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The role of virtual reality technologies in the quality training of future specialists in socionomic specialties

Роль технологій віртуальної реальності у якісній підготовці майбутніх фахівців соціономічних спеціальностей

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Abstract

The article reveals the content and proves the necessity of using virtual reality technologies in the quality training of future specialists in socionomic fields. It demonstrates the experience of using virtual reality technologies and identifies the types of virtual reality. The main environments for developing virtual reality applications are highlighted. The advantages of virtual reality formats in training future specialists in socionomic specialties are analyzed. Experimental research concluded that most teachers recognized the positive impact of using virtual reality technologies in the professional training of students, enhancing their interest in the educational process. A survey of students showed that most consider using virtual reality technologies in professional training as a more interesting and effective method, greatly

Анотація

У статті розкрито зміст та доведено необхідність застосування технологій віртуальної реальності у якісній підготовці майбутніх фахівців соціономічних спеціальностей, показано досвід використання технологій віртуальної реальності, названо типи віртуальної реальності. Виокремлено основні середовища для розробки застосунків віртуальної реальності. Виокремлено та проаналізовано переваги форматів віртуальної реальності при підготовці майбутніх фахівців соціономічних спеціальностей. У процесі експериментального дослідження було зроблено висновок, що більшість викладачів визнали позитивний вплив використання технологій віртуальної реальності при фаховій підготовці студентів та їх вплив на зацікавленість студентів в освітньому процесі.

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facilitating the understanding and study of subjects. These research results serve as a basis for conclusions regarding the practicality of using virtual reality technologies in the professional training of students, their impact on students' interest in the educational process, and their importance in improving the quality of education for future specialists in socionomic fields.

Keywords: virtual reality technologies, quality training, future specialists of socionomic specialties, higher education institutions, virtual reality formats.

Анкетування студентів показало, що більшість з них вважають використання використання технологій віртуальної реальності при фаховій підготовці цікавішим та ефективнішим процесом, який значно полегшує розуміння предметів та їх вивчення. Такі результати дослідження слугують підставою для висновків щодо доцільності використання технологій віртуальної реальності при фаховій підготовці студентів, їх вплив на зацікавленість студентів в освітньому процесі, вказують на значущість для підвищення якості навчання майбутніх фахівців соціономічних спеціальностей.

Ключові слова: технології віртуальної реальності, якісна підготовка, майбутні фахівці соціономічних спеціальностей, заклади вищої освіти, формати віртуальної реальності.

Introduction

In recent years, the requirements and format for engaging higher education students in the educational process have changed significantly. Digital technologies play a crucial role in the transformation of education. The need for virtual reality technologies is particularly evident in the quality training of future specialists in socionomic fields. These specialists are trained within an environment characterized by unlimited information resources, a new information space, multi-channel access to information, and the possibility of long-term storage and dissemination of data.

Future specialists in socionomic fields are prepared to address practical problems across various spheres of human life and society, necessitating the application of approaches for developing complex software systems and mastering new algorithms. This preparation is based on the persistent cognitive interest of higher education students in acquiring new knowledge and skills. The search for the latest digital content, modern forms, and methods of learning—particularly the active use of Internet resources and mobile applications—aims to improve the quality of education. This approach contributes to developing the information and communication skills of future specialists in socionomic fields, highlighting the importance of using virtual reality technologies in their quality training. (Tarangul & Romaniuk, 2022).

In today's conditions, virtual reality technologies are in wide demand in various spheres of human activity, in particular, in the quality training of future specialists in socionomic specialties during the educational process, scientific activity, design, business, and entertainment, etc. (Zadereiko et al., 2023).

The transformation of education under the influence of the latest information technologies, particularly VR technologies, and the determination of the necessary strategy for its development today requires the identification of relevant foundations and trends.

In the process of raising the level of quality training of future specialists in socionomic specialties, several contradictions remain unresolved:

- A public order for specialists in socio-economic professions who take an active life position aimed at supporting other people, improving the quality of their social life, and insufficient justification of the theoretical and methodological foundations of such training in institutions of higher education;
- The need for an urgent response of specialists in socionomic professions to the challenges of society, to overcome the manifestations of the spiritual and moral crisis in society, to promote the social growth of citizens and the lack of clear conceptual provisions for explaining and projecting the development of the social activity of individuals who acquire such professions from the standpoint of modern pedagogy;

- The need for consistent and systematic work on the development of the social activity of future specialists in socionomic professions and the absence of an especially substantiated pedagogical system as a basis for organizing such work;
- The need to improve educational and methodological support for social practices of future specialists and the fragmentation of the development and selection of such support.
- Between the possibilities of using virtual reality technologies in training specialists and the insufficient development of the corresponding methodology.

The development of virtual reality technologies in the quality training of future specialists is an urgent issue of theory and teaching methods in the educational process. Based on this, we considered the following questions in the article:

1. The content and necessity of virtual reality technologies in the quality training of future specialists in socionomic specialties.
2. Experience using virtual reality technologies in quality training of future specialists in socionomic specialties.
3. Types of virtual reality.
4. Basic environments for developing virtual reality applications.
5. Formats of virtual reality in the training of future specialists in socionomic specialties.
6. Experimental study.

Insufficient study and justification of the problem of quality training of future specialists of socionomic specialties in pedagogical theory and methodology, the need to resolve the mentioned contradictions determined the choice of the topic of the article.

Literature Review

We reviewed literary sources on the following topics:

- Study of the mechanisms of influence of virtual reality on the formation of a person's worldview;
- Development of virtual reality;
- Application of virtual reality technologies in the educational process of higher education institutions;
- A description of the possibilities of virtual reality technologies in the educational process;
- Analysis of the peculiarities of the use of immersive technologies in the training of future specialists;
- Showing the disadvantages and advantages of using immersive technologies;
- Analysis of conceptual requirements when using educational progressive digital technologies;
- Specifying the elements of the method of using immersive technologies in the training of future specialists;
- Description of examples of implementation of immersive technologies in the educational process;
- Show optimal formats of the synergy of innovative and traditional models of education;
- Research of resources of global information networks, and multimedia technologies;
- The role in the modern world of practical psychology of virtual reality – a new, relevant, and high-tech field of professional activity;
- The issue of using a virtual educational platform for Internet training participants and users of social networks to encourage students to study in STEM fields.

