2.1.1. Literature Survey. The literature research method is a relatively basic research method in all kinds of academic research, which mainly obtains new information by combining and analyzing existing relevant information [4]. This study uses the literature research method to sort out the current situation of mixed education research and selects and extracts some evaluation indicators. The main advantages are as follows: it can study objects that cannot be touched.

2.1.2. Specialist Visit. On the basis of the research guidelines of this research, by access with college animation teachers, animation education, and other related experts and scholars, the importance of virtual technology in college animation education experimental education is analyzed and discussed, and expert opinions are carefully listened to and adopted as appropriate [5]. The advantage is that more real information can be obtained.

2.1.3. Questionnaire Survey Method. Drawing on the traditional questionnaire survey method, through the process of design-distribution-recovery statistics, we learned the first-hand details of the research for the first time on the mixed education strategy of college English translation under the backdrop of the Internet, starting from the data evaluation and analyzing each choice to fully appreciate the present needs and suggestions of teachers and students of English majors, an in-depth analysis of the meaning-oriented data [6]. The advantage is that the questionnaire is easy to operate and the data collected are relatively reliable.

2.2. VR Animation Art Teaching Based on Image Method. Image-based VR has easy modeling, fast rendering, and strong sense of realism, processing time has nothing to do

with the complexity of the scene, and the means of interaction are not complicated, and the generation and interaction of virtual scenes can be realized more quickly [7]. As for the virtual reality technology, it is described here in conjunction with imaging technique. The image processing technology mainly includes image denoising and image segmentation.

2.2.1. Image Denoising. The advantage of image denoising is that it can ameliorate the clarity of the picture and increase the credibility of the information [8, 9].

(1) Mean filtering

The advantage of mean filtering is to eliminate noise and smoothen the graphics [10, 11]. Suppose the pixels to be processed are $m(a, b)$, and the image after the mean filtering is

$$n(a, b) = \frac{1}{S} \sum_{m \in T} m(a, b). \quad (1)$$

$n(a, b)$ represents the image obtained after mean filtering, and $m(a, b)$ represents the original image.

(2) Median filtering

The median value of median filtering can be showed as

$$x = \text{Med}\{x_1, x_2, x_3, \dots, x_n\} = \begin{cases} \frac{x_{k+1}}{2}, & k \text{ is odd,} \\ \frac{(x_{k/2} + x_{k/2+1})}{2}, & k \text{ is even.} \end{cases} \quad (2)$$

2.2.2. Image Segmentation. Image segmentation includes threshold division, verge separation, and region segmentation. The advantage of threshold segmentation is to directly use the grayscale characteristics of the image, so the calculation is simple, the calculation efficiency is high, and the speed is fast.

Among them, N represents the total category [12, 13], i is the actual category [14], and j is the predicted category; there is

$$\text{overall Acc} = \frac{\sum_{i=1}^N n_{ij}}{\sum_{i=1}^N t_i}. \quad (3)$$

Average accuracy refers to dividing the altogether quantity of pixels in pairs by the whole amounts of pixels [15]. For the average accuracy rate, there is

$$\text{mean Acc} = \frac{\sum_{i=1}^N n_{ij}/t_i}{N}. \quad (4)$$

MIoU is a standard accuracy measurement method [16]. It calculates the IOU (the intersection of the true label and the predicted result) for each class separately and then averages the IOUs of all classes; there is

$$\text{mean IoU} = \frac{\sum_{i=1}^N n_{ij}/t_i + \sum_{j=1}^N n_{ji} - n_{ij}}{N}. \quad (5)$$

2.3. VR Animation Art Teaching Evaluation Clustering Algorithm. The pixels in the image field are represented by the corresponding feature fields. The feature space is subdivided according to its set in the feature space, and then it is mapped back to the original image space to obtain the segmentation result, which is applicable to the situation of uncertainty and indifference in the picture. Clustering algorithm uses k points in the space as the center to cluster and classifies the objects closest to them, and the number of categories is k . Iterate continuously and update the value of each cluster center one by one until the best clustering result is obtained [17]. The formulas are expressed as follows:

$$d(i, j) = \sqrt{|x_{i1} - x_{j1}|^2 + |x_{i2} - x_{j2}|^2 + \cdots + |x_{ip} - x_{jp}|^2},$$

$$d(i, j) = |x_{i1} - x_{j1}| + |x_{i2} - x_{j2}| + \cdots + |x_{ip} - x_{jp}|,$$

$$d(i, j) = \left(|x_{i1} - x_{j1}|^q + |x_{i2} - x_{j2}|^q + \cdots + |x_{ip} - x_{jp}|^q \right)^{1/q}. \quad (6)$$

