

superficial engagement, and accessibility concerns pose significant barriers to their widespread and equitable adoption. Furthermore, overreliance on immersive tools risks diminishing the role of educators and undermining the importance of critical thinking and deep learning.

In light of these challenges, it is essential to approach immersive technologies in education with caution. Rather than viewing them as a one-size-fits-all solution, educators and institutions must critically assess when and how these tools can be used effectively and ensure that they complement rather than replace traditional teaching methods. Only then can immersive technologies truly enhance the learning experience without compromising educational equity or quality.

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A MODERN PERSPECTIVE ON THE NECESSITY OF USING IMMERSIVE TECHNOLOGIES IN THE EDUCATION OF MEDICAL UNIVERSITY STUDENTS

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Introduction: The importance of innovation in medical education includes some aspects, such as: modern medicine requires specialists to have a high level of knowledge, skills, and competencies, which must be combined with practical experience, because of the traditional teaching

methods (lectures, seminars, mannequin training) are limited in their ability to transfer the skills necessary for real-world practice. Immersive technologies (virtual and augmented reality, simulations, etc.) give new opportunities for medical education by allowing the creation of realistic scenarios and enabling students to practice in environments closely resembling real-life practice.

But it is important to define what are these technologies. Electronic computerized tools used in teaching students of medical universities, however, are sometimes a priori perceived by teachers of clinical departments as something similar to a real patient, with its problems and explanations of examination and treatment regimens. Definition of immersive technologies and their role in education:

1. Immersive technologies are technologies that immerse the user in a virtual or mixed environment, where they can interact with objects that simulate the real world.

2. These include virtual reality (VR), augmented reality (AR), mixed reality (MR), and various simulators that can replicate medical procedures, surgeries, diagnostics, and other aspects of medical practice.

3. Unlike traditional methods, these technologies offer the possibility of repeated training, allowing students to develop skills without risking harm to patients.

It is necessary to explain the advantages, which the technologies of immersive education give to students and teachers. Firstly, it is safety and risk reduction, because immersive technologies allow students to train in a safe environment, eliminating the risk of mistakes that could affect patient health. For example, students can perform virtual surgeries without risking harm to a real person. Many practical skills (e.g., diagnostics, surgery, resuscitation) require significant experience. Immersive technologies enable students to repeat complex procedures without using real patients, which is especially important given the limitations of time and resources. Virtual simulators can adapt to the student's skill level, providing tasks with varying degrees of complexity, which promotes more effective learning. Training with immersive technologies can be organized anywhere, anytime, which is important for students who may balance studies with practical work.

Immersive Technologies can be applicable in surgery and anatomy, as the samples of virtual operating rooms and 3D anatomical models allow students to work with real anatomical structures, dissecting them in detail, which is impossible when using real bodies.

It is useful for preparing the doctors in the branch of emergency or in military or extremal conditions medicine, as model extreme or rare medical situations (complex childbirth, trauma, emergency surgeries) that are difficult to replicate in real life but for which preparation is crucial.

One of the main skills of every doctor is his/her ability to contact closely with the patient. Simulations using artificial intelligence and VR allow students to practice communication skills with patients, improving emotional intelligence. Immersive technologies can be used to create rehabilitation programs that help patients undergo treatment and recovery, as well as train students in the basics of rehabilitation.

And now it's understandable that effectively use immersive technologies, high-quality and diverse educational programs and simulators are required, which demands collaboration between technology developers and educators.

But there exist some problems, at first, financial. Implementing immersive technologies requires investments in equipment (VR headsets, simulators, etc.) and training teachers to work with new teaching tools. For the effective use of new technologies, instructors need specialized training that covers both the technical aspects of working with VR and AR and pedagogical approaches for integrating these technologies into the educational process.

But, medical universities and colleges around the world are actively integrating VR and AR into their educational processes. The use of VR and AR in education helps students from various parts of the world, especially in developing countries, improve the quality of education and bridge the gap between theory and practice.

Companies such as Osso VR develop simulators for training surgeons, allowing them to repeat surgeries, train precision and speed without real risks to the patient. Also, the universities develop their own creations in this branch, in accordance with their author courses.

There are exist some problems in using the immersive technologies. High costs of their implementation and maintenance is one of the mains. Despite their enormous potential, the introduction of immersive technologies requires significant initial investment in equipment, content creation, and teacher training. Also, they need for strict and careful standardization to ensure equal quality of education for all students.

Very serious point is psychological aspects. In some cases, students may struggle to adapt to learning in virtual reality, requiring additional efforts to adjust educational methods.

Despite all that, the Future of immersive technologies in medical education lies in the way of integration of artificial intelligence in simulators; it can significantly enhance the realism of training devices, creating more complex and adaptive scenarios.

In conclusion, the introduction of immersive technologies in the educational process of medical university students is an important step towards more effective and safe education that combines realistic practice with advanced methods. Considering all the benefits, such technologies

represent the future of medicine and medical education, ensuring a higher level of specialist training and overall improvement in the quality of healthcare.

ІМЕРСИВНІСТЬ ДЛЯ ПІДРУЧНИКІВ

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Читати підручники, і не лише українські, не завжди цікаво. Як пов'язати корисність та цікавість? Довідники – стислі та конкретні – корисні. Текстами, в яких пояснення й обґрунтування розлогі, з реченнями на кілька строк, важко тримати мізки у тонусі час, потрібний для прочитання. У сучасних студентів відбувається зміна способів сприйняття інформації: вони вже мають розвинуту цифрову культуру, а тому звично розраховують на діалогову та інтерактивну співпрацю, в тому числі і під час здобуття знань. Позначається на сприйманні та обробленні інформації ще й набута кліповість мислення, коли краще засвоюються короткі фрагменти та трансформовання лінійного способу читання у блоковий.

Одноманітність текстового, хоч і з ілюстраціями та схемами, навчального матеріалу та відсутність активної читацької залученості й зануреності ї є проблемою більшості академічних підручників. Саме залученість і зануреність, як складові дії імерсивності, призводять до сенсорного та емоційного відгуку на знання, що сприяє кращому результату навчання.

Отже, імерсивність може бути тим інструментом, що буде допомагати створювати, а не лише писати цікаві та корисні, а тому ефективні навчальні підручники. Як і якими засобами можна краще занурювати у зміст підручників? Допомагають підсилювати навчальну активність цифрові технології та викладацький досвід. Прикладами цифрових імерсивних технологій, до залучення яких у процесі освітньої діяльності ми поступово починаємо зивкати та звертатися, є: мультимедіа, інтерактивний контент та елементи доповненої AR та віртуальної VR реальності [1].

Перевагами електронної подачі навчальної інформації є її доступність і зручність, а полегшують запам'ятовування різноманітні