FRI-2.104-1-QHE-04

VIRTUAL REALITY AND INNOVATIVE TECHNOLOGIES TO IMPROVE NURSING AND MIDWIFERY EDUCATION IN BULGARIA[2]

Assoc. Prof. Galya Georgieva-Tsaneva, PhD
Institute of Robotics,
Bulgarian Academy of Sciences
Phone: +359 878 111 283
E-mail: galitsaneva@abv.bg

Prof. Ivanichka Serbezova, PhD
Department of Health Care,
"Angel Kanchev" University of Ruse
Phone: +359 88 7082800
E-mail: iserbezova@uni-ruse.bg

Abstract: *Using virtual reality applications in Nursing and Midwifery Education allows learners to acquire clinical skills in a safe and interactive environment. The application of virtual reality and modern technologies undoubtedly contributes to increasing the quality of the educational process for students majoring in Nursing and Midwifery education.*

The research conducted among students in Bulgaria shows the desire of the respondents to use applications with virtual reality and other modern technological means in their studies.

A necessary condition for the use of virtual reality applications in the educational process is that teachers and students practice in advance the use of serious virtual reality games to be able to effectively use them later in the educational activity

Keywords: *Quality of Education, Health Education, Nurses and Midwives, Virtual Reality, Innovative Technologies*

JEL Codes: *I23*

INTRODUCTION

The modern technological revolution has enabled new approaches to the teaching and learning process. The ultimate goal of their use is to increase the effectiveness of the educational process and the motivation to learn, contribute to engagement with the studied material, and provide additional technological opportunities for learning in a different environment. In recent years, Virtual Reality (VR) has increasingly entered STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning (Alqahtani, Daghestani, Ibrahim, 2017) as a supplement to traditional learning.

Virtual Reality, Augmented Reality (AR) and their variations (for example Mixed Reality, Semi-Immersive VR, Fully Immersive VR) are computer interface techniques that create an imaginary space in which the user acts multifacetedly, based on visual, auditory, and various perceptions received through the skin of the body.

Virtual Reality (Mihelj, Novak, Beguš, 2014) is often associated with immersive technology that is provided in the real environment through special equipment such as (head-mounted) displays, tactile equipment, and other innovations. Increasingly, augmented reality, in turn, allows computer-generated virtual images to overlay physical objects in real time.

The application of Virtual Reality in Nursing and Midwifery Healthcare education is an innovative educational teaching strategy (Antón-Sancho, Fernández-Arias, Vergara) in which an increase in effectiveness has been observed (Kasurinen, 2017; McGrath, Taekman, Dev, Danforth, Mohan, Kman, & Bond, 2017) of the learning process.

[2] Докладът е представен на пленарната сесия на 25 октомври 2024 с оригинално заглавие на български език: ВИРТУАЛНА РЕАЛНОСТ И ИНОВАТИВНИ ТЕХНОЛОГИИ ЗА ПОДОБРЯВАНЕ НА ОБУЧЕНИЕТО НА МЕДИЦИНСКИ СЕСТРИ И АКУШЕРКИ В БЪЛГАРИЯ

Virtual simulation immerses users in an interactive virtual environment that resembles the real clinical environment. In this way, it is possible to create a preliminary experience where the student nurse/midwife can make decisions in conditions as close as possible to real life.

Virtual simulations in the training of Nurses and Midwives (Bayram, Caliskan, 2019; Chen, Leng, Ge, Wang, Li, Chen, Sun, 2020) provide an opportunity to respond to the ever-increasing demands on health workers and their responsibility in the process of patient care and treatment.

Virtual reality offers educators and students (Mäkinen, Haavisto, Havola, Koivisto, 2022; Liaw, Ooi, Mildon, Ang, Lau, Chua, 2022) flexibility in learning injection technology skills and expanding opportunities for developing student competencies.