Scientists from different countries are actively searching for the application of virtual reality technologies in the quality training of future specialists, who studied the mechanisms of influence of virtual reality on the formation of a person's worldview and made scientific reviews of the development of virtual reality, implemented the application of virtual reality technologies in the educational process of higher education institutions, described the possibilities, the current state, and problems of using virtual reality tools in the educational process.

In particular, O. Sokoliuk (2016) outlined the mechanisms of influence of virtual reality on the formation of a person's worldview and made scientific reviews of the development of virtual reality, and also proved that the need for a transition to a higher level of information technologies to satisfy the natural need of a person to form a new reality, individual creativity, is the main reason for the virtualization of society. This problem was worked out by O. Merzlykin, I. Topolova, & V. Tron (2018), who studied the directions of

influence on the methodology of virtual reality education and proved the possibility of expanding the types of educational activities to improve and promote the emergence of new types and methods of learning and organizational forms of the educational process, improving the interaction of the academic space and students. Scientists H.-K. Wu, S. W.-Y. Lee, H.-Y. Chang, & J.-C. Liang (2013) are actively searching in this direction, who study the phenomenon of virtual reality, the mechanisms of influence on the formation of a person's worldview, and make scientific reviews of the current state of education, regarding the development of virtual reality, highlight the problems and possibilities of using augmented and virtual reality tools in the educational process.

I. Mintii, & V. Soloviov (2018) indicate the problems associated with the implementation of augmented and virtual reality technologies in the field of education, in particular: a shortage of specialists in the preparation of educational projects for the introduction of virtual reality technologies in the training of future specialists, uncoordinated activities of education and business, etc.

The following scientists are devoted to using virtual reality technology to train future specialists: J. Martin-Gutierrez, E. Guinters, & D. Perez-Lopez (2012). The communicative aspects of the use of virtual and augmented reality tools in education are analyzed, and a model of a hybrid cloud-oriented learning environment is developed for an educational institution.

V. Tkachuk, Yu. Yechkalo, S. Hotzkina, O. Markov, & V. Hotzkina (2023) analyzed the features of immersive technologies in the training of future specialists. The scientists made an analysis, showed the disadvantages and advantages of the use of immersive technologies, described examples of the introduction of immersive technologies into the educational process, provided elements of the methodology of using immersive technologies in the training of future specialists, proved the need to prepare teachers for the use of immersive technologies in the educational process, selected means of immersive technologies for support training of future engineers in institutions of higher specialization, such as augmented and virtual reality.

V. Bykov, & O. Burov (2020) proposed a theoretical model between the internal and external organization of e-learning parameters and features; considering the problems of digitalization of education at the stage of transition from distance to traditional forms of education, when the activity of computer modeling, the use of new technologies (virtual and augmented reality), social networks, and cloud applications is increasing; regarding the participant in the educational process – analyzed conceptual requirements when using educational progressive digital technologies. The study focuses on improving the effectiveness of learning in a digital learning environment from the point of view of optimal use of human capabilities as a knowledge acquirer.

O. Politova, D. Pustovoichenko, N. Hrechanyk, K. Yaroshchuk, & S. Nenko (2022) revealed the nearest prospects for using information and communication technologies in preparing a specialist for higher education. Education is characterized by conservatism, the authors proposed forecasting the educational environment and introducing innovative elements of ICT training into the educational process. The aspects of the method of using immersive technologies in the training of future specialists are given, examples of the introduction of immersive technologies into the educational process are described, and optimal formats of the synergy of innovative and traditional learning models are shown, which dictates the need for value awareness of the information society and the practical use of technological achievements.

V. Kovalenko (2018) and O. Nemesh (2017) investigated the problem of forming an individual's social competence, identified multimedia technologies and web-oriented technologies for the formation of social competence of a person, and emphasized the use of ICT in open education: resources of global information networks, and multimedia technologies.

To encourage students to study in STEM fields, the issue of using a virtual educational platform was considered by N. Honcharova (2021), and in combination with education, the possibilities of virtual reality applications were described, which is aimed at forming the skills necessary for a career in STEM professions. The application of augmented reality applications is described in the educational process during distance learning.

M. Smulson, P. Ditiuk, I. Kovalenko, O. Kobylianska, & D. Meshcheriakov M. Nazar, S. Rudnytska, V. Deputat, & O. Ivanova (2018) revealed the theoretical and methodological analysis of the categories subject activity in virtual space, activity, subject, considered the activity of participants of Internet training

and users of social networks, outlined the concept of the development of subject activity in the virtual space of adults, described the technologies of forming subject activity adults, the specifics of the development of the elderly and their subjective activity are shown.

As a result of the analysis of scientific sources, we see active searches in the direction of the application of virtual reality technology for the purpose of quality training of future specialists, in particular, scientists from different countries study the mechanisms of influence of virtual reality on the formation of a person's worldview and make scientific reviews of the development of virtual reality, implement the application of virtual reality technology in the educational process of institutions of higher education, describe the possibilities and current state and problems of using virtual reality tools in the educational process, make a theoretical and methodological analysis of the categories subject activity in virtual space, activity, subject, consider the activity of participants of Internet trainings and users of social networks, consider the problems of digitization of education at the stage of transition to distance forms of education, when the activity of computer modeling, the use of new technologies (virtual and augmented reality), social networks, and cloud applications is increasing. However, the role and ways of implementing virtual reality technologies in the quality training of future specialists in socionomic specialties have not been fully explored. In particular, the experience of using virtual reality technologies is not shown, the impact of virtual reality types on the educational process is not shown; the main environments for the development of virtual reality applications have not been singled out, the advantages of virtual reality formats have not been analyzed in the training of future specialists in socionomic specialties; the positive impact of the use of virtual reality technologies in the professional training of specialists in socionomic specialties has not been experimentally proven.

