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Research Article

Application of Virtual Reality Technology in Adolescent Mental Health Science Education

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The 21st century is a time of rapid advances in science and technology, and scientific knowledge and literacy are highly relevant to the development of the country. Science education is the main means of learning scientific and cultural knowledge, and its teaching quality determines the formation of national scientific literacy. In addition, information technology teaching assistants are one of the main research areas in the field of educational technology, and they have long attracted the attention of researchers in the field of education. Based on these facts, this research introduces virtual reality technology into science education to make a favorable influence on the psychological well-being of young people, through color feature extraction, gray-level cooccurrence matrix feature extraction, Marching Cubes algorithm, and image synthesis technology to be scientifically and effectively combined with science education, and the popularization rate of students receiving science education has increased by 26.9%. As a result, the mental health of students was improved, and the number of students with subhealth mentality decreased by 16.9%. Adolescence is a transitional period for adolescents from immaturity to maturity. Adolescents are prone to fall into depression, anxiety, rebellion, autism, and other emotions, which will have a damaging impact on the growth of adolescents' mental health. The use of virtual reality technology in science education has opened up a new field of virtual teaching and learning. This pattern of education will make a huge influence on the future growth of education and the creation of teaching concepts.

1. Introduction

In recent years, virtual reality technology (virtual reality, VR for short) has developed rapidly. This is a kind of computer technology that helps users create virtual worlds and obtain simulation experience, breaking the shackles of time and space and giving users an immersive interactive experience. Virtual reality has made great contributions to medicine, entertainment games, and education. Applying virtual reality technology to education can mobilize learners' sensory stimulation in an all-round way, enhance learners' sensibility, and stimulate learning motivation. It has realized situational learning and has the effect of knowledge transfer, so virtual reality technology is suitable for education and teaching. Combining virtual reality technology with science education will produce a brand-new teaching model. Under the premise of grasping the essence of teaching, virtual reality technology can give full play to its advantages and bring qualitative improvement to science education.

The rapid development and popularization of computer technology have accelerated the development process of virtual reality technology. The current virtual reality technology is designed in many disciplines and related technical theories, including artificial intelligence, image processing, pattern recognition, graphics, and other high performance. The application and development of computing virtual technology should also cover many disciplines, such as mathematics, communication, aesthetics, physics, and psychology.

The mental health of adolescents is not only related to the happy life and healthy growth of individuals but also

relevant to the improvement of the national health status, and it is also an important guarantee for the development of national competition and internationalization. The application of virtual reality technology in science education to solve the mental health problems of adolescents and address the physical health problems of adolescents at different levels is of great importance to raising the physical health of Chinese adolescents. Using virtual reality technology to solve adolescents' mental health problems in scientific education is of great significance to improving the mental health of our country's adolescents.

2. Related Work

With the popularity of smartphones, the spread of virtual reality (AR) and virtual reality (VR) apps that utilize smartphone technology is also on the increase. However, the virtual reality technology of intelligent collection still needs to be strengthened, and many effects and technologies in the allocation of resources of smart phones are not achievable. Despite the widespread use of AR and VR technologies in education, there is still a lack of evidence-based research to test the discrepancies between AR and VR technologies in terms of educational impact. The purpose of Huang et al.'s exploratory research is to resolve this lacuna in the literature by contrasting the effects of AR and VR technologies on acquisition results (such as retrieval of scientific information). In particular, Huang et al. used a dual-condition (AR and VR) between-subject design to examine the retention of scientific knowledge by auditory and visual information rendered on the Samsung S4 smartphone app. The results of Huang et al.'s research ($<i>N = 109$) show that VR is considerably more absorbing and attractive via the regime of space existence. However, AR appears to be a more efficient medium for transmitting audible information via space presence, which may be due to the heightened awareness need related to immersive experiences. Therefore, an essential meaning of design is that when the experience is consumed, the educational component should be incorporated into the visual form [1]. Virtual reality (VR) is becoming recognized as a worthwhile tool for preparing dental students, and its usage is increasing in dental schools all over the world. Towers et al. timely review the literature related to the use of VR in dental education to ensure that educators fully understand the current areas of investigation and areas that require further investigation in order to make an appropriate decision on whether to adopt VR as an appropriate decision. The teaching tool used the methodology outlined by Arksey and O'Malley for a scoping review. The survey determined 68 related articles. As a result of the review, four educational topic areas related to "simulation hardware," "simulation authenticity," "scoring system," and "verification" emerged. The literature reveals some weaknesses and hypotheses. It suggests areas for extra inquiry to develop a greater foundation of evidence for the usefulness of VR in dental education and to inform its future development [2]. Background mixed reality technologies, consisting of virtual reality (VR) and augmented reality (AR), are seen as potential tools in science teaching and learning. It can cultivate positive emotions, encourage independent learning, and improve learning outcomes. Zhou X research proposed a VR/AR-based technology-assisted biological microscope learning system. The construction of the microscope is portrayed in a detailed three-dimensional model, and each element is indicated by the relationship and correlation between them. The interaction behavior of the model is defined and a standard operation instruction is produced. Motion control of the simulation elements on the basis of collision recognition. Combining immersive VR devices and AR technology, Zhou et al. worked on a virtual microscope subsystem and a mobile virtual microscope guiding system. The system thus consists of a VR subsystem and an AR subsystem. The VR subsystem has an emphasis on simulating the operation of the microscope and the related interactional behavior, allowing the user to view and manipulate the parts of the 3D microscope model through natural interaction in an immersive scene [3]. As the size of the software program code base in software development projects increases, the insight and understanding of its underlying dependency structure pose a challenge to programmers. The availability of virtual reality (VR) systems continues to increase, bringing VR-based program code structure visualization into the actual applications of software developers, and can support program understanding and insight. However, the full visual immersion of VR will bring cognitive burden and potential interference. So far, the potential motivation and program understanding factors for applying gamification to this VR visualization function have not been fully studied. Oberhauser and Lecon profiled and assessed a program code VR digital gamification method called VR Gamification Immersive Software Structure (VR-GaImS), which applies digital gamification to the multimetaphorical VR visualization of software program structure. The results of preliminary empirical investigations using the prototype of Oberhauser and Lecon's research show that it has the potential to enhance enjoyment and motivation, focusing on and encouraging inquiry into software architecture [4]. Virtual reality technology has captured the attention of people. This technology has been used in many fields such as medicine, industry, education, video games, or tourism. Perhaps, its greatest area of interest is recreation and amusement. The Martín-Gutiérrez study found that no matter which industry, the implementation of virtual reality or enhanced reality has a few limitations: it is pricey, has poor ergonomics, or means that too much work is required to produce the content. The most recent technological developments, which include the fast social adoption of smartphones, have boosted anyone's exposure to virtual and augmented reality. Moreover, a few major corporations such as Apple, Facebook, Samsung, and Magic Leap have invested more in these technologies in order to increase their availability in the coming years. Educational establishments will profit from better access to virtual technology, which will permit teaching in virtual environments that cannot be visualized in a physical environment [5]. Background virtual reality (VR) fusion technology has grown in popularity in recent years, and a number of prior studies have used it in laboratory education. However, due to the lack of evidence

