Novel Approaches in Clinical Simulation: Immersive Educational Technology to Enhance Nursing Education

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Abstract. The emergence of virtual reality (VR) simulation has brought about a significant shift in the healthcare industry, as it integrates modern technologies with human talents to foster patient-centered care, clinical efficiency, and a compassionate healthcare digital ecosystem. The use of clinical simulation in nursing education has become essential in the current day, revolutionizing the training of future medical professionals. This paper explored the realm of simulation-based learning, illuminating its importance, obstacles, and endless potential in the field of nursing education. Given the ever-changing healthcare landscape, nurses need to possess a broad range of skills and a thorough comprehension of real-world situations. But conventional didactic methods frequently fail to adequately prepare student-nurses for the intricacies of clinical practice. VR is one of the most crucial elements of immersive learning that increases constructive pedagogic engagements due to generative imagination it offers. By using VR headgear or goggles, student-nurses can fully submerge themselves in a customized digital world as if they were truly there, interacting with their surroundings and learn in an interactive and pedagogic informative digital ecosystem. In order to help student-nurses practice problem-solving techniques without really placing themselves in risk, VR can also be used to construct very realistic simulations. In this study, the authors offered the transformative potential of VR, with significances to improve nursing education by offering engaging and interactive learning environments. The paper presented a novel approaches in addressing nursing education through technology familiarization, proposing a cutting-edge simulation platform using actor network (ANT) model for the resource distribution.

Keywords: Virtual Reality (VR), Augmented Reality (AR), Nurse Education, Computer Simulation

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1 Introduction

In the next decades, nurses will attend multi-dimensional significant roles in advancing healthcare fairness globally by assuming new responsibilities, collaborating with other sectors and communities [1, 2, 3, 4, 5, 6], and trying novel approaches when working in innovative digital environments [7, 8, 9]. However, if the obstacles preventing nurses from using their education and training to the fullest are not adjusted, the promise to improve the healthcare of individuals and communities cannot be achieved [10, 11, 12]. To address this, it will be essential to amend statutes pertaining to the scope of practice, public health and health system guidelines, state laws governing the use of standing orders, and Medicare and other guidelines surrounding nursing education [13, 14, 15, 16, 17, 18, 19].

The setting that the future generation [20, 21, 22, 23, 24, 25, 26, 27, 28, 6, 29] of nurses will practice and lead will change significantly due to impressive changes taking place in both the healthcare system and society at large [30, 31, 32, 33, 34, 35, 36], security [37, 38, 39]. Nursing programs must prioritize training all nurses to address socioeconomic determinants of health, meet patients where they are, and navigate technology environments [40, 41, 42, 43, 44, 45] to achieve healthcare equity in its entirety [46, 47, 48, 49, 50, 51, 52, 53, 54].

This paper presents a comprehensive virtual reality (VR) and simulation training program that provides nurses with a sophisticated academic health sciences and clinical environment that fosters a deeper understanding of the human body and contemporary healthcare occupational digital settings. Dr. Amber Santos, Jacksonville University's Assistant Professor of Nursing and Director of Innovation and Immersive Learning, acknowledged that immersive clinical professionalism will be necessary for preparing a new generation of nurses who should be well-versed in VR clinical simulations. Through the use of an immersive virtual environment, the clinical VR simulation will provide an experience that closely resembles the real world in terms of how the brain and nervous system function [55, 56]. A greater understanding of the human body and the current healthcare environment will be available to nurses thanks to the significant VR and simulation training [57, 58, 59, 60] options provided by the new academic health sciences curriculum [61, 62, 63, 64].

2 Related Works

Through the use of immersive, three-dimensional VR simulation, clinical nurses can rehearse techniques and procedures in a secure yet authentic setting [63]. Since it enables students to acquire the necessary skills in a setting that does not jeopardize patient safety, simulation is an indispensable part of medical education. In order to provide context explanations, simulation is the imitation of a system or process that could be found in the actual world [64]. Simulation is employed in a variety of settings, including educational training and health video gamifications, to better understand how human or natural systems function in optimizing or tuning its performance [61]. A variety of clinical simulations that captured the reality of the state-of-art nursing practices were created through innovative simulated pedagogy for academic development, especially for nurses and clinical workforce [63]. Technology advancements and the need to find safety and diversified practice for nurses in obtaining clinical experiences are driving the ongoing nursing education and teaching methodologies [63]. The health researchers are also devising approaches in replicating those novel findings for opportunities in the emerging new world that advance clinical professionalism. These innovations are helping students prepare for the extreme digital automation of healthcare systems, connecting pertinent theories with practical reality in the twenty-first century. Even though simulation-based teaching methods have been around for a while, it's still difficult to create engaging and pedagogical linkages. For clinical students to learn, a simulation must be credible and realistic in serving its purpose within the educational context [62].