The purpose of the article. To find out the role of virtual reality technologies in the quality training of future specialists in socionomic specialties.

Methodology

To achieve the goal, the following research methods were used: theoretical – analysis, synthesis, systematization of the generalization of educational and methodological, scientific literature to substantiate the categorical research apparatus and determine the essence of the problem; analysis of influencing factors on educational activity – for substantiating and defining the research problem, proving its relevance; empirical methods of diagnostics, questionnaires, interviews, the technique of indirect observation adapted to the research objectives to determine the level and clarify the role of virtual reality technologies in the quality training of future specialists in socionomic specialties; a pedagogical experiment – to test the effectiveness of virtual reality technologies in the quality training of future specialists in socionomic specialties; statistical – statistical methods for the analysis and processing of experimental data.

To verify the results of the adopted teaching methodology, a study was conducted with the participation of university students. They were divided into two groups.

The first group – the control – used only traditional teaching methods, and the second – the experimental – used only virtual laboratory simulators.

Both groups had the same amount of time to complete the tasks. Higher education students passed a knowledge test before and after the experiment, to objectively assess the knowledge they received. Compared to traditional learning methods, the results showed a 76% increase in learning efficiency when using virtual laboratories.

We investigated the teacher's influence on the learning process. It was proven that when in virtual laboratories training was combined by the teacher with mentoring and coaching, there was an increase in the effectiveness of training, and with the same amount of time, the effectiveness of the influence of teachers doubled.

The survey of students and teachers was conducted using Google resources.

The number of teachers who participated in the survey was 29. The questionnaire for teachers contained 5 questions, the content of which is aimed at using virtual reality technologies in the educational process to train future specialists in socionomic specialties.

The number of students who participated in the survey was 92. The questionnaire for them contained 5 questions, the content of which is aimed at using virtual reality technologies in professional training and their impact on students' interest in the educational process.

In the process of experimental research, it was concluded that most teachers recognized the positive impact of using virtual reality technologies in the professional training of students and their effects on students' interest in the educational process. A survey of students showed that most consider using virtual reality technologies in professional training a more interesting and effective method, which greatly facilitates understanding the subject and study.

The obtained data indicate the positive impact of virtual reality technologies in professional training and their effects on students' interest in the educational process. Teachers and students highly appreciate the innovation, pointing to an increased understanding of the material and its interest. Students' results are improved by academic achievements when using innovative methods. Such research results serve as a basis for conclusions regarding the practicality of using virtual reality technologies in the professional training of students, their impact on students' interest in the educational process, and their importance for improving the quality of education of future specialists in socionomic specialties.
When determining the sample of subjects, the general specificity of the research subject was considered. The total volume of the sample is 121 subjects. The criteria of meaningfulness, representativeness, and equivalence were considered when forming the sample. The sample was composed by random selection using the technical procedure for calculating the selection step.

The experiment was conducted at the National University of Life and Environmental Sciences of Ukraine, Pavlo Tychyna Uman State Pedagogical University. The scientific councils of the universities permit the conduct of the experiment not to violate ethical considerations in institutions of higher education.

The reliability and validity of the obtained results, and the objectivity of their evaluation were ensured by the methodological validity of the initial positions and the qualitative mechanism of the assessment of the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

Research relies heavily on the accuracy and reliability of the data. In the framework of research work, the quality of data collection and analysis not only adds weight to the research but also contributes to the formation of sound conclusions, which is the key to academic success.

The following digital data collection tools were useful in the study:

- *Google Forms* – a simple survey tool that allows you to collect data from respondents, create different types of questions, and collect answers in spreadsheets.
- *SurveyMonkey* – a modern survey tool that offers a wide range of customization options and analytical tools for analyzing the collected data.
- *JSTOR, Google Scholar*, and other academic search engines provide access to scholarly articles, books, and other educational resources that may be useful for literature review and theoretical data collection.
- *Zotero* or *Mendeley* – bibliography management programs that help organize research materials, store references, and format bibliographies and citations according to different citation styles.
- *Microsoft Excel* or *Google Sheets* – spreadsheets are useful for organizing and analyzing collected data when working with quantitative data.
- *SPSS, R,* or *Python* for more advanced data analysis, statistical analysis, and processing of volumes of data.

Results and Discussion

Modern AR/VR technologies for modeling the production processes of specialists in socionomic specialties expand the boundaries of practical training of specialists in socionomic specialties. It is important to ensure a high level of simulation of the production environment, which students perceive as real, in the educational process. Professional training of future specialists in socionomic specialties based on the use of virtual

reality technologies allows for the involvement of students in future professional activities, including higher education graduates in production processes (Tkachuk et al., 2023).

The content and necessity of virtual reality technologies in the quality training of future specialists in socionomic specialties.

The use of virtual reality in education is essential in the process of modeling real situations from everyday life or training cognitive functions. When in virtual laboratories the training of future specialists in socionomic specialties was combined with mentoring from the teacher and coaching, the effectiveness of the influence of teachers for the same amount of time doubled, and the effectiveness of education increased. Scientists interpret virtual reality as:

- the technology of full immersion using a computer in a virtual, artificially created environment;
- contactless interaction technology, which creates the illusion of presence in the virtual space of real-time and direct immersion;
- the result of the interaction of the subjective and the objective, which is not rooted or not completely fixed in society and which is characterized by the status of accidental existence (Danylian & Dzioban, 2020).

So, we conclude: that virtual reality is closely related to various spheres of activity, influencing the human psyche, providing user interaction with the virtual space, and providing personal, social, and educational needs (Zadereiko et al., 2023).