to assess the impact of virtual reality convergence technology on VR education, many designers have chosen to forego this expensive and sophisticated technology. In this research, Qian et al. studied the influence of virtual reality convergence on immersion, presentment, and learning performance through experiments. Every player is allocated randomly to one of the following three states: a PC environment manipulated by a mouse (PCE), a VR environment manipulated by a controller (VRE), or a VR environment running virtual reality fusion (VRVRFE), manipulated by a real person. Findings of analysis of variance (ANOVA) and t-tests for immersion and co-efficacy showed considerable variation between the PCE ∗ VR − VRFE condition pairs. In addition, the results show that PCE ∗ VRVRFE and VRE ∗ VR − VRFE have significant differences in the intrinsic value of learning performance, and the difference between the immersive group is slightly significant. In conclusion, the results show that, compared with the traditional PC environment, virtual reality fusion can provide a better sense of immersion, presence, and self-efficacy, as well as the intrinsic value of better learning performance [6].

3. The Role of Science Education in the Mental Health of Young People

3.1. Overview of the Mental Health of Adolescents. Regarding mental health, self-confidence, no inferiority, no complaints in social life, and no extreme handling of things, regardless of whether real life is good or bad for them, they can calmly face the pressure from life and have a mature attitude and ability to love and be loved. They should also have certain management and organization capabilities, and be able to handle one's own affairs well in the interpersonal relationship of complex social life, with a certain degree of independence. Do not rely on others, behave rationally, have independent opinions, and listen to reasonable suggestions.

When necessary, they can make major decisions and be willing to take responsibility.

There is a good organization [7], a long-term plan, and a good self-control, using our own will to consciously control ourselves to achieve the desired goals.

This is the manifestation of our psychological maturity.

Adolescence is the transitional period between children and adults and the initial stage after adulthood. They are in a critical period of exploring identity and establishing identity. After entering puberty, self-awareness increases, inner conflicts increase, they are curious about the opposite sex, psychologically sensitive, caring about other people's opinions, having mood swings, and susceptible to surrounding events. This is a period of high incidence of psychological problems. It is an important period of life development. Different mental activities are very active and form different psychological qualities, but this does not seem to be a strong trend. They move quickly and have greater plasticity. With the rapid economic growth and major changes in lifestyles, young people are more likely to be affected by negative mental health problems than other groups [8].

3.2. Adolescents' Mental Health Status and Reasons. Based on the particularity of adolescents' psychological problems, academic circles at home and abroad have conducted in-depth studies on them, and the application of psychological scales has played a very important role in these studies. At present, the measurement tools used in the research of adolescents' psychological problems are mainly divided into four categories: the first category is a symptom-oriented psychological diagnosis scale, the second category is an adaptation-oriented scale, the third category is a mental health quality scale, and the fourth category is a scale focusing on adolescents' mental subhealth. The most widely used is the first category of symptom-oriented psychological diagnostic scales. The reason is that the first type of tools can be tested in a relatively wide range, with freedom of time and location, and most of them are self-evaluated. The symptom-oriented psychological diagnostic scales are more commonly used in research. It mainly includes Mental Health Diagnostic Test (MHT), Mental Health Scale for Chinese Middle School Students, Symptom Self-Rating Scale (SCL-90), Depression Self-Rating Scale (SDS), and Anxiety Self-Rating Scale (SAS). These measurement tools are based on mental illness factors such as anxiety, mood disorders, obsessive-compulsive symptoms, paranoia, hostility, and depression [9].

Based on the above multiple testing methods, a cross-sectional survey of the general conditions of adolescents was conducted using stratified cluster random sampling methods to analyze the detection rates of Chinese adolescents' mental subhealth of different genders, as shown in Table 1.

