International Journal of Advanced Scientific Research
www.multidisciplinaryarticle.com
ISSN: 2456-0421
Received: 29-04-2024, Accepted: 19-05-2024, Published: 13-06-2024
Volume 9, Issue 1, 2024, Page No. 54-56

Application of virtual reality technology in health education

Katherine Ning LI
Department of Anatomy, Institute of Sports Science, Xi'an Physical Education University, China

Abstract
The application of virtual reality (VR) technology in health education provides an immersive learning experience, overcoming the limitations of traditional teaching methods. In the education of physiological anatomy, VR employs virtual human body models and visualized organ structures to help students gain a more vivid and intuitive understanding of the human body. In simulated surgeries and medical practices, VR provides medical students and practitioners with a virtual environment for repetitive practice, enhancing their skills. In managing chronic diseases and rehabilitation, VR creates interactive and personalized virtual rehabilitation environments for patients, promoting active participation. In mental health education, VR simulates relevant scenarios to cultivate communication and coping skills in students and professionals. Currently, VR in health education faces challenges like cost, equipment accessibility, and virtual content development. However, with technological advancements and cost reductions in the future, VR is expected to make more remarkable breakthroughs in health education.

Keywords: Virtual reality, health education, visualization, simulation surgery practice

Introduction

Virtual Reality technology (VR) is a computer-simulated three-dimensional virtual environment that primarily provides users with simulated sensory experiences such as visual, auditory, and tactile sensations, making them feel as if they are physically present in the virtual environment. The hardware equipment of VR includes head-mounted displays, controllers, and sensors, and the software system comprises VR engines and VR applications. VR technology has many applications, including games, education, healthcare, industry, architecture, and tourism. In health education, VR technology can enhance students' practical abilities, improve health education, disseminate authoritative nutritional knowledge, enhance educational outcomes, provide medical and healthcare education, train nursing personnel, and contribute to improving preventive medicine and consulting skills.

Application of VR in Health Education

Physiology and Anatomy Education

The rapid development of virtual reality (VR) technology in physiology and anatomy education provides medical students with a more in-depth and specific learning experience. This advancement goes beyond simulating anatomical structures to providing students with an immersive virtual environment, allowing them to experience the internal structures and functions of the human body firsthand.

Firstly, VR has made significant progress in anatomical education. Traditional anatomical learning primarily relies on dissection rooms and specimens. At the same time, VR technology creates highly realistic virtual human body models, enabling students to learn more safely and intuitively. By wearing VR headsets, students can enter virtual anatomy labs and freely explore and learn about various organs, vascular systems, and nervous systems, enhancing their three-dimensional understanding of anatomy.

Secondly, virtual reality has also made significant progress in physiology education. Students can simulate physiological processes, observe organ functions, and understand physiological reactions and biochemical processes through virtual environments. For example, students can experience the heart beating, the process of respiration in the lungs, and other key concepts in physiology, making abstract theoretical knowledge more concrete and easier to understand.

Additionally, virtual reality provides a platform for interactive learning in anatomy and physiology. Students can simulate the process of anatomical surgery in a virtual environment, operate virtual tools, and perform steps similar to actual surgeries. This hands-on learning approach helps cultivate students' hand-eye coordination and operational skills, preparing them adequately for future medical practice.

In addition to students' learning experiences, educators can enhance teaching effectiveness through VR technology. Educators can adjust the difficulty of virtual experiments based on student's learning progress, providing personalized learning paths. Moreover, VR allows for remote teaching and collaborative learning, enabling students to participate in virtual labs through network connections and collaboratively explore and solve problems.

Simulated Surgeries and Medical Practice

The rapid development of virtual reality (VR) in simulated surgeries and medical practice provides medical students with a new, convenient learning experience. This advancement offers highly realistic simulations of surgical processes and allows medical students to repeatedly practice in a virtual environment to enhance their surgical skills and clinical judgment.

Firstly, VR in simulated surgery provides medical students with a safe, low-risk practice environment. Using VR headsets, students can enter virtual operating rooms and simulate various surgical scenarios, such as expansion and organ transplantation. This enables medical students to

engage in surgical operations without involving actual patients, reducing potential patient risks and allowing students to practice repeatedly in a safe environment.

Secondly, the progress of virtual reality in medical practice allows medical students to gain a deeper understanding of disease diagnosis and treatment processes. Through simulating clinical scenarios, medical students can conduct medical record analysis, patient assessment, and treatment plan development as if in a natural medical environment. This helps improve medical students' clinical decision-making and problem-solving abilities.