The fact that virtual simulations require lower costs and less necessary resources than simulations in a real environment is not without importance. Scientific research shows that virtual simulations are a very good environment for increasing the knowledge and skills of learners. They help develop real-time decision-making skills and build critical thinking, communication skills, and teamwork.

EXPOSITION

Virtual reality is an unreal three-dimensional environment that is created by a computer system possessing high computing power and audio/video devices. The unreal images created are projected into the human eye using:

- Stereoscopic glasses, at low prices today, in which there is a special place to put the smartphone;
- VR Helmet/VR Headset - a device that is worn on the head and allows the user to immerse himself in the virtual environment through visual, sound, and other sensory means. They are already affordable, equipped with screens, speakers, and sensors that project images; connected to a computer, smartphone, or tablet from where the signal is transmitted; the generated images are perceived by human vision through stereoscopic lenses, with a picture for each eye, to obtain volume. Today, helmets are equipped with good sound and multiple sensors.

Smartphone glasses are relatively inexpensive and have more basic features. Glasses intended for use with computers and consoles are more expensive and have special options created, thanks to which they provide users with a wide range of experiences. Virtual reality helmets with smartphones work independently of the devices they are used on and have their own display and additional sensors to enhance the effects.

Virtual reality is characterized by:

- Immersion: the user has the feeling of being in the virtual world of the computer. Devices that generate this sensation: glasses (Fig. 1) and Helmets/Headsets for Virtual Reality (Fig. 2); Virtual Reality Room (Fig. 3).
- Interaction: the user manipulates the virtual objects. Devices that deliver that feeling: digital gloves.
- Involvement: exploration of a virtual environment, the user has the feeling of being part of the virtual world, and can directly intervene in it by navigating the virtual environment passively or actively.

Fig. 1 Virtual Reality Glasses

Fig. 2 VR Helmet

Fig. 3 Virtual Reality Room

Virtual reality can make the classic pedagogical process more attractive for students of the modern digital generation. Simulation in VR allows students to gain experience in difficult and dangerous situations and thus be prepared when these situations occur in the real world. Thanks to VR, students can repeatedly practice complex and difficult manipulations.

VR can be effectively used for training in real but artificially created situations, facilitating the visualization of the specific situation and the actions of the learners in it. The use of VR enables future healthcare professionals to be trained in a safe environment for patients and with zero risk of adverse events such as injuries and others.

Negative sides that sometimes appear when using virtual reality are, for example, dizziness, nausea, and the like.

These negative manifestations arise from confusion in brain activity. If the body does not move, it transmits such signals to the brain. But the eyes see and perceive in virtual reality that it is moving, which leads to confusion and a reaction resembling, for example, seasickness.

For these reasons, a moderate use of virtual reality is recommended, giving the body time to get used to it at first. As a result, side reactions will be less.

Augmented reality (Sidiq, Lanke, and Makhdoomi, 2017) represents the integration of computer-generated information (digital layer) into the real environment in which we find ourselves. Unlike virtual reality, which generates a completely new environment replacing the real one, augmented reality (image, animation, video, sound, 3D model) is superimposed on real reality, combining with it and improving it. The main features of augmented reality are:

- Combining real reality and the virtual world;
- Interactivity;
- Three-dimensionality.

AR is implemented using specialized software for smartphones, tablets, etc. It can also be realized by using Google Glass – a portable optical display in the form of glasses that is attached to the head.

Augmented reality can be used to enhance learning content using marker-based augmented reality applications. It is necessary to place unique markers in the textbook on the figures to which information will be added; to install an augmented reality application to recognize the tags on a mobile device; to create the additional reality that will be superimposed on the textbook. Augmented reality is used in medicine to superimpose reality on a physical model or picture. It is more affordable than VR in terms of price and devices and no goggles/helmets are required.

The use of VR and AR, Serious Games (Zyda, 2005; Michael D. and S. Chen, 2006), and other modern technologies in Healthcare education should be based on certain educational concepts and lead learners to predetermined pedagogical goals. In this way, innovative educational applications will fulfill their goals: to challenge their users to continuously make decisions in conditions close to the real clinical environment, to stimulate creative thinking in students, and to support the creation of useful experiences in mastering the injection technique.