The detection rate of male mental subhealth symptoms is lower than that of females, and the mental subhealth status is higher than that of females. The comparison is statistically significant.

Analyze the detection rate of adolescents' mental subhealth for the age group from junior high to senior ones, as shown in Table 2.

The table shows that the detection rate of mental health among college students is the highest and that of junior high school students is the lowest. Moreover, the detection rate of mental subhealth symptoms and mental subhealth state of junior high school students is the highest among the three ages [10].

The test results of adolescent SCL-90 are shown in Table 3.

The factor scores of adolescent SCL-90 are measured in comparison to those of the control group. The average score of adolescent SCL-90 factors is between 1.37 and 1.84. The higher item is interpersonal relationship, and the lower score is somatization, as shown in Table 4.

When analyzing factors that affect the mental health of adolescents, structural equations are used for analysis. Five latent variables including school atmosphere, family atmosphere, objective family environment, academic pressure, and peer effect are included in the system to analyze whether they have an influence on the mental health of the latent variables. According to relevant literature and research, the assumptions made in this paper for the structural equation model of adolescent mental health are as follows:

Table 1: Detection rate of mental subhealth of Chinese adolescents of different genders.

Psychological condition	Boys	Girl	Overall	x^2 value	p value
Mood	2158 (25.9)	2061 (25.1)	4219 (25.5)	1.166	0.280
Conduct	2166 (26.0)	1976 (24.1)	4142 (25.0)	7.658	0.006
Social adaptation	1435 (17.2)	1215 (14.8)	2650 (16.0)	17.456	0.001
Mental health	4070 (48.8)	3975 (48.5)	8045 (48.9)		

Table 2: Analysis of the detection rate of adolescents' mental subhealth for different age groups.

Grade	Number of people	Mental health	Mental subhealth
Junior high school	6827	2996 (43.9)	2291 (33.61)
High school	6843	3267 (47.7)	2163 (31.6)
University	2875	1782 (62.0)	792 (27.5)
x^2 value		317.239	
p value		0.001	

First, the school atmosphere has a favorable influence on the psychological well-being of adolescents.

Second, the family atmosphere has a favorable influence on the psychological well-being of adolescents.

Third, the objective family environment has a positive effect on the psychological well-being of adolescents.

Fourth, academic pressure has a harmful effect on the psychological health of adolescents.

Fifth, the peer effect has a favorable influence on the psychological well-being of adolescents.

Sixth, the objective family environment has a positive effect on the family atmosphere.

Seventh, the family's objective environment has a negative impact on academic pressure.

Eighth, the peer effect has a positive effect on the school atmosphere.

Ninth, the school atmosphere has a negative effect on academic pressure, as shown in Figure 1.

A comparative analysis of the proportion of different grades that affect their physical and mental health due to school atmosphere, family atmosphere, objective family environment, academic pressure, peer effect, etc. is shown in Figure 2.

From the chart data, it is not difficult to find that the mental health of junior high school students is mainly affected by the school atmosphere and peer effect, while the influencing factors of the mental health of high school students are mostly academic pressure.

3.3. Science Education. The science curriculum in elementary schools in our country comes from the term "Gezhi." It spread to our country after the Westernization Movement. The main problem of learning lies in the acquisition of scientific knowledge through experimental questions. Later, the name of the course was changed to "Nature," and the Ministry of Education officially announced in 2001; the name of the course was changed to "Science," and the "National Standard for Basic Science Courses" was announced [11]. This change extends the curriculum teaching to the entire field of natural sciences, including the relationship between scientific nature and human society. An important purpose of basic science courses should be observation. It is because most of the science courses are based on experiments, which requires students to have the ability to observe to discover problems and to have the courage to question and innovate and research-based learning experiments to cultivate students' ability to discover and think about problems. However, it is not appropriate for all children to have the opportunity to take science courses. The popularity of statistical science education in various regions is shown in Figure 3:

Science education should form quality education, which is recognized by science teachers. Mental health education is an important part of quality education, but some science teachers neglect the mental health education of students [12]. Although science teachers are responsible for cultivating children's scientific literacy, education is still partial to exams. The fraction theory is probably the reason why many teachers ignore it. We must moisturize things silently in the mental health of students. Experimental teaching is an important part of science teaching, and it is also a valid method to cultivate students' rigorous scientific attitude, fearless scientific courage, and active and innovative scientific thinking. Therefore, it is very necessary to apply virtual reality technology to science education.

4. Virtual Reality and Technology

4.1. Virtual Reality. Virtual reality technology is VR technology. This technology is a kind of information technology with complex characteristics that appeared at the end of the 20th century and realized the fusion of multimedia technology, numerical image treatment, sensor technology, and computer graphics [13]. VR technology can produce three-dimensional visual and sound impacts. Because human-machine interaction is an amicable and concordant state that relies on natural skills and 3D virtual reality technology can transform the reactive and exhausted situation between man and machine, the status quo of traditional multimedia teaching has therefore had a significant impact. Virtual reality technology has applications in many fields, such as medicine, art design, and games, as shown in Figure 4.

As shown in Figure 5, virtual reality technology has high immersion, high interactivity, and high conception.

Table 3: The total detection rate of SCL-90 factor score problems in adolescents and control groups.