In nursing education, simulation is acknowledged as a useful teaching tool [65]. Its effectiveness and influence on learning have been proven in scenarios including decision-making, role-playing, identifying and motivating clinical students who are declining, and providing end-of-life care [66]. In order to develop and practice clinical reasoning, simulation is being used more and more in nursing education to improve practical results. The effectiveness of simulation for clinical reasoning acquisition has been obfuscated by variations in clinical reasoning definitions, despite the fact that research has mostly assessed certain clinical reasoning frameworks [64]. It is also becoming more and more helpful in educational settings as the literature on its application in nursing suggests huge potential [62]. However, cost, space, accessibility, and the ability to accommodate larger student groups are the disadvantages these emerging technologies are facing. As a key component of the curriculum in nursing education, simulation was formerly the purview of professors who appreciated the technical elements of working with computerized mannequins [66]. These days, virtual simulation, digital mannequins, role play, and standardized patients are all forms of simulation available for nursing students. Today, simulation must be included in every aspect of the nursing curriculum, as students can acquire skills, hone their clinical reasoning abilities, and gain competency in providing safe patient/family care through simulation [55]. In order to address the socioeconomic determinants of health and promote healthcare fairness, nursing organizations are expected to work together to find opportunities for education, practice, and policy. In addition to accompanying data and criteria for assessing impact, the agenda should include clear priorities across nursing practice, education, leadership, and involvement in health policy [66].

3 Methodology

With the development in federated learning, the exponential rise of AR-enabling technology increases sup-

port for Industry 5.0 service enhancement in the educational curriculum of nurses and midwifery [13]. The practical challenges of AR and VR play a major role in developing cognitive tools and analytics in many industry-wide advancements and real-time applications. Artificial intelligence (AI) and AR/VR seem to be influencing clinical precisions in a way that is a major model for the growth of society [62]. The upcoming wave of AR and VR devices will offer experiences that are personalized, easily accessed, and beautifully made in a manner that advances pedagogic constructivism [65]. Teachers that employ constructivist pedagogy encourage students to master skills and subjects by utilizing practical instruction and self-directed learning opportunities. Simulation-based learning has been shown to be beneficial for developing self-efficacy, gaining confidence and competence for workplace learning, and practicing skills in a safe environment before beginning work-related learning. Simulated learning, however, varies in experience and inventiveness in its ability to produce graduates who are prepared for the workforce. Constructivist pedagogy is an instructional paradigm that emphasizes rich investigation as a means of helping students learn and comprehend course content [55]. Students learn via doing when using constructivist education, which encourages experiential learning via computer-based simulation. When a non-constructivist technique is used, students could read a chapter from a textbook and respond to discussion questions. A constructivist instructor can assign students to finish a simulation that illustrates the processes involving clinical practice. Constructivist school of thought ultimately upholds the notion that information is constructed and that it is altered through personal experiences rather than passively absorbed [64].

4 Discussions

In general, education is a type of intellectual exchange in which habits, knowledge, and abilities of a community are imparted through study, teaching, training, and autodidactism that implied self-learning [64]. Technically speaking, education is the formal process through which society consciously passes along its acquired information, skills, customs, and values from one generation to the next, such as through instruction in schools [62]. Since education is the oldest sector of the economy, it serves as society's primary tool for preserving and improving its social equilibrium. VR simulation refers to a category of computer-based platforms that allow users to experience micro worlds that are somewhat based on reality and are created by hardware and software [64]. A category of computer-controlled multimodal communication technologies known as VR enables more natural interactions with data and novel ways to engage human senses. VR is essentially a method of recreating or reproducing an environment and providing the user with the impression that they are there, in charge, and directly engaging with it [62]. VR is a technology that lets a person engage with a computer-simulated world, either real or imaginary, possessing the potential to be an experiential learning tool that enhances interactivity with the virtual world. Immersion is a perceptual and psychological sensation of being in the digital world that is delivered to the senses in virtual reality. In order to enhance or change the educational experience and provide rich, varied, and flexible learning opportunities for the digital generation, VR offers digital education that makes use of multimedia applications, adaptive cloud computing, and other electronic foundations [64]. Teaching techniques and curricular concepts have seen significant developments and adjustments in the new century, on the premise that AR and VR are so common in simulating the digital learning environment, 20th-century pedagogy is not the same as 21st-century pedagogy.

5 Conclusion

In retrospect, it can be concluded that the majority of the time the institutional goals of the program were met by the participating nursing schools. The program had an impact on scholars' personal reputations engaging VR simulation which in turn affected the school's position overall. Several elements are outlined that can be duplicated separately or in different configurations by educational institutions desiring to implement parts of this pedagogic curriculum component. This study collected data on critical ICT policy implementation in Nigeria nursing education with the goal of achieving nursing and midwifery educational sustainability. The study created a conceptual framework for the application of VR simulation through multi-dimensional ICT policy using the ANT network model. The goals and tactics that the writers had earlier suggested for the conceptual framework were mostly validated by the results. It was found that utilizing developmental techniques in conjunction with top-down policy reinforcement works better to influence academic ICT use than depending just on teachers and their institutions. The current virtual reality simulation technique presented in this study was inspired by this issue and the gap it generates. Numerous opportunities for collaboration and resource sharing exist thanks to the NREN, which uses the internet to link various higher education and nursing institutes across Nigeria. Access to nearly infinite

chances and resources is made possible by this compilation of priceless works from several Nigerian medical institutions, research institutes, and other higher education organizations. It is recommended that the university library, school of nursing, and administration work together with their counterparts at other higher education institutions to identify resources that may be used in tandem and link them to the network in order to make the most of the network. In addition, the necessary infrastructure for utilizing the NREN's capabilities needs to be established. By using the suggested technology, the research issues outlined in the paper were satisfactorily addressed.

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