If a weight ω_i is assigned to each variable according to its significance, then the weighted distance exists:

$$d(i, j) = \sqrt{\omega_1 |x_{i1} - x_{j1}|^2 + \omega_2 |x_{i2} - x_{j2}|^2 + \cdots + \omega_p |x_{ip} - x_{jp}|^2}. \quad (7)$$

This part uses the above methods to explore the application of VR in animation art experimental education. Figure 1 shows the technical process. This technical process is important for research methods, virtual reality animation art experimental teaching, and clustering algorithms.

3. Experiment of VR in Animation Art Experimental Teaching

3.1. Deal with the Relationship between VR Animation Art Experimental Teaching and Traditional Experimental Teaching. Virtual reality animation art experimental teaching has a certain relationship with traditional experimental teaching. They both attach importance to the development of students in all aspects, but the former has the following advantages:

- (1) Strengthening the combination of virtual and real
In the process of VR animation art experimental education, we must pay full attention to the combination of VR and reality, fully explore the ways and methods of VR transformation in the process of VR animation art experimental education, and smoothly transfer knowledge between the two.
- (2) Strengthening real-time interaction

The reason why virtual experiment education has attracted the attention of many scholars and teachers is that, on the one hand, the technical advantages of virtual experiment education have solved the difficult problems in the traditional physical experiment education process; on the other hand, it focuses on the real-time interaction of virtual experiment education.

(3) Strengthening experimental assessment

In the education process and evaluation process of VR animation art experimental education, the assessment of students' experiments should be strengthened. This is an effective way to test the quality of experimental education and test students' practical ability.

3.2. Design of VR Animation Art Experimental Teaching System

(1) Overall system architecture design

System development starts from a template, and after modeling, it is imported into the Unity3D platform to build a site.

(2) Modeling software selection

The 3DS Max modeling software was selected for this study. 3DS Max (3D Studio Max) is a 3D modeling software developed by Autodesk based on the PC system. It has very powerful functions. Its modeling methods include polygon modeling, NURBS modeling, and mesh modeling. 3DS Max also supports multiple formats of files, including CAD, FBX, and STL.

(3) Development software selection

This article chooses Quest 3D development software. Quest 3D is the most realistic software in VR application software. All editors in Quest 3D are visualized and graphical. The powerful visualization of Quest 3D is mainly reflected in the direct visualization of graphics, without worrying about program errors.

4. Application Research and Analysis of VR in Animation Art Experimental Teaching

4.1. Quest 3D Superiority Analysis. This article compares the functions of Quest 3D and several mainstream VR software. The specific situation is shown in Table 1. Virtools is an integrated software program that can integrate common file formats, such as 3D models, 2D images, or sound effects. Virtools is a set of real-time real-world 3D real estate editing software, with rich interactive behavior modules.

It can be seen from Table 1 that Quest 3D is currently one of the most well-known VR technologies in China. It has the best quality in terms of flexibility and ease of use, simulation, and immersion.

4.2. Experiment Analysis

- (1) The subjects of this questionnaire survey are college students majoring in physical education. A total of 906 students participated in this study. Among them,

