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Research Progress on the Improvement of Clinical Practice Ability of Trainee Nurses Based on Augmented Reality Technology Teaching Mode

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Abstract: With the iteration and upgrading of medical technology and the continuous growth of public health demands, the quality of nursing services has become a core indicator for measuring the effectiveness of the medical system. The clinical practice ability of nursing staff is directly related to the safety of patient diagnosis and treatment and the rehabilitation process. However, the current clinical nursing talent training model is facing bottlenecks such as limited practical scenarios and fragmented case cognition. This study focuses on the teaching application of augmented reality (AR) technology in hospital Settings and systematically reviews the research progress on the improvement of clinical practice ability of trainee nurses based on the AR immersive teaching model. By constructing a clinical teaching scenario that integrates virtual and real, AR technology can dynamically simulate complex case handling processes and enhance nursing students' three-dimensional cognition of condition assessment, operation norms, and emergency plans. Hospitals, as the core base for practical teaching, can effectively shorten the connection cycle between theoretical teaching and clinical practice by integrating AR technology, improve the clinical practice level of trainee nurses, and provide an innovative model for optimizing the path of clinical nursing talent cultivation.

Keywords: Augmented Reality Technology (AR); Teaching mode; Trainee nurse; Clinical practice ability; Research progress

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1. Introduction

In the context of the new era, people have increasingly higher demands for medical care and medical services, and some traditional medical technologies have become difficult to meet people's pursuit of health, especially nursing work. The quality of care is one of the important indicators for measuring the level of medical services. Excellent care can reduce the occurrence of medical errors and complications, and improve patient satisfaction and medical

efficiency. The application of AR technology plays an important role in enhancing the clinical practice ability of trainee nurses. AR technology can simulate a realistic clinical environment and extract comprehensive patient information for them, helping them identify the key points of cases and thus develop targeted care plans.

2. The purpose and importance of enhancing the clinical practice ability of trainee nurses

2.1. The purpose of enhancing the clinical practice ability of trainee nurses

The analysis of complex cases in clinical nursing teaching can help trainee nurses gain a deeper understanding of the value and importance of nursing work and acquire the ability to understand cases and manage patients. Only through in-depth understanding and analysis of the cases can trainee nurses better understand the patient's past condition, living habits, and diagnostic process in detail, thereby designing targeted nursing plans and providing doctors with more comprehensive diagnostic basis [1]. Specifically, on the one hand, by analyzing the cases, trainee nurses can effectively apply the nursing knowledge they have learned to clinical practice, thereby improving their practical operation skills and adaptability. Trainee nurses need to develop good habits of case analysis and research in order to form strong logical and information extraction abilities and lay a good foundation for future nursing work and research [2]. On the other hand, in clinical practice, trainee nurses need to understand the diagnosis of patients' past conditions, analyze the patients' physical and condition conditions, and study the cases from a nursing perspective in order to closely observe the changes in patients' conditions.

2.1.1. The importance of clinical practice ability for trainee nurses

Clinical practice is an important link for nursing students to develop practical nursing skills and experience [3]. By actively participating in clinical practice, students can enhance their clinical practice skills and lay a solid foundation for becoming excellent nursing professionals in the future. The improvement of clinical practice requires not only comprehensive professional skills and deep knowledge reserves of trainee nurses, but also the ability to grasp the development pattern of patients' conditions in advance after in-depth understanding of cases and formulate more scientific and reasonable nursing plans, to adjust nursing measures [4].

3. An overview of AR technology and its role in the training of nursing students

Augmented Reality, or AR for short, is an innovative technology that combines virtual information with the real world. It uses a variety of technologies such as computer graphics, sensor technology, tracking, and positioning to superimpose virtual content such as digital information and three-dimensional models onto real scenes in real time, providing users with a richer and more three-dimensional visual experience [5]. The introduction of AR technology in the field of nursing can provide trainee nurses with a learning environment that simulates real scenarios, effectively enhancing their clinical operation ability and practical skills.