Virtual reality (VR) plays an important role in time in computer education because future specialists of socionomic specialties remember information better when it is presented to a student in virtual reality than when it is transmitted using a two-dimensional image created on the screen of a tablet, or smartphone, or personal computer.

Classes using virtual reality technologies in the quality training of future specialists in socionomic specialties increased interest in the topic, aroused students' curiosity, and made it possible to maintain their interest in classes at a much higher level than when classes are conducted using traditional methods.

The undoubted advantage of using virtual reality technologies in the quality training of future specialists in socionomic specialties, for example, during classes in the classroom, is the transformation of teaching methods into an interesting experience. Students of higher education in any specialty can use virtual reality. Engineering students or architects to design and build digital structures, marine biology students to learn virtually on the ocean floor, and history students to discover ancient ruins (Humennyi, 2022).

Experience using virtual reality technologies in quality training of future specialists in socionomic specialties.

The Internet of Things, mobile communication, cloud computing, and artificial intelligence provide the necessary information infrastructure for intelligent production. VR systems of the next generation are being created only thanks to these modern technologies that improve the process of labor safety of future specialists and professional adaptation of specialists in socio-economic specialties.

Those future specialists of socionomic specialties who studied using virtual reality technologies studied four times faster than during regular classroom training. This virtual reality training was carried out using VR training simulators and maintenance simulators, key VR training programs. These systems allow educators to provide feedback to learners, monitor learning, and more. The peculiarity of VR training makes it possible to repeat training actions until there is no productivity and the desired level of competence is achieved and consists of gamification.

Virtual reality technology for high-quality training of future specialists in socionomic specialties is an important part of intellectual production. Still, when implementing these technologies, there are several problems during the training of specialists:

- VR technologies require prior training of instructors;
- VR technologies are expensive;

- VR technologies have a complex process of adaptation in different regions to different production situations;
- Lack of methods for calculating the effectiveness of VR technology implementation (Tkachuk et al., 2023).

VR technology is not considered or used as a replacement but to achieve better results, as an additional component. The use of such advanced technologies as virtual reality technologies and 3D – three-dimensional animation was studied for this purpose. Such a balanced approach to developing educational materials was demonstrated through several applications in training courses. Developed technological learning methods that use traditional learning concepts were presented to improve learning.

Types of virtual reality

Let's name the types of virtual reality:

- virtual reality technologies with a common structure, include in their content a virtual space, which consists of a three-dimensional virtual world that creates interaction with other users (Minecraft game);
- technologies with the effect of full immersion include the entire virtual space, which simulates the environment with a high degree of detail;
- technologies without immersion, create a virtual space that reproduces simulations with sound, image, and controllers on a widescreen but does not fully meet the requirements for VR technologies.

Virtual reality technologies are becoming increasingly common in various spheres of human professional activity. In the educational process: "the use of interactive technologies during learning in three-dimensional space, for example, during the study of the solar system. Together with Google, Lenovo has developed more than 700 virtual tours that can be transported to any point on Earth: from the depths of the world's oceans to the most famous museums in Europe" (Holionko & Ostrovska, 2020).

Basic environments for developing virtual reality applications

With the help of virtual reality technologies, students of sociology majors can visit any place online. Nowadays, only some modern students perceive the material by reading or listening to lectures. The rest of the future specialists of socionomic specialties perceive visual information better. Virtual technologies allow you to visualize mechanisms, formulas, plans, etc. – many complex things. For example, Anatomyou VR 2.0 virtual reality technology demonstrates how our organs look and function. When training future specialists in socionomic specialties, the effect of presence provides them with such a training format that it overtakes the usual practical classes in popularity.

One such virtual reality technology is Story Spheres. This site, which combines digital tools and virtual reality, allows specialists of socionomic specialties to add images from Google Maps or photos and accompany them with their comments (Zadereiko et al., 2023).

Thus, future specialists in socionomic specialties can, acting as a presenters, make reports about certain historical events, imagining that they are conducting a report from the event scene.

The Panoform device allows you to convert 2D images into 3D models. With its help, future specialists in socionomic specialties can independently review and adapt the presented material in virtual reality mode during training. With the introduction of virtual reality, higher education students can use gadgets during classes for educational purposes. The effectiveness of virtual reality technologies can also be observed among specialists from various fields. For example, virtual reality devices were used by surgeons for two hours, and 83% of students saw the effectiveness of the work done. With the help of a gamified virtual reality program, soldiers were trained and when demonstrating their skills in practice, they were 17% ahead of their colleagues.

For e-learning applications of virtual reality – UX and content transport users to another reality, that is, the effect of presence is created. Therefore, these technologies can be effective educational tools.

Augmented reality glasses, specialized helmets/glasses (mixed reality), and the development of "Microsoft Hololens 2" facilitate interaction with objects that go beyond the virtual framework. They direct the student

to the real world and are the most common means of virtual reality immersion. The helmet comprises a system of lenses and motion-tracking sensors, a body, and a display. Controllers and base stations allow interaction in virtual space with other objects. Therefore, the student can feel himself inside the virtual reality, to "look around" inside the virtual reality, and in the real world (Savchuk, 2017).

The use of virtual reality systems in higher education institutions is a new approach to the assimilation of systematic and scientific material and its presentation. With their assistance, students can work in unique experimental laboratories, observe and participate in historical events, and even conduct experiments, construct three-dimensional diagrams, go on a trip to any point on the globe, and visit space. Virtual reality objects make it possible to feel like a participant in the objects of material reality. According to the real laws of physics, students affect these objects (properties of water, gravity, reflections, collisions with objects, etc.).

Currently, a person's conditions and way of life are distinguished by the new characteristics of the information society. These differences are acutely felt by future specialists of socionomic specialties, who act as the "main consumers" of educational services. That is why they put forward demands for the quality and level of the educational process, to the content of education. Therefore, virtual technologies will increase the communication skills of students and teachers, open access to educational resources, help individualize educational programs, and ensure controllability and flexibility of the educational process. Scientifically introduced elements of virtual environment technologies, training highly qualified specialists in higher education, and virtualization of the educational learning environment will contribute to forming a fundamentally new education system (Savchuk, 2017).

