

Application of Virtual Simulation Technology in Medical Field Research and Practice of Scientific Research Back Feeding Teaching

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Abstract

The curriculum of medical specialty has the characteristics of foundation and operability. Simulation teaching is a necessary practical link in medical curriculum teaching. Therefore, it is necessary to establish a new practical experiment teaching mode based on virtual simulation technology. Based on the Internet plus, a virtual simulation teaching platform for medical experiments is established, which integrates medical expertise and technology information technology. The experimental teaching platform combines medical textbooks and medical test standards to carry out simulation experiments and integrate advanced scientific research mode. Using virtual simulation technology, this project organically combines the development projects related to virtual reality such as "virtual simulation of medical history collection" and "virtual simulation of pain nursing" with the courses of virtual reality specialty. Through real project case teaching, stimulate students' interest and initiative in learning. At the same time, case teaching can better help students combine theory with practice, promote the improvement of students' virtual reality development ability, and achieve the effective inheritance of medical experiment operation methods and the effective practice of scientific research back feeding teaching.

Keywords

Medical Teaching; Virtual Simulation; Back Feeding; Innovation Platform.

1. Introduction

The guiding opinions on the innovation and development of medical teaching (GBF [2020] No. 34) issued by the State Council calls for promoting the reform and innovation of medical education, repositioning medical education, taking "great country planning, great people's livelihood, university subjects and major majors" as the development goal, realizing a healthy China and a powerful educational country, strengthening the scientific and technological innovation of medical education and teaching, and accelerating the reform of intelligent medical education. The application of virtual simulation technology in the process of medical teaching has been promoted and the "Internet + intelligent education" has been innovated. At present, the phenomenon of emphasizing theory and neglecting clinical practice in medical teaching still exists. Virtual simulation technology has the characteristics of immersion and interactivity. The medical experiment in virtual environment is very realistic with the real environment, which is like immersive. It can stimulate students' creative ability, strengthen students' medical cognition and improve the effect of medical teaching. Our college opened the virtual reality application technology specialty in 2020, and completed the enrollment of 90 students in 2 classes in September 2020. Virtual reality technology is based on three-dimensional technology. Our college has courses in the direction of virtual reality in the majors of machinery, electrical appliances, construction engineering, fashion design and so on. Relying on the advantages of virtual reality technology, break through the barriers between majors, integrate the

advantageous resources in the VR industry, focus on the in-depth application of virtual reality in education and teaching, build and plan high-quality virtual simulation training software, create key core products, form industry aggregation advantages, and serve the training of Construction Engineering, machinery and other professionals in our university. At the same time, actively seek to cooperate with industry enterprises to develop virtual simulation teaching resources, integrate enterprise actual simulation projects into professional teaching, so as to strengthen students' practical operation ability, create line theory courses, virtual simulation experiment platform and medical students' innovation platform, and integrate virtual simulation and real operation. Medical teaching has achieved ideal results.

2. Deficiencies in Traditional Medicine Teaching

With the vigorous development of information technology and the improvement of research ability of new materials, new processes and new technologies, new requirements are put forward for the operation ability of medical students. Medical professional courses have the characteristics of foundation and operability. Simulation teaching is a necessary link in the teaching of these courses. There is a mismatch between the traditional training mode of medical laboratory talents and medical ability, and there are many problems: for example, the classroom teaching form is single, the experimental equipment can not be shared by one person, the experimental space can not meet the operation of all students at the same time, the opportunities for students to operate and practice are limited, and the experimental teachers operate repeatedly; There is a negative correlation between the experimental time and the actual teaching effect; The experimental content is mostly demonstrated by PPT, and the expression of medical principle and experimental process is unclear; The traditional teaching mode is often disturbed by many environmental factors, which makes the experimental teaching impossible; In the process of experiment, it is difficult for teachers to master the experimental situation of each student; Experimental teaching is divorced from theoretical teaching. It is difficult for students to realize the relationship between experiment and theoretical course. Learning is in a passive state, and it is difficult to stimulate students' innovative spirit and innovative needs.