Virtual reality also provides medical students diverse learning opportunities, allowing them to experience practices in various professional fields. For instance, medical students can engage in simu-lated practices in fields such as pedia-trics, obstetrics and gynecology, and surgery, providing a comprehensive understanding of the diversity within the medical field and preparing them for future career choices.

Furthermore, VR innovation in medical education offers real-time feedback me-chanisms. By monitoring students' virtual surgical processes, the system can provide immediate assessment and advice, helping medical students correct errors and improve their techniques. This real-time feedback accelerates students' learning processes and en-hances their rapid mastery of surgical skills.

Chronic Disease Management and Rehabilitation

Firstly, VR in COPD management provides patients with a more interactive and personalized rehabilitation en-vironment. Through virtual reality, patients can participate in customized exercises and rehabilitation practices in virtual rehabilitation settings. This interactive rehabilitation makes it easier for patients to maintain a positive attitude toward rehabilitation and increases their participation in rehabilitation programs.

Secondly, VR's progress in chronic disease rehabilitation offers a variety of rehabilitation programs. Patients can participate in virtual rehabilitation activities with different themes and difficulty levels, such as outdoor walks and aquatic exercises. This diversity helps break the monotony of rehabilitation, increasing patients' interest and participation and improving the effectiveness of rehabilitation.

Virtual rehabilitation environments also provide a safe practice space for patients. Participating in traditional rehabilitation activities may pose risks for individuals with chronic diseases, while VR technology can provide a safe practice experience in a virtual en-vironment. Patients can engage in ba-lance training, strength training, and other activities in virtual reality, reducing the risk of accidental injuries that may occur in real-life rehabilitation.

In addition, VR in chronic disease rehabilitation offers real-time feedback and monitoring. By monitoring patients' movements and performance in virtual environments, the system can offer real-time feedback to guide patients in adjusting their actions, ensuring the accuracy and effectiveness of rehabilitation exercises. This real-time monitoring helps patients better understand and master the correct rehabilitation techniques.

For patients requiring long-term rehabilitation, virtual reality technology also improves the sustainability of rehabilitation. Patients can use VR devices for rehabilitation exercises at home, avoiding the inconvenience of frequent visits to medical institutions, thus enhancing the convenience and continuity of their rehabilitation.

Application of VR in Mental Health Education

Virtual reality (VR) technology's application in mental health education has brought revolutionary changes, enhancing mental health awareness, helping patients understand and cope with mental illnesses, and providing a more practical, immersive treatment experience. Here are the advancements in the application of VR in mental health education

Firstly, VR provides a new approach to recognizing and understanding mental illnesses. Through virtual reality, individuals can enter simulated scenes of mental illnesses and experience the fee-lings and emotions of patients. For ex-ample, in a simulated scene of anxiety disorder, users can experience symptoms such as accelerated heartbeat and rapid breathing, thus gaining a deeper under-standing of the impact of anxiety dis-order. This immersive experience helps reduce misunderstandings and prejudices about mental illnesses and promotes societal understanding and support for mental health issues.

Secondly, VR plays a crucial role in crisis intervention and psychological therapy. Virtual reality offers a virtual treatment environment, allowing patients to safely face and manage their emotions and stress. For example, vir-tual reality therapy can be used for ex-posure therapy to help patients gradually confront their fears and traumas. This virtual treatment environment can be customized according to the patient's needs, providing a more personalized treatment approach.

Virtual reality also provides experiences of relaxation and meditation in mental health education. Through virtual en-vironments, individuals can immerse themselves in tranquil scenes and engage in meditation and relaxation exercises. This helps reduce stress, anxiety, and depression, improving individuals' mental health. This relaxation experience also provides an effective coping tool for daily stress.

Furthermore, virtual reality plays a role in social support and behavior change in mental health education. Through virtual social environments, individuals can interact with virtual characters or other real users, providing social support and emotional connections. This is a bene-ficial supplement for individuals facing social barriers or feelings of loneliness. Additionally, virtual reality can simulate various social scenarios, helping indi-viduals change harmful social behaviors and improve social skills.

The Impact of VR on the Effectiveness of Health Education Learning

Studies have shown that compared to traditional teaching methods, health education courses using virtual reality can significantly improve students' aca-demic performance and knowledge retention. One study found that students participating in virtual labs performed better on knowledge tests and demonstrated a deeper understanding of the experiments. This indicates that the immersive learning experience of virtual reality positively affects the absorption and understanding of subject knowledge.