With the continuous advancement of information technology, AR technology has gradually matured and has been widely applied in various industries. AR technology combines the virtual world with the real world through real-time rendering and interaction techniques, providing users with immersive experiences. In nursing education, AR technology can simulate real clinical settings, allowing students to practice repeated operations in a virtual environment, thereby effectively improving their operational skills. AR technology can play a significant role in the training of nursing students [6]. With AR technology, trainee nurses can experience various physiological

processes and disease conditions, perform virtual surgeries and simulation operations, and practice and consolidate surgical techniques [7]. This virtual limb simulation allows trainee nurses to gain more experience in real situations and deal with emergencies rationally.

4. Analysis of the current situation and problems of AR technology application in nursing education

Nursing education is highly practical and applicable. Clinical nurses need not only professional theoretical knowledge but also high-level nursing skills. Therefore, improving the clinical practice ability of trainee nurses plays an important role in the development of their skill level. In the traditional teaching model, the focus is usually only on imparting some theoretical knowledge, and the instruments and equipment used in nursing are rather outdated, making it difficult to improve the learning outcomes and efficiency of nursing students. These rigid teaching methods are no longer suitable for the requirements of modern society. In the context of the rapid development of new-generation information technology, although some colleges and universities promote the reform of the nursing teaching system, However, due to problems such as inadequate technical conditions or outdated equipment, intelligent teaching cannot be achieved. In nursing education, teachers can only present through a uniform textbook or multimedia, which is difficult for students to understand. In recent years, AR technology has been widely developed and applied in the healthcare industry. With features such as real-time interactivity, virtual-real integration, and three-dimensional spatial positioning, augmented reality (AR) significantly enhances the effectiveness of nursing education. It enables students to repeatedly practice and reinforce learned skills in a safe, simulated environment without posing any risk to actual patients. This accelerates the acquisition of clinical competencies and deepens understanding of nursing knowledge. As a result, AR contributes to raising the professional standards of nursing students and supports the advancement of high-quality, modern nursing education [8, 9].

Clinical practice skills play an important role in training trainee nurses. Clinical practice often involves multiple aspects, usually including operational skills (such as puncture, dressing change), clinical thinking (such as case analysis, decision-making ability), emergency handling (such as rescue process), communication skills (such as nurse-patient communication), etc. It requires trainee nurses to have the ability to comprehensively apply multidisciplinary knowledge, conduct in-depth analysis, and precise handling [10]. The traditional model of nursing education, which focuses more on the teaching of a single disease or symptom, is difficult for trainee nurses to meet their actual needs for clinical practice skills. In the traditional nursing education system, the teaching content is often centered around typical cases introduced in the textbooks, which are disconnected from the development of The Times and the level of medical technology. When students analyze these cases, they usually analyze and reason with conventional thinking and technical operations. Over time, this leads to the fear of nursing students when facing some clinical practices. This is not conducive to their subsequent development.

5. Application strategies of AR technology for enhancing the clinical practice Ability of trainee nurses

5.1. Understanding the source of clinical cases and strengthening clinical practice ability

When dealing with some complex cases, trainee nurses should have a comprehensive and multi-angle

understanding of the patient's basic information, such as the patient's age, gender, living habits, past medical history and various examination results, imaging examination results, etc., to conduct a more in-depth analysis of the patient's condition and formulate specific nursing measures. In clinical practice, trainee nurses need to communicate with doctors, colleagues, head nurses, and patients' families, which requires trainee nurses to conduct in-depth research and understanding of clinical cases to ensure the quality of care for patients [11]. However, traditional nursing education methods have been ineffective in improving trainee nurses' comprehension and management skills, resulting in a variety of problems in their practice. In light of this situation, medical schools can use AR technology to obtain real-time data of clinical cases and visual assistance to help trainee nurses gain a deeper understanding of the patient's visit process, enabling trainee nurses to make more accurate and timely evaluations and decisions when facing patients, and helping them achieve sustainable development in future positions. In addition, trainee nurses have different clinical practice abilities, and there are also differences in their comprehension and professional skills [12]. AR technology can provide more personalized and targeted training paths to meet the needs of trainee nurses at different levels, thereby enhancing their understanding and management effects.