Factor name	Boys	Girl	Total
Somatization	7 (16.46)	15 (25.84)	22 (12.54)
Obsessive-compulsive symptoms	26 (45.62)	28 (53.26)	54 (14.56)
Man-machine relationship	21 (40.12)	25 (18.65)	46 (14.69)
Depression	17 (25.12)	20 (23.06)	37 (41.59)
Anxiety	26 (26.56)	16 (23.12)	42 (14.59)
Hostility	15 (23.21)	14 (15.21)	29 (12.89)
Paranoid	5 (9.61)	8 (21.21)	12 (15.65)
Spirituality	6 (11.52)	2 (12.21)	8 (54.21)

Table 4: Comparison of the factor scores of adolescent SCL-90 with those of the control group.

Factor name	Test group	Control group	T
Somatization	1.32 + −0.37	1.41 + −0.43	-0.405
Obsessive-compulsive symptoms	1.73 + −0.51	1.82 + −0.60	-0.963
Interpersonal relationship	1.81 + −0.50	1.84 + −0.52	-0.065
Depression	1.68 + −0.42	1.71 + −0.49	-0.344
Anxiety	1.53 + −0.48	1.58 + −0.56	-0.049
Paranoid	1.59 + −0.46	1.63 + −0.42	-0.033
Psychotic	1.54 + −0.52	1.57 + −0.47	-0.030

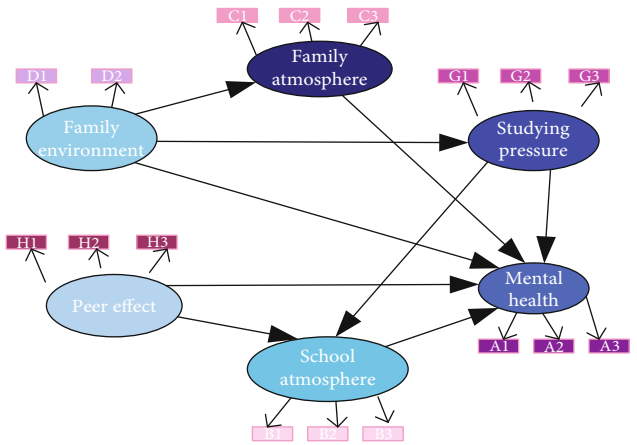

Figure 1: The original path diagram of the factors affecting the mental health of adolescents.

4.2. Virtual Reality Technology

4.2.1. Color Feature Extraction. Because the image pixel value array is a series of values, therefore, it is essentially possible to use some simple mathematical statistics to achieve a representation of the overall color characteristics of the image [14]. The most popular color feature is the calculation of moments per channel on the basis of the RGB color space. RGB color is the most common in virtual reality technology; besides this, there is HIS color space.

The first-order moments mean the calculation formula for the mean is

$$\eta = \sum_{j=0}^{M} \frac{1}{M} P_{ij}, \tag{1}$$

where P_{ij} represents the value of the ith color channel at pixel position j and N represents the total number of pixels. Second-order moment is the standard deviation, which is the square root of the distribution difference. The calculation formula can be expressed as

$$\alpha = \sqrt{\frac{1}{M} \sum^{M} \left(P_{ij} - \eta\right)^2}. \tag{2}$$

Third-order moment stands for skewness, which gives a measure of the asymmetry of the pixel value distribution. The calculation formula can be expressed as

$$\text{Skewness} = \sqrt[3]{\left(\frac{1}{M} \sum_{j=1}^{M} \left(P_{ij} - \eta_i\right)^3\right)}. \tag{3}$$

In the process of image processing, the RGB color space is usually converted to the HIS color space. There are two most commonly used color spaces for color feature extraction, RGB and HIS, but compared with the two color spaces,

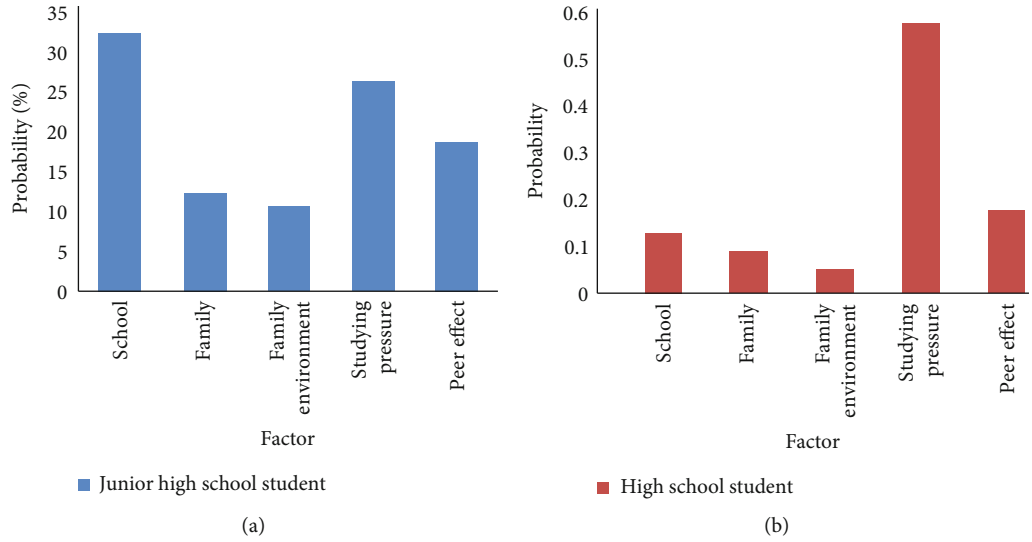

Figure 2: Different comparisons of the physical and mental health of junior high school students and high school students due to school atmosphere, family atmosphere, objective family environment, academic pressure, peer effect, etc.