3. Advantages of Virtual Simulation Medical Teaching Platform

In view of the problems existing in the experimental teaching resources and experimental process of our college, it is necessary to explore a new experimental teaching mode. Virtual simulation technology has greatly changed the traditional medical teaching methods. Virtual simulation medical teaching platform has played a very important role in the field of medical teaching experiment by using advanced simulation technology. Through the combination of virtual and real, the virtual simulation teaching platform vividly simulates and reproduces the real medical operation environment, so that students can immerse themselves in the medical environment, just like on-site operation and control. Therefore, medical virtual simulation platform and medical experiment teaching are combined with each other, and virtual reality, network video and communication technology are applied to medical teaching. The advantages of medical virtual experiment operation and medical actual operation complement each other, making the virtual simulation intuitive and vivid. The principle and operation process of medical experiment have been fully demonstrated, and the experience ability of students has been improved.

The teaching of virtual simulation experiment platform improves the teaching efficiency, reduces the hard work of teachers, reduces the purchase of medical experimental equipment and reduces the experimental cost. It has strong operability and has the advantages of time and space. It has great advantages for the experiments that are difficult to explain and time-

consuming in the analysis of real operation, such as heart surgery and delivery operation. The research group has conducted practical research on experimental teaching based on medical virtual simulation technology. At present, the teaching application based on medical virtual simulation technology in our college is very frequent. It has innovatively studied the medical virtual simulation teaching platform, applied the virtual simulation technology to the operation of medical experiments, developed innovative virtual simulation experiment courses, and constructed a medical teaching platform, Realize the new teaching mode of medical professional courses integrating online learning and offline operation, virtual simulation and reality teaching, virtual operation projects and actual experimental training, and achieve the objectives of efficient teaching management and resource sharing. The experimental operation is very flexible and convenient. Relying on the medical experimental virtual simulation teaching platform, innovate the teaching mode and change the previous single teaching mode, Alleviate the financial pressure of experimental equipment, optimize the quantitative function of virtual simulation experiment teaching, carry out innovative research on previous medical experiment teaching, realize online and offline intelligent learning, cultivate students' practical ability, popularize teachers' digital ability, build a medical virtual simulation teaching curriculum system, and innovate the idea of cultivating medical talents.

4. Analysis of Medical Virtual Simulation Platform

4.1. System Technical Analysis

Virtual reality application technology is a new specialty added by the Ministry of education in 2019. As of February 2020, 157 colleges and universities across the country have opened the specialty of "virtual reality application technology". The professional development time is short, the professional and technical threshold is high, and the technical scope involved is wide. Therefore, there is a lack of teaching resources such as professional related teaching materials and courses, and there are no authoritative teaching materials or courses on the market. In this context, this project proposes the research on the application of virtual simulation technology in medical cases to feed back teaching. The professional team of virtual reality application technology has strong experience in virtual simulation development, and has successively provided virtual simulation technical support for China Unicom and China Ruili group; Among them, the "virtual simulation experiment teaching system for clinical skill history collection" and "virtual simulation experiment system for pain nursing" developed for Zhejiang Yilian Network Technology Co., Ltd. and Huzhou Normal University include most of the course contents of virtual reality application technology specialty, which is highly representative.