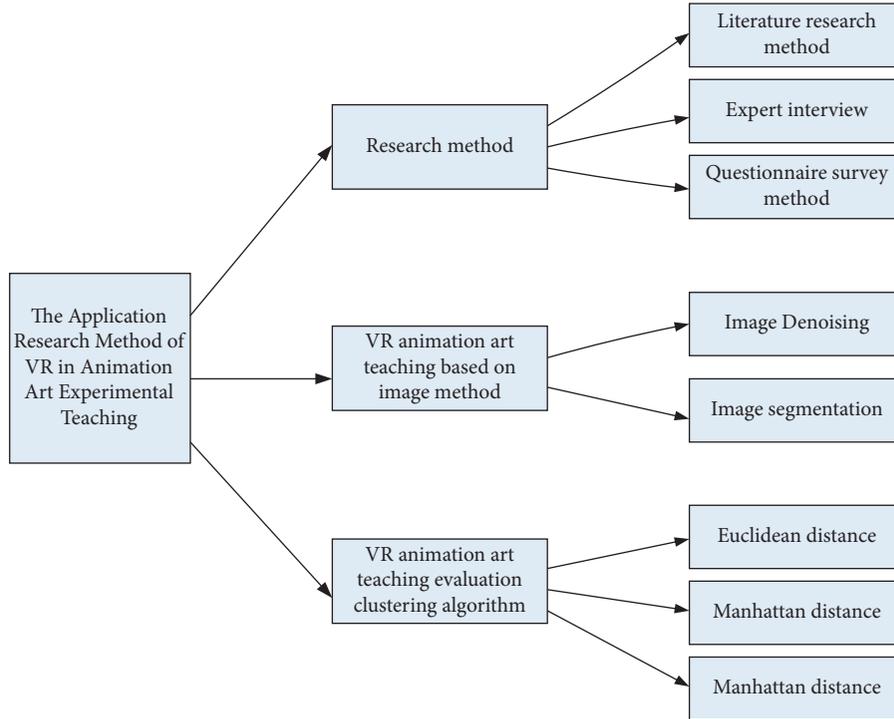


FIGURE 1: The technical process of this method.

TABLE 1: Comparison of features between Quest 3D and other VR software.

Software	Panoramic technology	VRML	Virtools	View point	Quest 3D
Function attribute	Commodity exhibition, community exhibition	Scene roaming	Game	Product display	Education, game
Learning difficulty	Easiest	Easy	Simple	Difficult	Simple
Development difficulty	Very low	Lowest	Very low	High	Lowest
Visual effect	Photo level	Preferably	Photo	Photo	Good
Interaction ability	Worst	Best	Good	Good	Best

boys and girls participated in the research from freshman to senior year. See Table 2 and Figure 2 for specific division.

It can be seen from the chart that the choice of study items is a combination, and the average number of college students choosing freshmen and sophomores, juniors, and seniors is relatively small, and the ratio of male to female students is relatively even, and the total number of students is between 200 and 250. The small gap in the number of people is also small for the four grades.

- (2) In this study, the questionnaire set up related questions about whether students are willing to use VR to conduct animation art experimental education. The results of the questionnaire were statistically sorted and graphed, as shown in Table 3 and Figure 3.

From the data in the chart, it can be seen that 71.22% of boys are willing to use VR for experimental animation art education, and the proportion of girls who are very willing to use VR for experimental animation art education is 69.53%. These data show

TABLE 2: Distribution of students participating in the questionnaire.

Sex	Freshman	Sophomore	Junior	Senior
Boys	124	117	111	109
Girls	107	110	115	113
Total	231	227	226	222

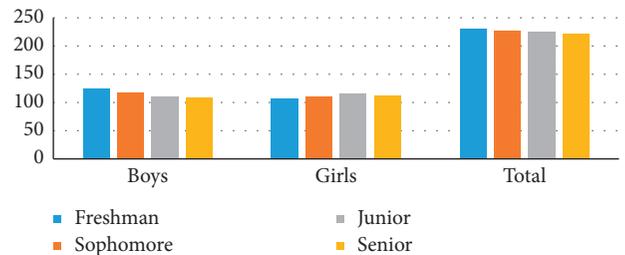


FIGURE 2: Distribution of students participating in the questionnaire.

that students' acceptance of virtual reality technology is still good, which is conducive to the development of teaching work.

TABLE 3: Student wishes.

Willingness		Boys (%)	Girls (%)
1	Very willing	71.22	69.53
2	Willing	16.04	22.57
3	General	10.32	4.34
4	Reluctant	1.73	3.32
5	Very reluctant	0.69	0.34

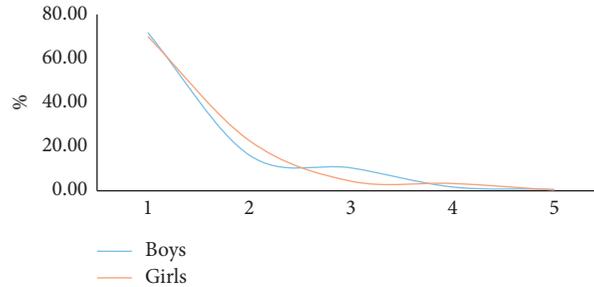


FIGURE 3: Student wishes.

TABLE 4: Student feedback.