Objects of virtual reality for quality training of future specialists in socionomic specialties behave closely to the behavior of similar objects of material fact. At the same time, modern smartphones capable of independently processing any 3D content are highly productive. Smartphone monitors have a fairly high resolution. The smartphone has sensors for determining the position of the device in space. Virtual reality technologies in the quality training of future specialists in socionomic specialties can make the educational process more interesting. For example, future specialists in socionomic specialties can see various events and dangerous and complex processes "with their own eyes" described in manuals and textbooks.

There are two main environments for developing virtual reality applications:

– Unreal Engine;
– Unity.

Unreal Engine is a game engine written in C++ language, supported and developed by Epic Games, and allows you to create educational games for:

– Operating platforms and systems: Linux, Microsoft Windows, Mac OS; consoles Xbox, Xbox One, Xbox 360, Xbox Series, PlayStation 5, PlayStation 4, PlayStation 3, PlayStation 2, PSP, PS Vita, Dreamcast, Wii, GameCube, etc.;
– On various portable devices: controlled by the iOS system and others, Apple (iPad, iPhone).

Kismet, an innovative editor for creating interactive and animated levels, appeared in Unreal Engine 3, a special scripting language in which there is no work with UnrealScript, but block diagrams are used. It allows you to operate with many properties of objects (transparency of materials, rotation of movers, color of lighting, etc.). The Matinee utility of the animation task is closely related to the movement of objects at a certain time.

Unity is a cross-platform environment for developing computer games for educational applications. Unity allows you to create applications that include mobile devices, game consoles, personal computers, Internet applications, and more, and run under more than 20 different operating systems. Availability, cross-platform support, a visual development environment, and a modular system of components are the main advantages of Unity. Unity offers a flexible approach to the visual editing of objects. Also, due to the specifics of its architecture, the WebGL version of the engine has several unresolved problems with performance, memory consumption, and performance on mobile devices (translation of code from C # to C ++ and further to JavaScript). Hundreds of games, applications, and simulations are written on Unity,

which can be used in the educational process of a higher school. Unity is used both in creating indie games and by large developers (for example, Blizzard) (Plakhotnik et al., 2023).

Interactive intelligent educational systems built based on virtual reality technologies activate the educational and cognitive activities of students of higher education. Educational programs created based on virtual reality technologies widely use cognitive computer graphics, the main task of which is developing creative thinking, stimulating human cognitive mechanisms, and not unambiguous interpretation of knowledge in the educational process. With this approach, the active use of virtual reality technologies in the high-quality training of future specialists in socionomic specialties is one of the system requirements that ensures the maximum effect of education at reasonable costs for developing educational process systems. So, we can see that virtual reality technology in the high-quality training of future specialists in socionomic specialties is an ideal educational environment, because it allows you to visually conduct seminars, lectures, and training, demonstrate to students of higher education all aspects of a real process or object, which improves the speed and quality of educational methods, gives a significant effect, reduces their cost (Shetelya et al., 2023).

Virtual reality technologies in the training of future specialists in socionomic specialties make it possible to make full use of the fact that a higher education student receives 80% of information from the surrounding world with the help of vision. In comparison, a university student remembers 20% of what he sees, 40% of what he hears and sees, and 70% of what does, sees and hears. The motivation of those seeking higher education and success in acquiring knowledge increases because students are fully involved in the educational process. Using new technologies in education implies that the educational process must be rebuilt accordingly.

Formats of virtual reality in the training of future specialists in socionomic specialties.

Currently, the following formats of virtual reality in education are distinguished:

- *Face-to-face training* – virtual technologies offer interesting opportunities to transfer empirical material. With this approach, the classic training format is not distorted, because the class is supplemented with an n-minute immersion. A virtual lesson can be divided into several scenes, which are turned on at the right moments. As before, the lecture remains a structural element of the lesson. This makes it possible to involve students in the educational process, to modernize classes, to fix and illustrate the material visually;
- *Distance learning* – preference is given to group classes with social interaction and the effect of presence. During distance learning, both the students and the teacher are in any part of the world. Each of them is personally present in the virtual audience and has his own avatar (can interact, listen to lectures, perform group tasks). This will make it possible through video conferences to eliminate the boundaries that exist during training, to feel presence);
- *Mixed education* – provides an opportunity to see what is happening, to be in the classroom remotely, and to interact with real teachers and students (the student can work remotely). For this purpose, the audience must be equipped with a camera for recording video in real-time with the possibility of broadcasting it in 360 o format;
- *Self-education* – student adaptation to the independent study of developed educational courses. Classes are posted in online stores (Oculus Store, Steam, Google Play Market, App Store) so that everyone has the opportunity to repeat the material or master it independently.

According to experts' estimates, the entire education system will spend about five years to put into operation and purchase 8 million augmented reality and virtual reality devices. Experts estimated that the revenue from the sale of software for higher education and extracurricular education was estimated at $300 million in 2020 and $700 million in 2025.

A vivid example of the use of virtual reality technologies in training future specialists is the Apple program. In March 2013, since the start of the project, the company has provided 8 million tablet computers to educational institutions around the world, 4.5 million of them to educational institutions in the United States. The company has donated almost 7% of all iPads produced in three years.

The Google company is promoting its Cardboard project for free for education (according to the developers' idea, the helmet is the basis of an experiment that can be assembled from improvised materials). More than 100 educational programs were ready by the beginning of 2016.