Firstly, VR provides an immersive learning experience. Through virtual environments, students can feel like they are in real-life scenarios, such as medical laboratories, operating rooms, or anatomy labs. This immersive experience enables students to intuitively understand

complex concepts in the health field and deepen their understanding of medical knowledge.

Secondly, VR offers more practical practice opportunities. Practical operations and practices are essential learning components in medical and health education. Virtual reality technology provides students with safe and realistic practice opportunities through activities such as simulating surgeries, clinical skills training, and operational techniques, helping them improve their practical skills.

Virtual reality also changes traditional classroom learning from passive listening and observing to a more active and interactive approach. Students are no longer simply recipients of information; they can actively engage in learning in virtual environments, interact with scenes, ask questions, practice, and solve problems. This interactivity helps stimulate students' interest in learning and enhances the depth and breadth of learning.

Furthermore, virtual reality provides a personalized learning experience during the learning process. By adjusting parameters in virtual environments, systems can provide customized learning paths based on students' learning styles and progress. This helps cater to the needs of different students, enhancing the effectiveness and effi-ciency of learning.

Conclusion

Virtual reality (VR) has significant implications in health education. Firstly, VR enhances learners' practical skills by providing training in simulated environments, such as teaching breastfeeding knowledge and skills using simulated models. Secondly, VR helps improve health education capabilities, such as its application in clinical teaching for nursing undergraduates, enhancing their health education, critical thinking, and clinical communication skills. Furthermore, VR can disseminate authoritative nutritional knowledge, as evidenced by university nutrition and health practices based on simulated training platforms.

Moreover, VR has a significantly positive impact on overall educational outcomes, even though there may be some adverse effects in specific areas such as anxiety, cognition, and creativity. VR can also be applied in healthcare education, delivering visual stimuli and other sensory experiences through simulated environments, allowing learners to practice skills without fearing severe mistakes. In nursing staff training, VR can simulate emergencies for interactive practice, increasing realism and enriching learning experiences.

VR also aids in cultivating preventive medicine and counseling skills, teaching learners to assess patient conditions, receive timely feedback prompts, and educate through interactive experiences with virtual patients, helping learners determine how to guide patients to change unhealthy lifestyles. In conclusion, VR has broad prospects and significant value in health education.

References

1. Abid Haleem, Mohd Javaid, Mohd Asim Qadri, Rajiv Suman. Understanding the role of digital technologies in education: A review,Sustainable Operations and Computers,2022:3:275-285.
2. Moro C, Štromberga Z, Raikos A, Stirling A. The effectiveness of virtual and augmented reality in health sciences and medical anatomy. Anat Sci Educ,2017:10(6):549-559.
3. Zhao J, Xu X, Jiang H, Ding Y. The effectiveness of virtual reality-based technology on anatomy teaching: a meta-analysis of randomized controlled studies. BMC Med Educ,2020:20(1):127. Published 2020 Apr 25.
4. Wang J, Li W, Dun A, Zhong N, Ye Z. 3D visualization technology for Learning human anatomy among medical students and residents: a meta- and regression analysis. BMC Med Educ,2024:24(1):461.
5. Bork F, Stratmann L, Enssle S, *et al*. The Benefits of an Augmented Reality Magic Mirror System for Integrated Radiology Teaching in Gross Anatomy. Anat Sci Educ,2019:12(6):585-598.
6. Longo UG, Lalli A, Gobbato B, Nazarian A. Metaverse, virtual reality and augmented reality in total shoulder arthroplasty: a systematic review. BMC Musculoskelet Disord,2024:25(1):396.
7. Patsaki I, Avgeri V, Rigoulia T, Zekis T, Koumantakis GA, Grammatopoulou E. Benefits from Incorporating Virtual Reality in Pulmonary Rehabilitation of COPD Patients: A Systematic Review and Meta-Analysis [published correction appears in Adv Respir Med,2024:92(1):89-91.
8. Otsuka H, Okahashi S, Ishii H, *et al*. Capture of emotional responses under a simulated earthquake experience using near-infrared spectroscopy and virtual reality. PLoS One,2024:19(5):e0304107.
9. Baydoun M, Gajtani Z, Patton M, McLennan A, Cartwright S, Carlson LE. Virtual reality-guided mindfulness for chronic pain in cancer survivors: protocol for the virtual mind study-a single-group feasibility trial. Front Pain Res (Lausanne),2024:5:1291374.