Survey of students' opinion on the use of virtual reality and other modern technologies in education

The opinion of students in Bulgaria on the use of virtual reality and other modern technologies in education was studied. The conducted research (made through an online survey, 103 respondents took part in the survey) shows that students are willing to use innovative educational tools in their studies. In Fig. 4 shows the distribution of the answers to the question "Would you like to be given the opportunity to learn through virtual reality in your training?" A strictly positive opinion "Strongly agree" was given by 93 students (89% of the participants). Nine participants (8.7%) answered "I can't judge". The remaining two think that virtual reality will most likely be useful in their studies.

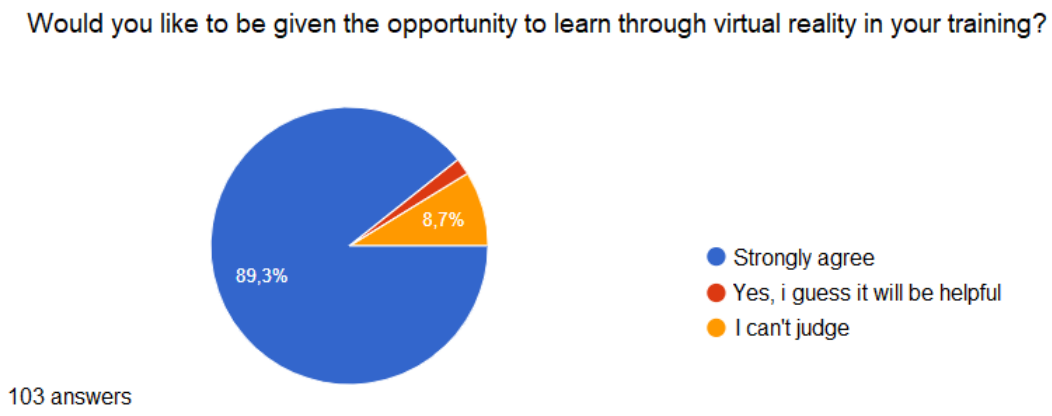

Fig. 4 Investigating student interest in virtual reality applications

The research participants are even more definite when answering the question "Would you like to be provided with educational video materials?" (Fig. 5). Video materials are short educational video films with a pedagogical focus (Hristova, Georgieva, 2021).

A strictly positive opinion "Strongly agree" was given by 101 students (98% of the participants). Two assume that the video materials will be useful in their studies. This definiteness of the answers is due to the long-term use of educational video films (Georgieva-Tsaneva, Serbezova, 2021) in the study of Health Care at the University of Ruse, created in 2015 and uploaded to YouTube. Created according to a pre-developed teaching script, and viewed tens of thousands of times, these video materials have proven their usefulness in teaching students.

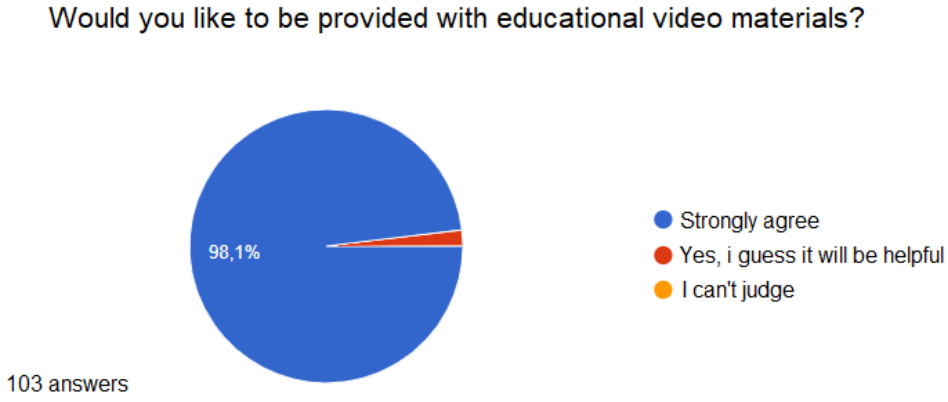

Fig. 5. Study of students' interest in educational video materials

CONCLUSION

The use of modern technological means together with classical pedagogy leads to the formation of a modern educational process that can fully meet the needs of the new era and today's students from the professional field of "Health Care", specialties Nurse and Midwive in Bulgaria.

