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"EFFECTIVENESS OF SIMULATION-BASED EDUCATIONAL TECHNOLOGY IN MEDICAL EDUCATION"

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This article is devoted to exploring the possibilities of using modern technologies in medical education. The integration of these technologies into the system of higher medical education occurred due to the need to find contemporary methods for teaching a new generation of students, who were born in the digital world, possess technical skills, and expect education to reflect their experiences while developing their abilities in a technology-driven learning environment.

The emergence and rapid spread of digital technologies in the last decade of the 20th century changed the way students think and process information, making it more difficult for them to succeed academically when traditional teaching methods are used.

The article examines technologies such as mobile applications, video games, simulators, and virtual reality, which are applied in the training of students engaged in continuous medical education.

Keywords

medical education, new generation of students, technology-based learning environment, simulation technologies, virtual reality modeling, information processing.

Medical education is undergoing a transformation influenced by multiple factors, including the constantly changing healthcare environment, the evolving role of physicians, altered societal expectations, rapidly advancing medical science, and the emergence of a wide variety of pedagogical methods used in medical training. Changes in societal expectations place patient safety at the forefront and raise ethical concerns regarding the training of medical students on live patients, as the long-standing "see one, do one, teach one" approach is no longer acceptable.

The educational objectives of using technologies in medical education include facilitating the acquisition of basic knowledge, improving decision-making processes, enhancing perceptual variability, refining skill coordination, practicing actions in non-standard and stressful situations, fostering team-based learning, and improving psychomotor skills.

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The use of technologies in medical education has been developing over many years. The trend toward adopting innovative technologies has largely evolved in response to challenges facing medical education. Numerous studies [1–6] have addressed issues in medical education. According to most researchers, one of the main challenges is the quality of medical education, which can be improved through the implementation of technological innovations [7–13].

Research Aim. The use of technologies can provide the necessary infrastructure and become a key solution to many challenges related to the organization of medical education, both at present and in the future. This article examines technologies such as mobile applications, video games, simulators, and virtual reality. These represent only a small part of the wide range of methods available to address the evolving educational challenges in a modern technological world.

The shift in focus in the curricula of higher medical education institutions, both at the undergraduate and postgraduate levels, from mere knowledge acquisition to the development and enhancement of professional competencies of physicians no longer allows instructors to overload students with excessive information. Instead, it provides an opportunity to teach students how to navigate rapidly changing information flows [14–16].

Recently, a popular educational approach aimed at increasing student motivation through video game elements is gamification [19]. In medical education, digital games are also used to train future specialists. So-called “serious games” provide a learning environment that simulates real-life scenarios and are often employed in surgical training. The use of serious games for surgical education enhances hand-eye coordination and reflexive responses.

At the Florida State University College of Medicine, students play *ElderQuest*, a role-playing game in which players attempt to find the Grey Sage, a powerful wizard in poor health, and restore his health first. Researchers have found that this game provides medical students with knowledge of gerontology, as well as experience in caring for elderly patients, influencing not only their learning but also their understanding of the unique needs of older populations.

Many important educational objectives can also be achieved through new medical technology—simulation. Recent studies on high-fidelity medical simulation technologies indicate that they facilitate learning in environments closely approximating reality, creating a “full immersion” effect in clinical situations [20].

The identified features of simulation-based learning include providing feedback during medical procedures, integrating theoretical and practical activities,

allowing students to practice acquired skills at different levels of complexity, developing multiple learning strategies that take clinical variations into account, and facilitating both group and individual learning while simultaneously assessing students using performance indicators. Although research in this area requires further improvement and refinement, high-quality medical simulations are effective educational tools, and simulation-based education complements traditional medical education in patient-interaction settings.

The use of simulations in lessons, ranging from simple demonstrations of isolated body parts to complex full-body mannequins with dynamic physiological parameters, helps medical students gain experience in delivering medical care in a safe environment. For example, Figure 1 illustrates a mannequin used to teach the anatomical placement of electrodes for ECG procedures. Students learn the electrode positions on an adult simulator using anatomical landmarks such as intercostal spaces, midclavicular line, anterior axillary fold, midaxillary line, and scapula.

Another rapidly developing area in medical educational technologies is virtual reality (VR) modeling, where environments and objects are recreated as complex computer-generated images. In VR simulations, the computer display replicates the physical world, and user interaction occurs within this simulated environment. There are numerous virtual reality simulation programs currently used in medical education.

The use of simulation models in nursing practice has become widely adopted in the teaching of medical disciplines, providing students with realistic, hands-on experience in a controlled and safe learning environment.

The use of modern technologies in medical education should support learning, rather than replace traditional approaches where the educator plays the central role. Instructors must still focus on the principles of teaching rather than on specific technologies.

Technologies are merely one tool among many in the educational toolkit. The task of educators working in medical education is to effectively utilize these new technologies to transform learning into a more collaborative, personalized, and empowering process.

Conclusions. Thus, since new technologies are capable of addressing many challenges in medical education, their use in the training of students engaged in continuous medical education is becoming increasingly essential. The application of these technologies facilitates the learning process, makes it more engaging, enhances information processing and decision-making skills, and provides an

educational environment that actively involves students while allowing them to practice practical skills without putting patients at risk.

The use of innovative technologies in medical education contributes to the acquisition of specialized skills that will be applied in solving professional medical tasks in future preventive, diagnostic, and therapeutic activities. It also increases the interest of future medical professionals in mastering integrative professional competencies, as well as enhances both external and internal motivation for learning in general and for studying medical disciplines in particular.

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