Among the best projects are the following:

- LABSTER – an interactive 3D project developed in partnership with leading universities – MIT (Massachusetts Institute of Technology), Harvard and Stanford. Students in scientific laboratories with a full set of equipment can carry out remote experiments;
- EXPEDITIONS PIONEER PROGRAM – the program allows future specialists of socionomic specialties to visit places "where students cannot reach". The virtual platform makes it possible to conduct virtual excursions to exotic and strange places on our planet and is designed as a program for students (the platform has more than 100 such excursions);
- LECTURE VR – the project offers a series of lectures with visual visualization, which are iconic, and can be attended both as part of a group and individually, for example, as a supplement to a training course;
- COLOSSEUM VR (the creators of this application offer everyone who wants to be transported to study the history of the world. This immersion in history will not leave anyone indifferent, even though the graphics in this project are still far from ideal;
- ZSPACE – the project makes it possible to use glasses that function according to the 3D example in the educational process: with the help of an interactive pen, students can examine the human body step by step, control the model of the molecular lattice, and at the same time, everyone who is wearing the glasses at that moment can see the image.

Thus, virtual reality technology in the training of future specialists in socionomic specialties is a set of tools that technically immerse the student in a virtual 3D scene, the model of which is created with the help of a computer and implemented in the educational process. This approach to education allows the student to see a realistic prototype of what exists so far only in drawings and to feel present in another world. There can be a different set of devices that affect the student: a virtual reality helmet, a three-dimensional screen, a 3D room, or any other configuration of a VR system.

In addition, depending on the customer's budget and desired functions, the virtual reality system can be equipped with various peripherals. These can be various joysticks, tactile feedback devices, virtual reality gloves, and motion-capture suits. Virtual reality technologies make it possible to interact with the virtual scene with a high degree of interactivity. Undoubtedly, VR technologies are a promising direction, the development of which will contribute to the further progress of self-education and professional development in the field of education (Trach, 2017).

Experimental study

The purpose of the article was to clarify the role of virtual reality technologies in the quality training of future specialists in socionomic specialties.

The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the purpose and tasks of the research were defined, the experimental plan was developed, methods of measurement and processing of results were selected, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, an experiment was conducted.

At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

In our research, we used the results of research by scientist O. Humennyi (2022) who proved that virtual reality technologies in combination with traditional teaching methods give very good educational results.

At the university, in practice, the important work of a virtual simulator of a scientific laboratory was proven, in which students of higher education had the opportunity to conduct experiments and simulate what happens in a real laboratory.

After that, to check the results of the adopted teaching methodology, a study was conducted with the participation of university students. They were divided into two groups. The first group – the control – used only traditional teaching methods, and the second – the experimental – only virtual laboratory simulators. Both groups had the same amount of time to complete the tasks. Students of higher education passed a knowledge test before and after the experiment, to objectively assess the knowledge they received. The results showed a 76% increase in learning efficiency when using virtual laboratories, compared to traditional learning methods.

We investigated the teacher's influence on the learning process. It was proven that when in virtual laboratories training was combined by the teacher with mentoring and coaching, there was an increase in the effectiveness of training, and with the same amount of time, the effectiveness of the influence of teachers doubled.

The survey of students and teachers was conducted using Google resources.

The number of teachers who participated in the survey was 29. The questionnaire for teachers contained 5 questions, the content of which is aimed at the use of virtual reality technologies in the educational process in the training of future specialists in socionomic specialties.

To the first question, regarding the use of virtual reality technologies in the educational process:

- 88% of the interviewed teachers noted that they use virtual reality technologies in the educational process when training future specialists in socionomic specialties;
- 12% of respondents do not use such technologies.

The second question of the questionnaire involved finding out whether virtual reality technologies have a positive effect on the level of knowledge of students in the training of future specialists in socionomic specialties. The respondents received the following answers:

- 66.7% indicated that the use of virtual reality technologies in the training of future specialists in socionomic specialties has a positive effect on students,
- 33.3% believe that the use of virtual reality technologies in the training of future specialists in socionomic specialties negatively affects the level of students' knowledge.

The third question of the questionnaire involved finding out whether the educational process involves the use of virtual laboratories in classes during the training of future specialists in socionomic specialties. It turned out that the majority of interviewed teachers do not use virtual laboratories at all in the educational process when training future specialists in socionomic specialties:

- 69.1% was their share;
- 30.9% of teachers, this is the rest who successfully use virtual laboratories.

The fourth question of the questionnaire in the course of the study involved finding out the feasibility of using smartphones during classes or other digital means. The following results were obtained:

- 88.9% of the interviewed teachers consider it appropriate and necessary to introduce smartphones or any digital means into the educational process;
- 11.1% of respondents consider the use of gadgets in classes inappropriate.

The survey of students – future specialists in socionomic specialties, as well as teachers, was conducted with the help of Google resources.

The number of students who participated in the survey was 92. The questionnaire for them contained 5 questions, the content of which is aimed at the use of virtual reality technologies in professional training and their impact on student's interest in the educational process.

To the first question – do you like the use of virtual reality technologies and virtual laboratories during classes, the following answers were received (Fig. 1):

- 71% of the surveyed respondents noted that they like the use of virtual reality technologies and virtual laboratories during classes and listed the most effective of them;
- 21% have not decided which ones and what exactly they like in the innovative approach to education;
- 8% of respondents are not satisfied with the use of virtual reality technologies and virtual laboratories during classes.

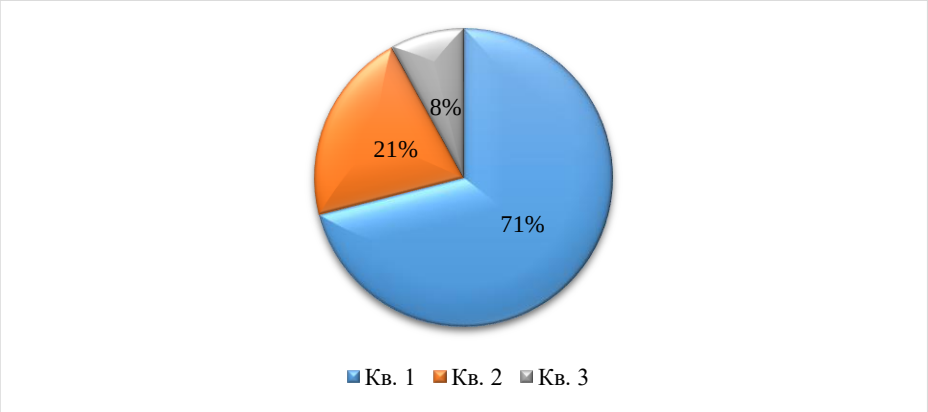

Fig. 1. Student preferences for using virtual reality technologies in class.