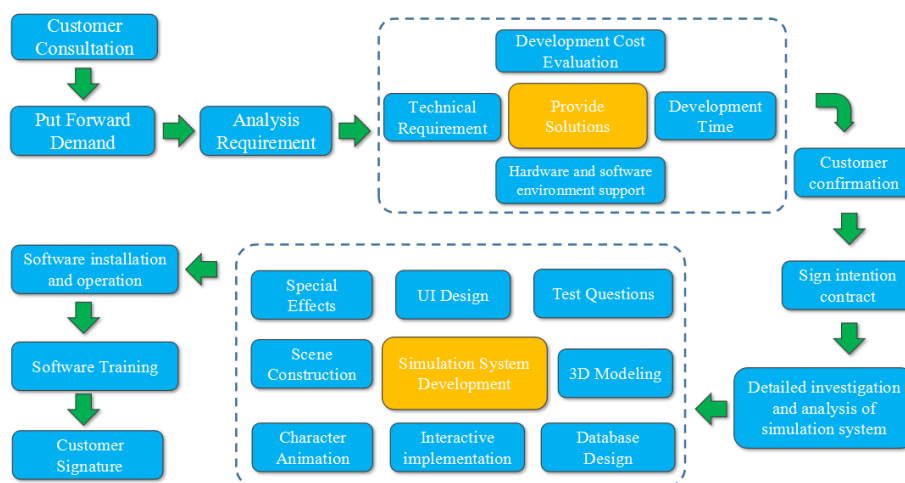


Figure 1. Basic flow of virtual simulation system development

The system includes medical virtual simulation experiment, experimental training video, medical experiment learning test, extensible test assessment, teaching management, system operation, teaching evaluation and other projects (its design principle is shown in Figure 1).

4.2. Clinical Skill History Collection Virtual Simulation Experiment Teaching System and Pain Nursing Virtual Simulation Experiment System

The clinical skill history collection virtual simulation experiment teaching system and pain nursing virtual simulation experiment system involve the core key technologies of virtual reality development such as 3D modeling, 3D animation, 3D scene construction, scene baking, database, virtual scene interaction and scene optimization (as shown in Figure 2 and figure 3).



Figure 2. Pain nursing virtual simulation experiment system



Figure 3. Case nursing evaluation

4.3. Highlights of Clinical Skill History Collection Virtual Simulation Experiment Teaching System and Pain Nursing Virtual Simulation Experiment System

4.3.1. Establish a Reasonable Medical Teaching Experiment System

The course system in the virtual simulation experiment teaching system of clinical skill history collection and the virtual simulation experiment teaching system of pain nursing takes the talent training goal of our college as the purpose, takes the "integrity, comprehensiveness, experiment and innovation" of talent training as the starting point, and strictly abides by the outline of medical practitioner qualification examination, the basic skill training project of higher medical education China higher medical education standard establishes a systematic skill virtual simulation system for clinical skill history collection virtual simulation experiment teaching and pain nursing virtual simulation experiment, innovates the need teaching system, covers clinical skills and medical knowledge, and meets the training, teaching, scientific research and examination of medical personnel at different levels and stages (as shown in figure 4).

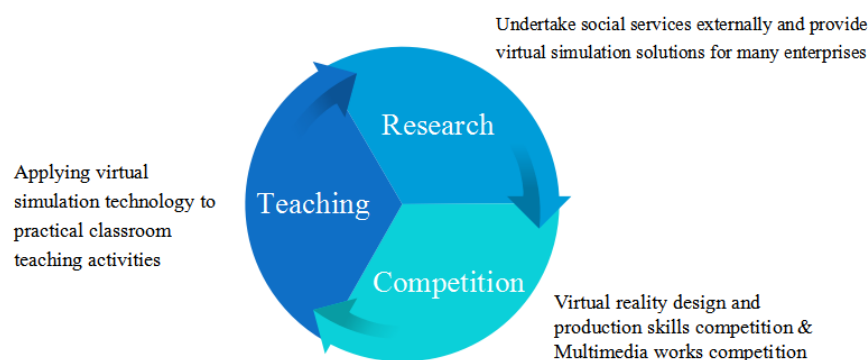


Figure 4. Function analysis of virtual simulation system - "match class post" accommodation

4.3.2. The Teaching Items of Virtual Simulation Experiment Such as Clinical Skill History Collection, Virtual Simulation Experiment Teaching and Pain Nursing are Vivid and Vivid

The application of experimental teaching project technologies such as clinical skill history collection virtual simulation experiment teaching and pain nursing virtual simulation in clinical teaching can vividly show the clinical scene, better apply to teaching projects, provide detailed services for students' learning, make the clinical experiment more arouse students' learning enthusiasm and enhance students' learning and memory. Take cardiac anatomy as an example to improve virtual simulation The position, shape, structure, adjacent relationship and basic functions of the real heart are conducive to students' physical heart anatomy, field anatomical operation, understanding of the heart structure, improving the automatic digital camera system, real-time processing and storage of important images in the students' anatomical process, students synchronously observe important details in the anatomical process, and use the virtual simulation experiment of 3D digital human heart to display the heart Almost all structures and functions (as shown in Figure 5) It is also more conducive to teachers' real-time monitoring and guidance. Therefore, the virtual simulation design of teaching projects requires vivid images, so that students have the feeling of immersive operation of heart surgery, and truly make students feel that their medical level is directly related to the patient's life, so as to learn clinical skills and exercise clinical consciousness.

