Application of virtual simulation technology in Physical Education

Liping Chen[1], Kai Wang[2,*], Yufu Wei[1], Nan Zhang[1]

[1]School of Health, Baotou Medical College, Baotou, China

[2]Xiamen Medical College, Xiamen, China

*Corresponding author

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Abstract: VR simulation technology mainly simulates the real environment through a variety of perceptual abilities such as touch, vision and hearing, and physical education teaching just needs the joint participation of students' multiple senses. This paper mainly integrates the characteristics of VR technology and the characteristics of physical education teaching process itself to strengthen the application of sports intensity and load in VR physical education teaching simulation system. The experimental teaching of sports human body science has some problems such as space and instruments and equipment in the traditional teaching mode. The introduction of virtual reality technology can effectively improve the teaching environment and improve students' learning interest, which has high potential application value for realizing the purpose of practical teaching. Starting from the practicability of virtual reality technology, this paper studies its application in the experimental teaching of sports human body science.

1. Introduction

With the rapid development of science and technology and the gradual deepening of teaching experimental research, when carrying out sports physiology experiments, scientifically apply virtual simulation technology to help students deepen their understanding of the experiment. Through the application of virtual simulation technology, enrich the classroom teaching content, which is conducive to students' understanding of the knowledge content and deepen students' memory. Not only fully mobilize students' learning enthusiasm, but also effectively improve the quality of classroom teaching and improve students' physical quality. Virtual reality technology has played a great role in promoting the development of all levels of the whole society. It is also an important direction of the development of modern educational technology. It changes the problems existing in students' learning based on Teachers' naked eye observation to the measurement data based on accurate human motion technology; Changing the previous subjective judgment of students' learning problems based on experience to the analysis of programmed human motion simulation and simulated human motion, and using objective data to explain learners' problems; Reduce the time for students to gain sports experience in teaching, strengthen muscle action memory, shorten teaching cycle and improve teaching efficiency.

2. Virtual reality technology

2.1 Development of virtual reality technology

For the students who pass the physical education examination, they are more inclined to think in images. In the sports anatomy and sports physiology carried out in the freshman stage, teachers use multimedia means to display pictures and videos and teach theories in class. Students are prone to burnout under the indoctrination of a large number of theoretical knowledge. They only rely on mechanical memory and can not effectively complete the teaching objectives. The experimental class is supplemented by specimens and instruments for experimental teaching. The content is relatively fixed. Anatomical specimens are easy to cause fear for non-medical students, and physiological skill experiments are difficult to fully display the complete skills of each system.

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Therefore, most students will feel abstract, boring and difficult to understand and lose their interest and enthusiasm in learning. The teaching environment provided by virtual reality technology, whether from theory or experiment, is usually not constrained by practice and space, and is quite close to reality. It is not easy to be distorted and easy for students to understand and operate. Students can experience and operate immersively, become participants and leaders of the virtual learning environment, fully mobilize the subjective initiative of sports students, more easily stimulate their learning interest and contribute to the understanding of the content.

2.2 Application of virtual reality technology in sports human body science experiment teaching

Experimental teaching reform is an important part of undergraduate teaching reform. The application of virtual reality technology in experimental teaching is not only an important development direction of reform, but also an inevitable requirement of the development of the times. When virtual reality technology is put into the experimental teaching of sports human body science, it can carry out diversified integrated simulation through its virtual image characteristics, make full use of multimedia technology, apply a large number of experimental photos, video and audio materials, and cooperate with realistic animation to create a simulated experimental environment for students, which can achieve clear and beautiful visual effects, Broaden students' cognitive dimension and enable students to take a three-dimensional view of the anatomical change process of the human body from newborn to middle-aged and elderly. Virtual reality technology can also display the human blood circulation system in three dimensions in front of students, so that students can repeatedly watch all links experienced in the whole circulation process, which is helpful to understand and master the key and difficult points of the whole blood circulation system and improve teachers' teaching effect. Students can carry out open experimental verification of learned knowledge through virtual reality technology, improve their independent creativity and innovation ability and cultivate their speculative ability.