The purpose of the second question was to find out how accessible online resources and digital textbooks are to students (Fig. 2).

We received the following survey results:

- 23.1% of respondents believe that digital textbooks and online resources are available at a high level;
- 60.8% assess the availability of digital textbooks and online resources at an average level;
- 16.1% of respondents rate the availability of digital textbooks and online resources at a low level.

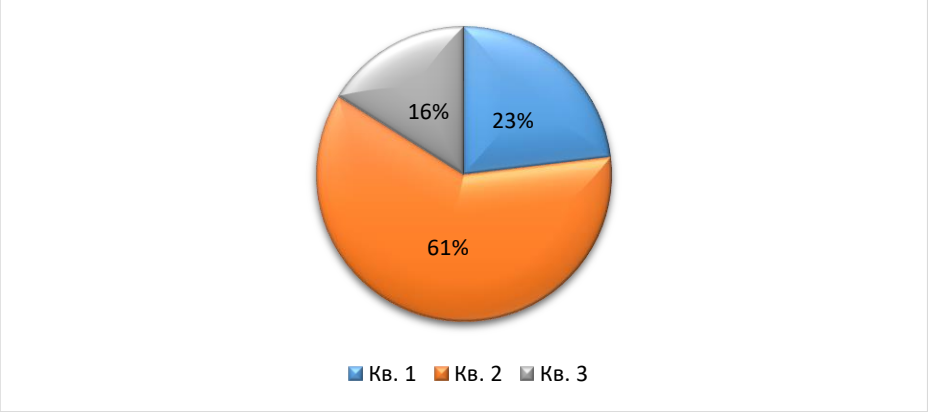

Fig. 2. Availability levels of digital learning materials as rated by students.

The third question related to the content and use of online resources and digital textbooks in ways that facilitate the study of disciplines (Fig. 3):

- 90.3% of respondents gave affirmative answers regarding the importance of content and the use of online resources and digital textbooks as tools that facilitate the study of disciplines;
- 9.7% of respondents gave negative answers regarding this question.

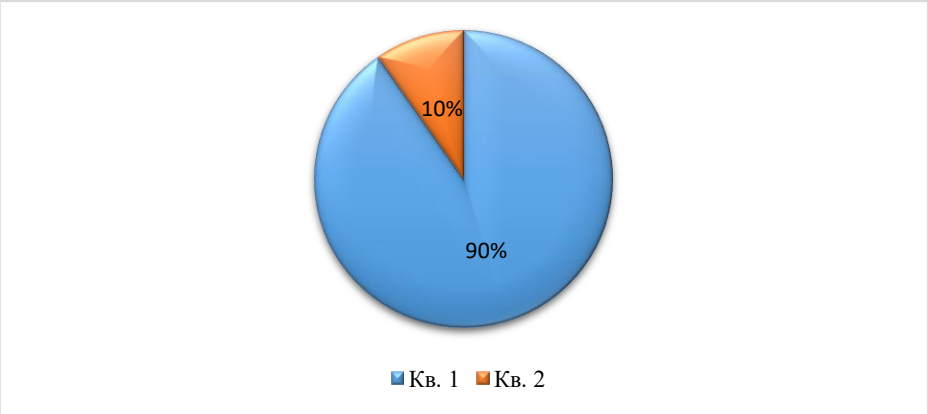

Fig. 3. Perceived effectiveness of online resources and digital textbooks.

The fourth question for the respondents concerned the impression of using smartphones during classes or other digital means (Fig. 4):.

- 32.3% of respondents believe that the possibility of using smartphones or other digital means has a positive effect on their level of knowledge;
- 29% of respondents noted that the classes became much clearer and more interesting;
- 19.4% believe that working with a textbook is better and more convenient, but digital tools should also be used;
- 19.3% of respondents did not support the use of gadgets in classes because, in their opinion, they negatively affect the level of their knowledge.

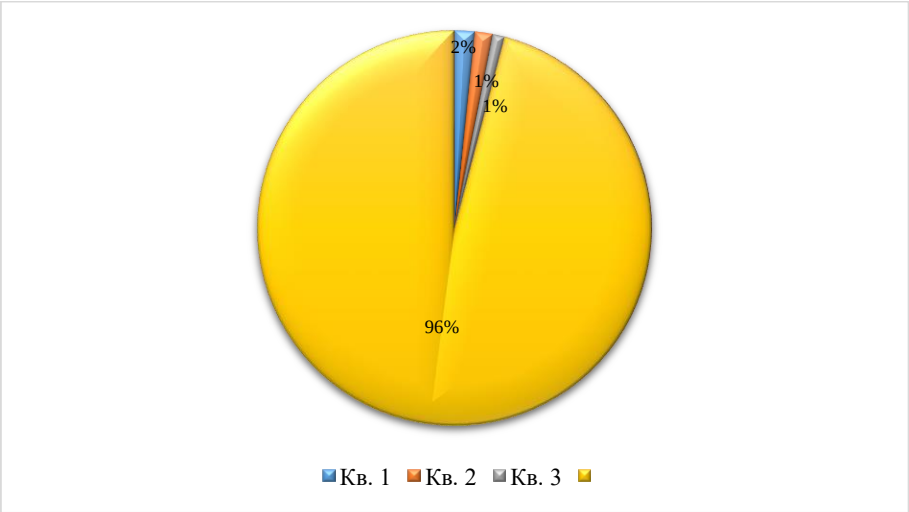

Fig. 4. The results of students' answers to the fourth question.