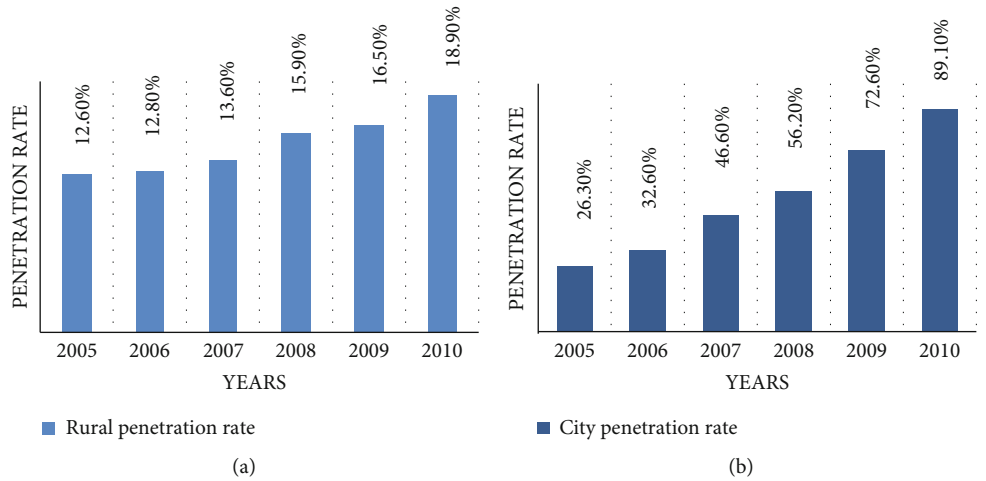

Figure 3: The penetration rate in urban and rural areas from 2015 to 2020.

HIS is more accurate and efficient in the calculation process. The conversion formula is as follows:

$$E = COS^{-1}\left\{\frac{(1/2)[(O-G)+O-B]}{\sqrt{(O-G)^2+(O-G)(G-B)}}\right\}, \quad (4)$$

$$Z = 1 - \frac{3}{O+G+B}\min(O,G,B).$$

4.2.2. Feature Extraction of Gray-Level Cooccurrence Matrix. Texture is an intrinsic characteristic of an image related to the surface material of a material, and it includes a lot of significant information about the surface structure and its relationship to the surrounding environment [15]. Texture can be thought of as the gray scale of an image in some form in color space, and it is one of the characteristics in common with images. Because the texture of an image is also formed by the repetition of grayscale distribution, there must be a specific connection between two pixels in the image space domain. We call it the spatial correlation of the pixels of the image, that is, the grayscale. The hierarchical cooccurrence matrix is based on the spatial correlation of pixels to describe the texture characteristics of the image [16]. Obtain the gray-level cooccurrence matrix from the gray-level image. According to statistics, at a certain distance in the four directions of 0°, 45°, 90°, and 135°, the gray value of gray pixel i and the value of gray pixel j appear at the same time. The result is shown in Figure 6.

Where D is the distance, suppose there is 6×6 image pixel data with gray levels of 0, 1, 2, and 3. A cooccurrence matrix count is conducted for the horizontal and vertical orientations around each pixel, and the results are shown in Figure 7.

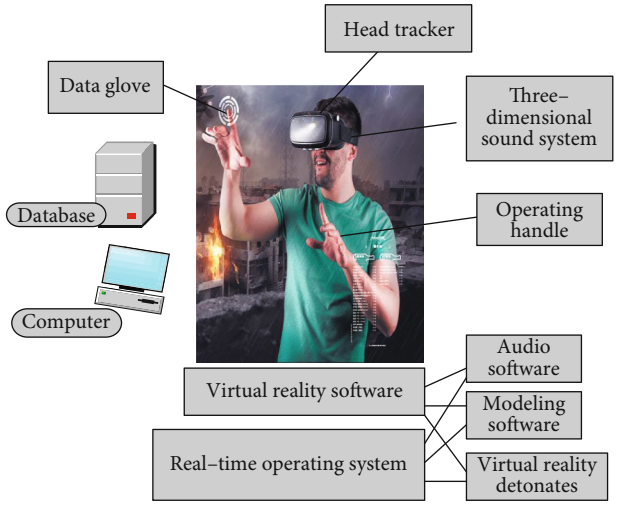

Figure 4: Virtual reality game.

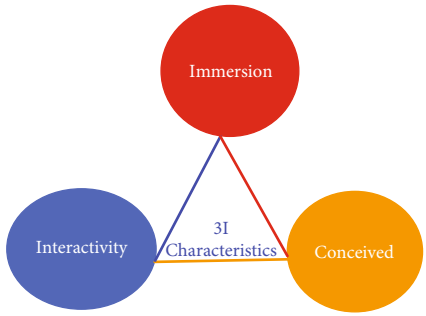

Figure 5: Three characteristics of virtual reality.

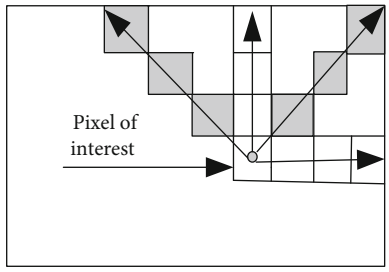

Figure 6: Matrix.

