

Guiding Role of Augmented Reality Technology in the Reform of Medical Education Teaching Model

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Abstract

With the rapid development of science and technology, augmented reality (AR) technology is becoming more and more mature. The goal of this technology field is to create a real experience, which is gradually developed and applied in various industries and fields. In the field of medical education, both theory and practice are emphasized. At present, the existing problems of medical education and teaching need innovation and reform of teaching mode. AR technology can change the teaching concept, change the form of classroom organization, improve the teaching evaluation, and supplement the limitations of practical operation. It is an effective teaching assistant tool that can be integrated with PBL and other teaching modes. AR technology can provide students with rich learning experience, greatly improve their learning initiative and learning effect, and has broad application prospects.

Keywords

AR technology, medical education, teaching mode.

1. Introduction

AR technology, full name is augmented reality technology. It is a new technology that uses the popular application of computers and mobile phones, as well as the continuous development of display technology, visualization technology and tracking and positioning technology, and merges the real world and the virtual world through special software and equipment. That is, the real world and the virtual world are combined to form the same picture and the same space that are interdependent, which can be perceived by human vision, hearing, touch, and even smell, taste and to achieve a transcendental sensory experience[1,2]. AR technology has the merits of combining reality with virtual, three-dimensional vividness and real-time interaction. For the operator, it extends the real world and enhances the understanding of some real environments. AR technology has three characteristics, called "3I". One is "Immersion", which can provide the operator with an immersive experience, and the other is "Interactivity", which refers to real-world interaction between the user and the computer or mobile phone, and the third one, is "Imagination", which can provide the operator with a space and experience that does not exist but can be truly felt [3,4]. The development of information technology has led to the development of AR technology. Due to the characteristics and advantages of AR technology, AR technology is now gradually being applied to multiple industries such as military, construction, entertainment and education[5,6]. The application of AR technology in the distribution of education disciplines is mainly natural sciences and humanities and social sciences, but the application of AR technology in medical education is relatively low.

2. Problems in Current Medical Education

2.1. The Constraints of Teaching Mode

The medical education teaching model has experienced many changes and innovations. Now, multimedia education has become popular. Some new teaching models such as PBL, CBL, and flipped classrooms have gradually been introduced into the classroom [7], but they have not been able to get rid of the traditional teaching mode which is teacher-centered and the direct goal of knowledge transfer. Too much emphasis on the transfer of knowledge has formed a situation of instillation of teachers and passive acceptance of students. It can lead to a dull classroom atmosphere in colleges and universities, low interest in learning, poor active participation, neglecting the cultivation of student capabilities which are contrary to the nature of education.

2.2. Weak Medical basic Theoretical Knowledge

The study of basic courses in medical colleges is the basis for the training of medical personnel and the foundation of medicine. Students are poor grasp of basic knowledge because medical basic theoretical knowledge is obscure and difficult to learn, and they have the large number of subjects, heavy tasks, low interest. So it is difficult for the academic performance to reach the set teaching goal

2.3. The Operation Ability is Weak and it cannot be Applied in Practice

Medicine is a discipline combining theory with practice. The cultivation of practical ability and the accumulation of clinical experience play a vital role in medical education. However, as far as the current status of medical education is concerned, practical teaching is an area that needs to be strengthened urgently. Most medical students cannot use the knowledge and skills they have learned after employment. The main reason is that the practice teaching is too much invested in the venue, equipment, and funds. the exclusion of patients in the hospital, and the impact of the postgraduate entrance examination also affect the cultivation of practical ability.

3. AR Technology and Reform of Medical Education Teaching Model

3.1. AR Technology can Promote a Change in Teaching Philosophy

The traditional teaching philosophy is one-way teacher indoctrination, students passively grasp the knowledge, and then follow the steps to verify the theory they have learned with the help of teachers and teaching materials. The 3I characteristics of AR technology allow students to change passive learning to active learning, which does not tell students what knowledge is, but allows students to experience knowledge directly and changes teaching thinking. For example, the seventh cervical spinous process is a sign of counting vertebrae. Real-time interaction through AR technology allows students to know how to find, and to find in real time, which is very helpful for students' understanding and learning. In 2016, the West China Medical College of Sichuan University developed a VR version of Human Anatomy 3D System Anatomy, which allowed students to bring a VR helmet to see a full-scale three-dimensional display of the human body structure, and the students had a better response.

3.2. AR Technology can Change Classroom Organization.

Whether the traditional teaching mode is theoretical or practical teaching, the teacher usually talks and talks in the classroom. The students have no interaction with the teacher, and they are easily attracted to other things such as mobile phones. In AR classrooms, teachers can design different content for different students, put forward different requirements, and often require students to complete interactively. Sometimes the entire class requires student

interaction to continue. with students as the protagonist of the classroom, and teachers as guides, this can increase the interest of students, stimulate students' enthusiasm for participation, and improve the effectiveness of classroom teaching.

3.3. AR Technology can Promote the Improvement of Teaching Evaluation

In the traditional teaching mode, teachers evaluation of students' classrooms and evaluation of teaching effects are difficult to implement, especially for individual students. In AR classrooms, teachers can implement individual evaluations of students automatically by the AR teaching system through student interaction. For example, in the study of the internal knowledge of the internal view of the skull, a clinically realistic internal view of the skull base can be set for students to solve it by themselves, and the system automatically judges the right and wrong, so that the teacher can grasp the student's learning effect at any time, and the student can also maintain a high degree of attention and can also be combined with the clinic to deepen the understanding of what has been learned. Teaching evaluation is two-way. In addition to teachers' assessment of students, students can also feedback the teacher's teaching effect in a timely manner through the system, so that teachers can correct their problems in a timely manner and better improve the teaching effect [8,9].

3.4. AR Technology Complements the Limitations of Medical Practice

The training process for medical students is complicated. Not only should the necessary basic knowledge be mastered in the classroom, but also practical operation is an important part. It includes not only experimental observation of anatomy and pathology, but also animal experiments such as physiology, as well as clinically invasive and non-invasive examination of patients. The experimental cost is high, and a large amount of funds are invested . Whether it can achieve the desired effect, it is also affected by many factors.with AR technology to create a virtual and actual experimental scene, students can independently finish the experimental steps and experience the process in real. so it save the resources and costs for the experiment, and is conducive to large-scale repeat ability experiment and operation. For example, during the practical operation of lumbar puncture, AR can show students a virtual human model, which can demonstrate the levels from shallow to deep, the length direction of the needle, the positioning of the puncture point, the puncture technique, and the breakthrough feeling of the needle. through the combination of virtual and real,it can approach the real operating state. The Department of Neurosurgery of the General Hospital of the Chinese People's Liberation Army uses multi-modal navigation virtual and augmented reality technology to realize the positioning and visualization of brain functional areas, and uses this technology to explore the teaching of puncture surgery for intracranial lesions [10].

4. Conclusion

AR technology is an effective teaching aid, which can change the disadvantages of traditional teaching modes, and can be perfectly integrated with PBL and flipped classrooms. It can not only improve the teaching quality of teachers, but also enhance students' learning interest and enthusiasm for participation. To enable students to study autonomously in a pleasant and relaxed environment and enhance the learning effect, it is worth of promoting in medical education. Of course, the popularization process of AR technology still has a long way to go. First, teachers and students need to adapt to the process. Second, AR medical resources for hardware and software need to be further developed and improved. AR should be seen as a supplementary teaching. Means, for the information of plain text is still the traditional paper, but with the support of national and school policies, the development of information technology, AR technology will lead the development and reform of education in the future. Therefore, educators should actively invest in the integration of AR and education.

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