The purpose of the fifth question was to find out whether all respondents have the opportunity to work remotely in classes through distance learning platforms. The results proved that (Fig. 5):

- 96.8% of respondents have this opportunity;
- 3.2% of respondents do not have this opportunity.

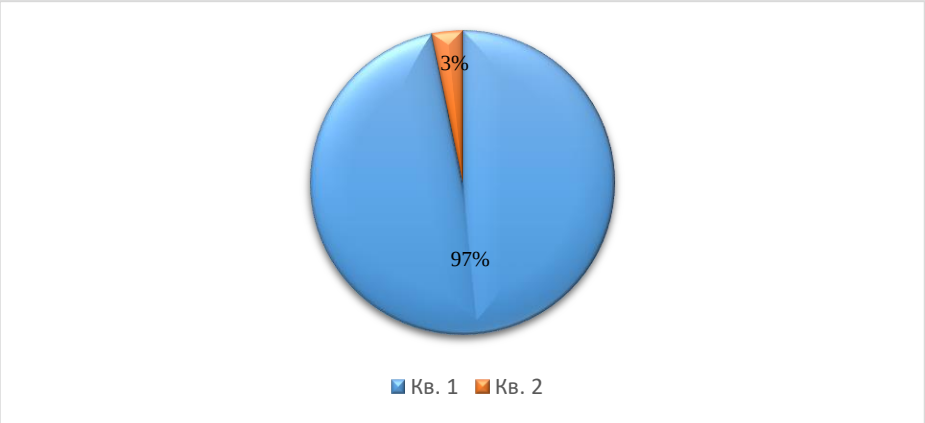

Fig. 5. Student attitudes towards integrating digital devices in education.

In the process of experimental research, it was concluded that the majority of teachers recognized the positive impact of using virtual reality technologies in the professional training of students and their impact on students' interest in the educational process.

A survey of students showed that most of them consider the use of virtual reality technologies in professional training to be a more interesting and effective process, which greatly facilitates the understanding of the subject and study.

The obtained data indicate the positive impact of using virtual reality technologies in professional training and their impact on students' interest in the educational process. Teachers and students highly appreciate the innovation, pointing to an increased understanding of the material and its interest. The improvement of students' results is evidenced by academic achievements when using innovative methods. Such research results serve as a basis for conclusions regarding the expediency of using virtual reality technologies in the professional training of students to influence students' interest in the educational process.

The practical significance of the obtained results lies in the conclusions made in the work and the proposals provided in the applied aspect, which aim at forming scientifically-based strategies and tactics, establishing new priorities, directions, and tasks for digital support in the implementation of electronic education. Additionally, the results of this research can be used in the professional training of specialists.

Theoretical provisions and practical developments can be used by specialists in the field of education, pedagogues-scientists, methodologists, and teachers in the process of teaching pedagogical, methodical, and informatics disciplines at the faculty of primary education of institutions of higher pedagogical education; to be used in the preparation of special courses, textbooks, methodological manuals and recommendations; by students when performing individual educational and research tasks, when writing coursework, master's theses, during pedagogical practice; by teaching staff of the system of postgraduate pedagogical education, in distance learning, in postgraduate pedagogical education.

An analysis of the implications of the results for educational practice and theory in the field of virtual reality in higher education is Application of virtual reality is an effective tool that requires proper use to achieve maximum results.

Despite the significant advantages of virtual reality, which were described above, certain limitations must be taken into account during its integration into educational settings. Educational virtual programs cannot completely replace traditional teaching in educational institutions, because they only simulate reality and objects in the digital space. However, their wide use is appropriate when studying the most complex topics and provides additional opportunities for in-depth learning of the material.

Conclusions

Modern AR/VR technologies for modeling the production processes of specialists in socionomic specialties expand the boundaries of practical training of specialists in socionomic specialties. We found out the role of virtual reality technologies in the quality training of future specialists in socionomic specialties. The meaning and necessity of virtual reality technologies in the quality training of future specialists in socionomic specialties are revealed, and the experience of using virtual reality technologies in the quality training of future specialists in socionomic specialties is shown. The types of virtual reality are named.

The main environments for developing virtual reality applications are highlighted. With the help of virtual reality technologies, students of sociology majors can visit any place online. The advantages of virtual reality formats in the training of future specialists in socionomic specialties are highlighted and analyzed.

To verify the results of the adopted teaching methodology, a study was conducted with the participation of university students. They were divided into two groups. The first group – the control – used only traditional teaching methods, and the second – the experimental – only virtual laboratory simulators. Both groups had the same amount of time to complete the tasks. Students of higher education passed a knowledge test before and after the experiment, to objectively assess the knowledge they received.

In the process of experimental research, it was concluded that the majority of teachers recognized the positive impact of using virtual reality technologies in the professional training of students and their impact on students' interest in the educational process. The majority of teachers noted an increase in student interest when using virtual reality technologies. A survey of students showed that most of them consider the use of virtual reality technologies in professional training to be a more interesting and effective process, which greatly facilitates the understanding of the subject and study.

The obtained data indicate the positive impact of using virtual reality technologies in professional training and their impact on students' interest in the educational process. Teachers and students highly appreciate the innovation, pointing to an increased understanding of the material and its interest. Such research results serve as a basis for conclusions regarding the expediency of using virtual reality technologies in the professional training of students, their impact on students' interest in the educational process, and indicate their importance for improving the quality of education of future specialists in socionomic specialties.

The prospects for further research of the proposed problem involve clarifying the degree of implementation of virtual technologies in the educational activities of Ukrainian educational institutions of various levels, as well as identifying the attitude of teachers to the implementation of mixed reality technologies in the educational process.

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