Then, in the 0 direction, the gray level cooccurrence matrix with a distance of 1 is

$$P_{1,0} = \begin{bmatrix} 4310 \\ 3454 \\ 2565 \\ 0654 \end{bmatrix}. \tag{5}$$

According to the gray-level cooccurrence matrix obtained by statistics, the following related attributes of the texture can be calculated:

0	0	1	2	3	1
0	0	1	2	3	1
1	1	2	2	0	2
1	1	2	2	1	3
2	2	3	3	3	2
2	3	1	3	1	0

Figure 7: 6×6 image pixel data.

$$\begin{aligned} \text{Contrast} &= \sum_{i,j} |i-j|^2 p(i,j), \\ \text{Correlation} &= \sum_{i,j} \frac{(i-\eta i)(j-\eta j)p(i,j)}{\alpha_i \alpha_j}, \\ \text{Energy} &= \sum_{i,j} p(i,j)^2. \end{aligned} \tag{6}$$

4.2.3. Marching Cubes Algorithm. The essence of MC algorithm is to find isosurface from volume data, so MC algorithm is usually called isosurface extraction algorithm. It is the most classic and most commonly used algorithm among the three-dimensional reconstruction surface rendering methods [17].

Marking the corner points of the voxel can simplify the solving of the isosurface. The specific method is as follows: in a voxel, we set the corner points with a pixel value greater than the threshold as the marked points and mark them with black dots; the corner points whose pixel value is less than the threshold are set as marked points without any marking, as shown in Figure 8.

Generally, there are two methods to find the coordinates of the equivalent point and the normal vector of the triangle surface: linear interpolation and the method of selecting the midpoint.

Linear interpolation

$$\begin{aligned} B &= \frac{B_1(\text{is covalue} - W_1)(B_2 - B_1)}{W_2 - W_1}, \\ N &= \frac{N_1(\text{is covalue} - W_1)(N_2 - N_1)}{W_2 - W_1}. \end{aligned} \tag{7}$$

Choose the midpoint method:

$$\begin{aligned} B &= \frac{|B_2 - B_1|}{2}, \\ N &= \frac{|N_2 - N_1|}{2}. \end{aligned} \tag{8}$$

So we can use the gradient vector of the point to represent the normal vector of the point, and the gradient formula of any point on the isosurface is

$$g(a,b,c) = \oplus f(a,b,c). \tag{9}$$

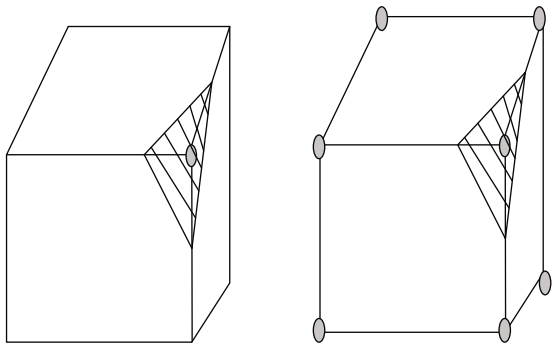

Figure 8: Schematic diagram of marked and unmarked points.

The gradient at the corner points of the voxel can be obtained using the central difference method:

$$g_a = \frac{f(a_{i+1}, b_j, c_k) - f(a_{i-1}, b_j, c_k)}{2 \oplus a},$$
$$g_b = \frac{f(a_i, b_{j+1}, c_k) - f(a_i, b_{j-1}, c_k)}{2 \oplus b}, \quad (10)$$
$$g_c = \frac{f(a_i, b_j, c_{k+1}) - f(a_i, b_j, c_{k-1})}{2 \oplus c}.$$

4.3. Image Synthesis. Before the final image is obtained, image synthesis must be performed in a specific way. According to the scanning direction of the ray in space, we can roughly divide the image synthesis methods into the following two categories:

Back-to-front image synthesis method: this method starts from the ray farthest from the viewpoint. The color value and transparency value of the pixels on the ray are synthesized along the direction from the ray to the viewpoint, until the viewpoint position is reached [18]. The calculation is as follows:

$$C_k = C_j(1 - \partial_i) + C_i\partial_i. \quad (11)$$

Continue to iterate and simplify the available formula:

$$C = C_0\varphi_1\varphi_2 \cdots \varphi_n + C_1\partial_1\varphi_2\varphi_3 \cdots \varphi_n + \cdots C_n\partial_n,$$
$$C_0 = \prod_{i=1}^{n} \varphi_i + \prod_{i=1}^{n} C_i\partial_1 \prod_{j=i+1}^{n} \varphi_j. \quad (12)$$

Front-to-back image synthesis method: the front-to-back image synthesis method is very similar to the back-to-front synthesis method. The only difference is that the initial position of the ray is at the viewpoint, and it is projected from the viewpoint to the farthest point, the same as above.