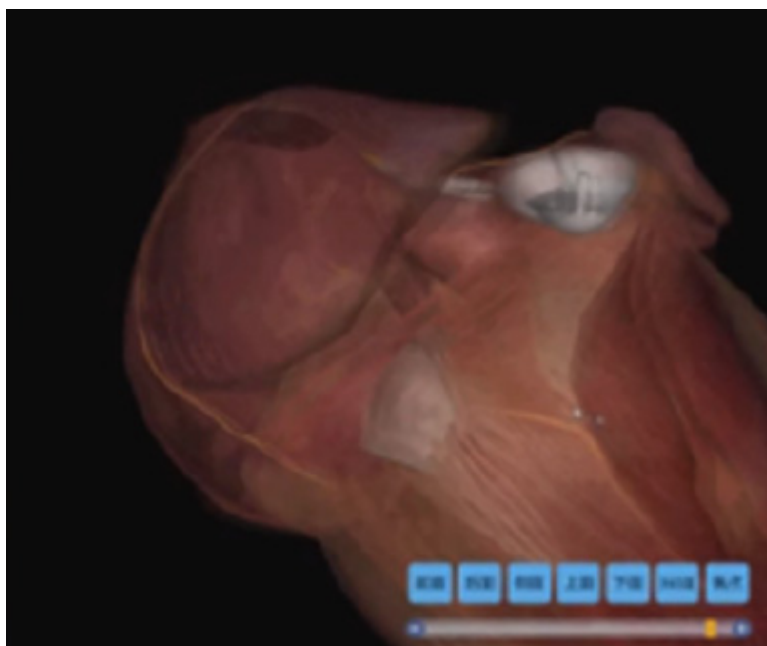


Figure 5. Screenshot of operation interface of cardiac anatomy experiment

4.3.3. Meet the Training Requirements of Medical Talents and Pay Attention to Project Back Feeding Teaching

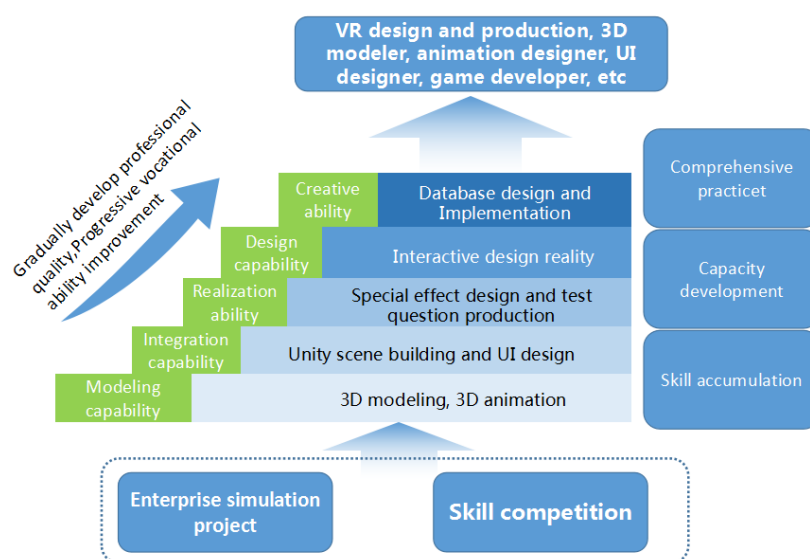


Figure 6. Integration of simulation project into course teaching and training

In order to more excellent medical talents and meet the objectives and requirements of medical talent training in the new era, the construction of virtual simulation medical experiment platform pays attention to the scientific research of virtual simulation technology to feed back the teaching of medical specialty, integrates medical needs and virtual simulation technology into medical experiments, strengthens the cross research of different disciplines, and carries out the integrated application and R & D of medicine, biology and network information science The virtual simulation experiment teaching course of medical experiment integrates it into the virtual simulation teaching platform of medical experiment, innovates the training mode of medical talents, pays attention to the integration of teaching, scientific research and learning, integrates research results and methods into the medical experiment platform, improves the quality of medical teaching, shows the latest scientific research and innovation achievements to students, improves medical students' understanding of medical development trends, and

strengthens Medical students' innovation ability and humanistic quality (as shown in Figure 6). Constantly enrich the types of experiments on the teaching platform, meet the experimental learning and scientific research ability of medical students, and inherit the experimental operation skills through medical virtual simulation technology, so that teachers have more energy and time for scientific research and teaching reform.

5. Apply Medical History Collection to Virtual Simulation Experiment

Doctors improve consultation and collect medical history. In the virtual simulation experiment, the platform simulates the communication between doctors and patients, collects medical history data, and stores them in the platform for future diagnosis. This clinical skill is used in outpatient and other environments. Through the virtual simulation experiment system platform, the location and time limitations of medical history collection can be avoided and patients can be reduced. The virtual simulation experiment teaching platform provides convenience for students and reduces time and place constraints and restrictions. The virtual simulation system can store all cases. Students can communicate with virtual patients through the platform, improve situational learning, improve students' sense of clinical substitution and empathy, and better collect medical history information. Materials, improve students' adaptability, create an intelligent system ecology, and create a 3D scene simulation training system for clinical thinking.

6. Feasibility Analysis of Back Feeding Teaching of Virtual Simulation Medical Experiment System Platform Project

6.1. Technical Feasibility