Serial number	Survey content	Yes	Yes (%)	No	No (%)
1	Do you like VR animation art experimental education system?	872	96.25	34	3.75
2	Does the VR animation art experimental education system help you learn football skills?	798	88.08	108	11.92
3	Whether the VR animation art experimental education system can stimulate your interest in learning?	674	74.39	232	25.61
4	Does the VR animation art experimental education system enhance your enthusiasm?	716	79.03	190	20.97
5	Is the VR animation art experimental education system conducive to understanding difficult points in animation art?	743	82.01	163	17.99

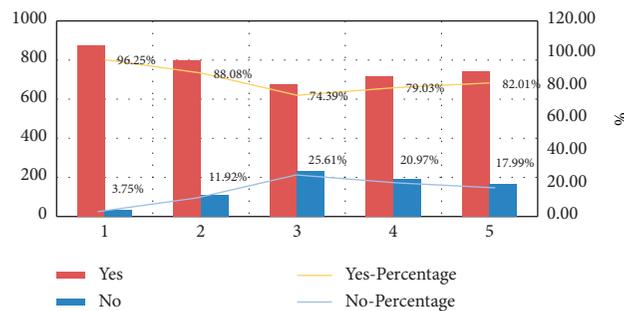


FIGURE 4: Student feedback.

(3) In the questionnaire, the feedback situation of students after receiving the education of the VR animation art experimental education system is set up, and the results are statistically sorted and graphed, as shown in Table 4 and Figure 4.

Obviously, we can learn from students' feedback that most of the students like VR animation art experi-

mental education system, accounting for 96.25%.

(4) We use α (Cronbach's alpha) coefficient to test the reliability of the questionnaire. The value of Cronbach's α coefficient in this questionnaire is shown in Table 5 and Figure 5. The Cronbach coefficient is a statistic that refers to the average of the semi-dependent values obtained by all possible probability

TABLE 5: Questionnaire reliability test.

Changeable	Size formation	α modulus of each changeable	Global α coefficient
Students	Reform force	0.914	0.905
	Innovation character	0.896	
Teachers	Quality of faculty	0.907	0.915
	Content of curriculum	0.914	
	Education method	0.923	
Environmental science	Substantial condition	0.916	0.907
	Ethnic circumstance	0.897	
Education quality	Distance inwards	0.876	0.884
	Range	0.891	

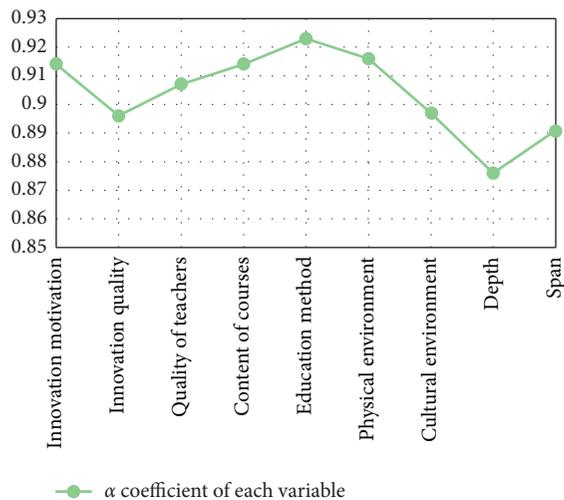


FIGURE 5: Questionnaire reliability test.

distribution methods of size. It is the most common method of trust measurement.

The average Cronbach's α coefficient is 0.903, showing that its reliability is high, and its content is more real and feasible.

5. Conclusions

In the education and education link, VR is used to form a new virtual education, which not only can fully reflect its technological advantages through virtual education but also is an indispensable means for future education development and information development.

This article regards VR as a brand-new educational resource, and from the perspective of pedagogy, it studies and analyzes the application status of this technology in this discipline and proposes a brand-new research field, namely, virtual education.

This article introduces VR into the animation experiment education, which not only improves the study, life, and work efficiency of animation art students in art colleges but also meets their entertainment needs. The VR animation art experimental education system greatly stimulates children's enthusiasm in studying and, at the same time, promotes students' independent creation, which is conducive to improving their professional skills. At the same time, this

article also has some shortcomings. The research in this article did not combine some aspects of virtual technology but only collected the attitudes of students, such as the impact of virtual reality technology on students' interest, acceptance, and learning ability.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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