5. Virtual Reality Is Used for Science Education

5.1. Analysis of Virtual Phenomenon Applied Teaching. Science education often includes the explanation of many natural phenomena and the accumulation of common sense in life, requiring students to combine theory and practice to deepen the internalization of knowledge [19]. Primary school science curriculum is an integral part of overall science education. In order to support the advancement of basic science education, long-term education researchers have conducted related research and research outside of teaching and discovered the current problems in basic science education in China: teaching fills ducks, insufficient training, and lack of curriculum resources. Therefore, the current low level of science education in elementary schools in our country hinders the development of science education in China. In order to better improve the science curriculum and solve the shortcomings of traditional teaching, researchers in the education field are gradually trying to use new technical methods to support the development of educational activities [20]. Thanks to virtual reality technology, students can feel themselves in the real world through various technical means, such as three-dimensional computer technology, interactive technology, computer technology, and man-machine interface, to get a real educational experience. The easy-to-use virtual teaching software allows teachers to improve scientific teaching methods and enhance teaching software resources. At the same time, it can effectively improve students' interest in learning, complete the content, and teach more effectively. For "virtual reality application education," its academic attention index is shown in Figure 9.

It is not difficult to see the application and popularity of virtual reality from this data. The research on virtual reality application education began to grow exponentially, indicating that the application research of virtual reality technology in education has gradually become a hot spot in the past two years. This is also related to the maturity of virtual reality technology.

5.2. The Application of Virtual Phenomena to the Analysis and Design of Science Education. To investigate virtual reality technology from the standpoint of educational technology, use this technology as a novel educational technology, and design a novel field of study linked to educational technology—virtual teaching and learning. Virtual teaching is a new learning method that integrates information technology with contemporary talent development, which takes people into a virtual learning environment. Virtual learning utilizes virtual reality technology to build a virtual learning environment and then uses the generated objectified reality to replicate key knowledge points. It guides students to take in information in a virtual environment using their senses, such as sight, and hearing; to receive information in a virtual environment; and to improve students' interest in learning and awareness of innovation. With the use of virtual reality in teaching, we found that most of the teaching based on virtual reality usually gives control of body movements, as shown in Figure 10.

The interest and attitude of students in the classroom based on virtual reality games are more active, which is better than traditional online learning platforms. Therefore, based on the theory of embodied cognition, we can think that the teaching environment in virtual reality or mixed reality environment has a positive impact on teaching activities. It is on basis of the design of learning activities on basis

Figure 9: Academic analysis and publication volume of virtual reality technology education in the next few years of 2010.

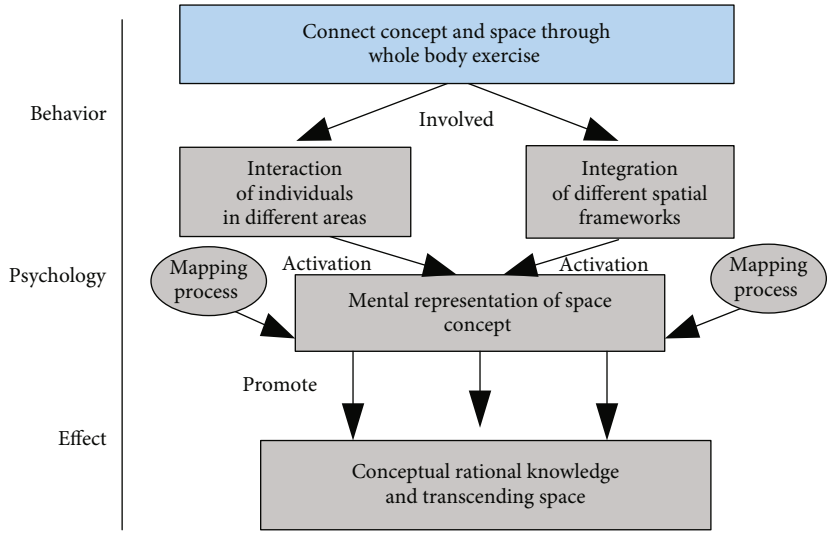

Figure 10: Process model diagram of embodied interaction to promote conceptual understanding.

of the activity theory, combined with the characteristics of virtual reality technology, and on the basis of the existing learning activity theory, adding the element of "teaching context," as shown in Figure 11.

5.3. The Preparation and Implementation of Virtual Phenomena Applied to Scientific Education Analysis and Design Experiments. 10 virtual reality-based learning activity cases of elementary school science courses were designed, and teaching experiment research was carried out in the fourth grade of an affiliated experimental elementary school in the autumn semester. The specific teaching experiment research process is shown in Figure 12.

This study uses questionnaire surveys and learning tests to study the changes in learning motivation and the comparison of test scores between the experimental group and the control group, through the interview method and questionnaire survey method to explore the learning subject's experience and evaluation of science courses based on immersive

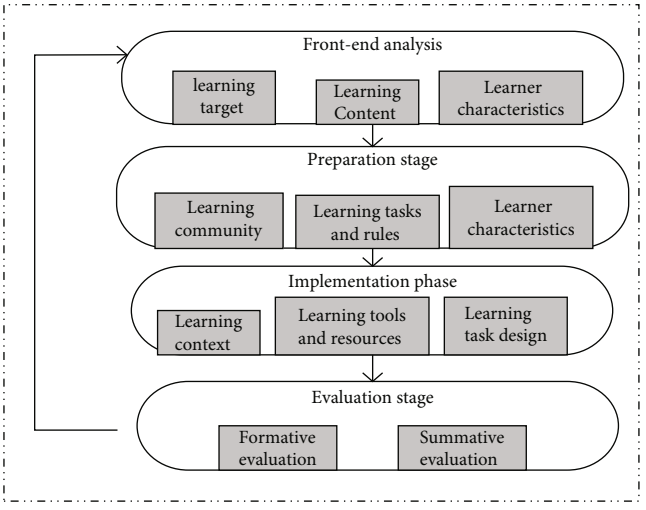

Figure 11: Virtual reality classroom teaching design process.