The knowledge points of virtual simulation technology come from real projects cooperated with enterprises. The project leader has experienced all the processes of technology development, and there are no technical difficulties. The project leader has strong teaching ability, can explain the knowledge points in simple terms, and has the development experience of high-quality courses, and can effectively integrate course resources to "offline" + "online" To integrate teaching resources.

6.2. Feasibility of Teaching

Virtual reality application technology majors include virtual reality foundation, virtual reality development script, virtual reality comprehensive project practice, augmented reality comprehensive project practice, virtual interior effect design comprehensive project practice, virtual reality fine model production and virtual scene interactive design and production. And other virtual reality related courses. The enterprise simulation project includes most of the core technologies of virtual reality development. The developers of the virtual simulation project are full-time teachers of virtual reality. After the technical points of virtual simulation technology development become teaching knowledge points, they can be used as comprehensive practical courses to meet the requirements of teaching feasibility.

7. Conclusion

The application of virtual simulation medical experiment platform in clinical medical teaching makes medical teaching more concrete. Using virtual simulation technology, it will "virtual simulation of medical history collection" and "virtual simulation of pain nursing". And other virtual reality related development projects are organically combined with virtual reality professional courses. Through the case-based teaching of real projects, students' interest in learning and learning initiative are stimulated. The core technologies and technologies involved

in medical virtual simulation projects include 3D modeling, 3D animation, 3D scene construction, scene baking, database, virtual scene interaction, scene optimization, project release and so on Virtual reality foundation, virtual reality development script, virtual reality comprehensive project practice, augmented reality comprehensive project practice, virtual interior effect design comprehensive project practice, virtual reality fine model production, virtual scene interactive design and production The medical virtual simulation platform constructs a comprehensive and innovative teaching mode of medical teaching experiment, expands the time and space of medical experimental teaching, extends the breadth and depth of medical experimental teaching, and is an important supplement to medical field teaching and theoretical learning The reform of experimental teaching is an important embodiment of scientific research back feeding teaching. Based on the teaching principle of "combination of virtual and real", we should build a new experimental teaching mode, better promote the healthy development of medical cause, and carry out real-time training "intuitively" from the senses of sight, hearing and touch, so as to ensure the quality of medical experimental teaching.

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