5.2. Expand virtual operations to enhance nursing application capabilities

Trainee nurses need to perform invasive operations during their practice, which mainly include intravenous injection, intravenous infusion, and venous blood sample collection [13]. Due to the limited opportunities for practice, some nursing students find it difficult to perform invasive nursing procedures on patients during their school years. When these trainee nurses are in clinical practice, they often have problems with their skills, causing safety hazards and patient dissatisfaction. In response to this, some medical schools should apply AR technology to the training of trainee nurses, allowing them to simulate and manage real clinical procedures and scenarios in a safe environment, and provide unlimited training sessions to help trainee nurses adapt to various clinical cases, enabling them to master the steps and details of nursing more comprehensively. At the same time, VR should be used to simulate real clinical cases, including not only the patient's basic information, medical history, symptoms, and signs, but also various examination results and changes in the condition. By applying AR technology to clinical practice, trainee nurses can perform repeated operations intuitively in a relatively safe environment and obtain comprehensive problem feedback after each operation, enabling them to effectively master clinical practice skills and continuously improve their nursing skills [14].

5.3. Create a virtual environment to enhance the effectiveness of clinical practice

Trainee nurses can get better training faster, more conveniently, and at a lower cost in a virtual setting. For example, virtual patients and other virtual medical teams in the virtual environment respond in real time to students' decisions and judgments about clinical practice, and the logically driven "plot" can constantly change scenarios according to students' different decisions to simulate the most realistic situation [15]. AR technology can create virtual environments to recreate clinical scenarios in the field of vision of trainee nurses, allowing them to train in a virtual environment, which not only enhances the safety of practical operations but also maximizes their experience and professional level. In the virtual environment, trainee nurses can conduct a comprehensive exploration of clinical cases. They can simulate various examinations, such as palpation, auscultation, and even more complex nursing procedures. Trainee nurses can clearly perceive whether their operations are correct and whether there are areas that need improvement. At the same time, in the virtual environment, trainee nurses can

simultaneously view multi-dimensional information such as the patient's medical history, laboratory test results, and imaging images, and form a more systematic profile of the patient's condition, improving the readability and understandability of clinical case information and helping them to conduct in-depth analysis and reflection on the case from multiple perspectives. For example, when facing clinical cases, trainee nurses can use AR technology to display three-dimensional images of the lesion site, anatomical structure, and related physiological and pathological processes, thereby enhancing their clinical practice ability and deepening their memory and understanding of clinical knowledge.

6. The challenges of AR technology in nursing education

In the context of the new era, although AR technology is developing rapidly in the field of medical care, the cost of technology remains an important factor affecting its effective development and application in the field of clinical practice. The high construction costs are difficult for some medical institutions or poverty-stricken areas. Therefore, reducing equipment costs and increasing the availability of technology are among the important challenges at present.

In addition, in nursing education, AR technology can provide nursing students with a more vivid and visual learning experience. However, due to the differences in awareness and learning ability among nursing students, it is difficult to ensure that all students can adapt to the new learning methods. Some students may be affected in their learning outcomes due to their unfamiliarity or dislike of the technology. In addition, over-reliance on AR technology may also cause nursing students to lose opportunities for real operation and hands-on experience, affecting their in-depth understanding and practical application of knowledge.

7. Conclusion

With the advancement of medical technology and increasing public health demands, nursing service quality has become a pivotal metric in evaluating healthcare systems. The clinical competence of nursing staff plays a crucial role in patient safety and recovery outcomes. However, traditional nursing education faces challenges such as restricted practical training opportunities and fragmented case-based learning. This study highlights the transformative potential of augmented reality (AR) technology in clinical nursing education. By creating immersive, virtual-real integrated teaching scenarios, AR enhances trainees' multidimensional understanding of patient assessment, procedural standards, and emergency response. The integration of AR in hospital-based training not only bridges the gap between theory and practice but also accelerates the development of clinical skills among nursing students. Ultimately, AR-driven immersive teaching offers an innovative approach to refining clinical nursing education, fostering higher competency, and advancing the cultivation of skilled nursing professionals. Future research should further explore its long-term efficacy and scalability across diverse healthcare settings.

Disclosure statement

The authors declare no conflict of interest.

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