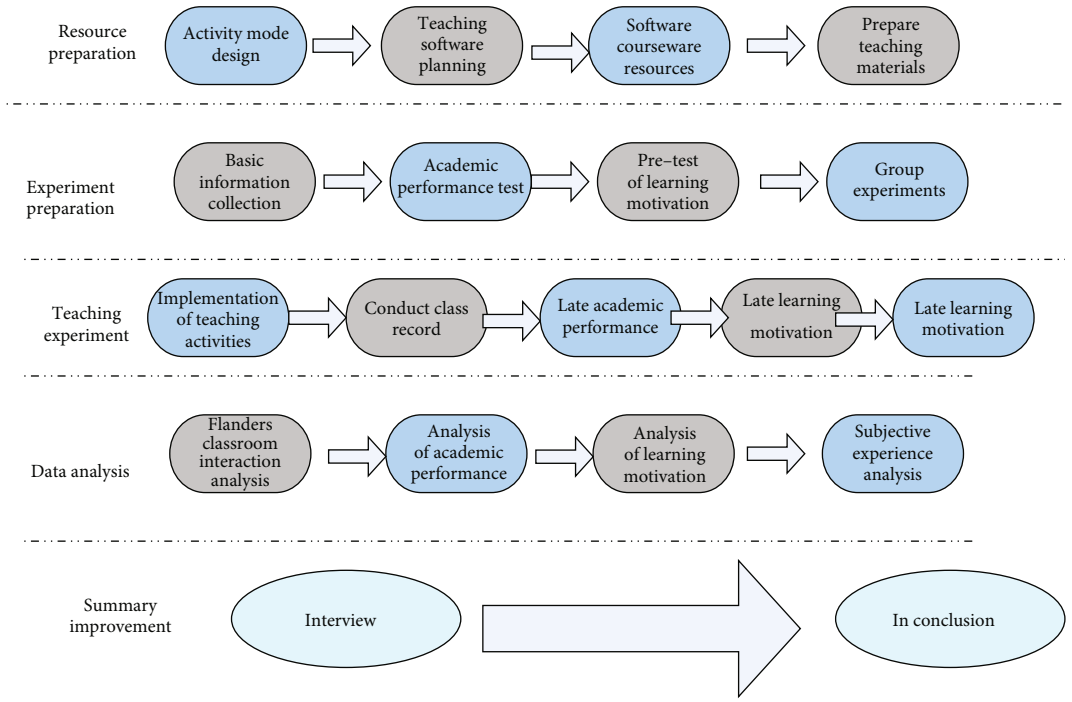

Figure 12: Teaching experiment research process.

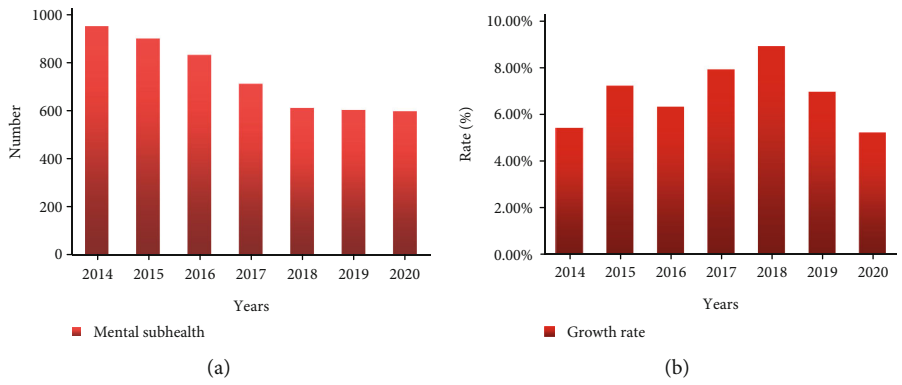

Figure 13: The number of mentally subhealthy people in the school from 2014 to 2020 and the rate of decrease.

virtual reality. And after a long-term experiment course, the students were tested by this test and found that the mental subhealth of the students in the school was gradually decreasing, as shown in Figure 13.

It is found that the school's insistence on combining science courses with virtual reality during the past few years has been quite effective in curing students' mental health. The rate of decrease in 2016 was relatively fast, but the rate of decrease afterwards was relatively slow. This is related to the pressure of the current society, but the overall situation is positive.

6. Conclusion

Teaching and learning activities require reliance on certain technological tools. As a result, with the reform of teaching technology, changes in teaching models and teaching activities will take place. Teaching technology is getting more and more sophisticated, making the present misunderstanding of education and teaching progressive and human educational thinking and awareness increasing. Thus, with the appearance and popularity of virtual reality technology, virtual education has breached the traditional education and teaching model and has given the field of education a distinctive approach to innovation and an unprecedented educational model. This education model will have a huge influence on the future growth of education and the creation of teaching ideas. Future directions are as follows: (1) improve teaching process: combine current experimental research data to improve elementary school science classroom teaching process based on immersive virtual reality technology. (2) Enriching experimental objects: choose

learners from different regions and different age groups to conduct related experiments in different subjects, enrich the experimental research objects, and obtain more complete experimental data. (3) Expand the software function: realize the use of virtual reality software to collect students' learning data, realize the function of online score generation and analysis, and reflect the teaching application effect of virtual reality technology to the greatest extent.

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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