Incorporating educational applications using virtual and augmented reality as well as other innovative means (such as proven video materials) in Healthcare education provides an opportunity to increase the quality of the educational process and build confident and capable healthcare professionals.

REFERENCES

Alqahtani, A.S., Daghestani, L.F., Ibrahim, L.F. (2017). *Environments and System Types of Virtual Reality Technology in STEM: A Survey.* International Journal of Advanced Computer Science and Applications, Vol. 8, No. 6, pp. 77-89.

Antón-Sancho, Á, Fernández-Arias, P, Vergara, D. (2022). *Virtual Reality in Health Science Education: Professors' Perceptions.* Multimodal Technologies and Interaction. 6(12):110. https://doi.org/10.3390/mti6120110.

Bayram, S.B., Caliskan, N. (2019). *Effect of a Game-Based Virtual Reality Phone Application on Tracheostomy Care Education for Nursing Students: A Randomized Controlled Trial.* Nurse Educ. Today, 79, 25–31.

Chen, F., Leng, Y., Ge, J., Wang, D., Li, C., Chen, B., Sun, Z. (2020). *Effectiveness of Virtual Reality in Nursing Education: Meta-Analysis.* J. Med. Internet Res. 22, e18290.

Georgieva-Tsaneva, G., Serbezova, I. (2021). *Using Serious Games and Video Materials in Clinical Training in Nursing and Midwifery Education.* iJET – Vol. 16, No. 16, pp. 231-241.

Hristova, Tsv., D. Georgieva. (2021). *Video Films in Nursing and Midwifery Teaching – Statistical Study of Dependence.* TEM Journal, 10 (4), 1520-1524, doi: 10.18421/TEM104-04

Kasurinen, J. (2017). *Usability Issues of Virtual Reality Learning Simulator in Healthcare and Cybersecurity.* Procedia Comput. Sci., 119, 341–349.

Liaw, S.Y.; Ooi, S.L.; Mildon, R.; Ang, E.N.K.; Lau, T.C.; Chua, W.L. (2022). *Translation of an Evidence-Based Virtual Reality Simulation-Based Interprofessional Education into Health Education Curriculums: An Implementation Science Method.* Nurse Educ. Today, 110, 105262.

Mäkinen, H.; Haavisto, E.; Havola, S.; Koivisto, J.-M. (2022). *User Experiences of Virtual Reality Technologies for Healthcare in Learning: An Integrative Review*. Behav. Inf. Technol. 41, 1–17.

McGrath, J. L., Taekman, J. M., Dev, P., Danforth, D. R., Mohan, D., Kman, N., & Bond, W. F. (2017). *Using Virtual Reality Simulation Environments to Assess Competence for Emergency Medicine Learners*. Academic Emergency Medicine.

Michael D. and S. Chen. (2006). *Serious Games: Games That Educate, Train and Inform*, Thomson, Boston, Mass, USA.

Mihelj, M., Novak D., Beguš S. (2014). *Virtual Reality Technology and Applications*. Springer, Textbook,

Sidiq M., Lanker T., Makhdoomi K. (2017). *Augmented Reality VS Virtual Reality*. International Journal of Computer Science and Mobile Computing (IJCSMC), Vol. 6, Issue. 6, June 2017, pp. 324 – 327.

Zyda, M. (2005). *From Visual Simulation to Virtual Reality to Games*. Computer, 38(9), 25-32.