2.3 Limitations of virtual reality technology

There are still many problems to be solved in the experimental teaching of virtual reality technology, such as relying solely on the computer, unable to effectively carry out the actual operation, ignoring the subtle problems of the experimental link and so on. Based on the existing research of virtual simulation test projects, the experimental teaching of sports human body science, as an important provider of the application of virtual reality technology, can promote the development of virtual reality technology related industries through the wider promotion and application of experimental contents.

3. Design process of physical education teaching simulation system

3.1 3D modeling

Modeling is divided into three parts: human modeling, scene modeling and demonstration modeling. The manikin database includes: head model, mouth and nose detail model, arm model, forearm model, shoulder joint model, elbow joint model, wrist joint model, hand model, upper body model, abdominal model, waist model, hip joint model, thigh model, knee joint model, calf model, ankle joint model, foot model, etc. The demonstration modeling database includes: professional athlete demonstration human modeling and related animation design. The scene model database includes: sports scene modeling, etc. The system adopts 3ds max, OpenGL and unity 3D to jointly complete the modeling of the system's three-dimensional mirror and the production of relevant animation.

3.2 Rendering of models and scenes

For the lighting setting of the virtual scene, the brightness of the whole scene is improved through the built-in ambient light of 3ds max, the light source is set at the appropriate 3D coordinates, the light is supplemented at the appropriate position, and the related shadows are

softened. To clarify the control object of light, the purpose of light layout and the control of light intensity will help the virtual scene to complete rendering faster and better. Each node of each model is rendered in blocks to ensure the true presentation of key details. The sky box and lighting functions of unity3d are adopted to give the scene a more real virtual operation scene.

3.3 Model animation design

The system uses the script language based on 3DS MAX to animate the relevant model objects. As the most extensive 3D animation design software at present, 3ds Max has built-in powerful animation development function. The system will use the built-in MAXscript script language of 3ds Max to design the animation of the model. Firstly, the design object is the guiding posture demonstration of the demonstration model, which uses the way of key details to strengthen perception to design standard animation in different ways and technologies of people in the environment, with the goal of teaching users in standard actions. The last is the animation design of the environment model, which aims to reflect the real impression of the environment model while the model moves.

3.4 Establishment of virtual scene

The system will use unity3d to establish the required virtual scene and apply it to VR. Firstly, the model is established in 3ds max, and then exported into the mode that unity3d can import in order. Import all model elements into the scene of unity3d engine, adjust the corresponding position relationship, and delimit the scene boundary.

3.5 Motion capture

Real time capture, record and obtain the accurate movement posture during human movement, and study the improvement method of movement based on the analysis of human physiology, physics and other principles; Calculate and analyze the speed, acceleration and angle of the subject's specific joint point at a certain time, and compare it with the data of professional athletes in the database, so as to enhance the teaching interaction, improve the learning experience, effectively solve the key problems of quantitative research and real-time interaction in learning, and promote the development of sports field.

Restore human physiological mechanism process through a large number of high simulation 3D animation. By visualizing the abstract content in three dimensions, students can intuitively understand each knowledge point, deeply understand and master the knowledge, and have high technical content and unique application value. The physical education teaching simulation system based on VR is a typical human-computer interaction system. Its teaching effect will be affected by three factors: hardware system, simulation software and operators. Whether the standardized action demonstration can be correctly displayed to users, and whether the user's actions can be successfully identified and analyzed will become the key to the real effect of the system and training efficiency. Therefore, the algorithm will be optimized to improve code efficiency. A good graphical interface helps users have a better experience. The system uses unity3d as the design tool of 2D interface, and uses mapping and UI import to complete the interface design, including initial interface, scene selection interface, action teaching selection interface, timing bar, indication bar, etc.

4. Application

4.1 Application of virtual reality technology in Physical Education

Virtual reality technology optimizes the teaching process. The traditional teaching process is that teachers explain and demonstrate, students imitate and practice, and establish the concept of action; Through error correction and repeated practice, make the action coherent and accurate, establish dynamic stereotypes, and then make the action tend to be consolidated and used freely by adding new stimulation conditions to achieve dynamic stereotypes. Virtual simulation technology is that learners perceive actions through vision (multi angle observation of three-dimensional animation),

hearing (explanation of technical actions), touch (action experience) and interaction (action comparison), create virtual situations and interact again (communication, comparison, technical analysis, etc.) to deepen their understanding of actions, By adding new situations to deepen the understanding of technology and muscle memory, the movement tends to be stable. Virtual reality technology will enable physical education teaching from a single teacher to teach students to an interactive and comprehensive model. The traditional teaching is generally practice under the guidance of teachers. The teaching under virtual simulation technology is based on the knowledge construction of the superposition of virtual environment and real environment. Virtual reality changes the problems existing in students' learning based on naked eye observation to accurate human motion technology measurement data; Change the previous subjective judgment of students' learning problems based on experience to the programmed human motion simulation and simulated human motion analysis, and use objective data to explain learners' problems, so that the teaching process is more scientific and reasonable. Virtual reality technology can help overcome fear. Virtual fear is no different from real fear. The problem is what leads to real fear and virtual fear. It doesn't matter what you fear. The advantage of VR is that it can reproduce the real scene in detail and let yourself face things that feel stressed. By being in its environment, the discomfort will begin to decrease, helping everyone experience things they haven't experienced before, And make a change and feel like you're in it, so that you can get rid of your fear and slowly change.

4.2 Application of virtual simulation technology in exercise physiology experiment

In the experimental class, teachers need to pay full attention to students' dominant position in the classroom, stimulate students' interest in learning, and comprehensively improve students' creativity, initiative and enthusiasm. In teaching, we need to help students get more knowledge when they participate in the experiment. When mastering the content of sports physiology, guiding students to do more chest expansion training is conducive to increasing students' vital capacity; Carry out sit ups and exercise abdominal muscles; Pull up, exercise latissimus dorsi, etc. With the improvement of people's living standards, people pay more attention to their own health. Everyone should strengthen sports. Sports need to pay attention to methods and skills. The same is true when teachers explain physiology to students. Through more exercise physiology experiments, we can help students solve more problems, comprehensively improve students' autonomous learning ability and improve teaching effect. With the continuous development of virtual simulation technology, physiological experiment science applies virtual simulation technology to enrich classroom teaching content. In the process of the experiment, a three-dimensional, multi angle and multi-level learning space is established for students to help students fully understand the form of sports. Fully mobilizing students' interest in learning can effectively improve classroom learning efficiency, so as to comprehensively improve students' physical quality.

5. Conclusion

In the process of sports physiology experiment, the scientific application of virtual simulation technology can improve the interest and operability of teaching, enrich the classroom teaching content, help students better understand the knowledge content and comprehensively improve the quality of classroom teaching. The application of VR based simulation technology in physical education teaching organically combines the real environment with the virtual scene, which helps to improve the teaching environment and realize the reality of the teaching scene; Change the traditional teaching process, that is, teachers are the imparters of knowledge and become the guides and organizers; To improve the teaching effect, teachers create corresponding virtual teaching scenes and characters according to students' learning situation for students to learn. It can be seen that VR based virtual reality technology will be widely used in physical education.

References

[1] Yang H W . Application of Virtual Simulation Technology in Physics Experiment[J]. Research

and Exploration in Laboratory, 2005.

[2] Li D , Yi C , Gu Y , et al. Research on College Physical Education and Sports Training Based on Virtual Reality Technology[J]. Mathematical Problems in Engineering, 2021.

[3] Jha A , Tripathy P P . Recent Advancements in Design, Application, and Simulation Studies of Hybrid Solar Drying Technology[J]. Food Engineering Reviews, 2021, 13(5).

[4] Xu C , Siegrist M , Hartmann C. The application of virtual reality in food consumer behavior research: A systematic review[J]. Trends in Food Science & Technology, 2021(1).