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AUGMENTED AND VIRTUAL REALITY TECHNOLOGY IN EDUCATION: A NEW DIMENSION OF LEARNING

Abstract

Technologies of augmented and virtual reality are investigated on the example of their use in education in education. The subject of the research is the study of known and previously developed methods of teaching with the help of AR and VR, advantages and disadvantages in terms of their use for educational purposes. The purpose of the work is to conduct an analytical literature review and analyze the known methods of using augmented and virtual reality, to present the most promising solutions in various tasks of science. The research materials used were the search method of scientific and popular scientific works in licensed Kazakhstan and foreign databases. The methods of teaching with the use of augmented reality and virtual reality technologies are presented and virtual reality. Modern ways of teaching schoolchildren and students by means of augmented and virtual reality technologies are considered. Many of today's "innovative" manuals lack visual enhancements or interactive features that make learning for students a tedious, boring, and tedious endeavor. Interactive features, making it seem tedious, boring and tedious for students to learn. If the instructor is not able to make the material interesting, it becomes very difficult for students to concentrate on learning. To concentrate on learning: they do not absorb new information well or do not want to learn at all.

Virtual reality technology allows to make educational materials interesting and understandable for students, as well as to achieve full immersion of students. Students and full immersion in learning is achieved by reproducing three-dimensional virtual space virtual space. Also, much depends on the perception of the person: some people find it easier to perceive the text in the printed text, while others find it easier to perceive the media format. For them, VR-technology will make the learning process exciting and interesting.

Keywords: augmented reality, virtual reality, educational assessment, immersive learning, assessment methods, virtual tours, simulations, critical thinking.

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БІЛІМ БЕРУДЕГІ ТОЛЫҚТЫРЫЛҒАН ЖӘНЕ ВИРТУАЛДЫ ШЫНДЫҚ ТЕХНОЛОГИЯСЫ: ОҚЫТУДЫҢ ЖАҢА ӨЛШЕМІ

Аңдатпа

Толықтырылған және виртуалды шындық технологиялары оларды білім беруде қолдану мысалында зерттеледі. Зерттеудің тақырыбы-кеңейтілген шындық пен виртуалды шындық VR арқылы белгілі және бұрын әзірленген оқыту әдістерін, оларды білім беру мақсатында пайдалану тұрғысынан артықшылықтар мен кемшіліктерді зерттеу. Жұмыстың мақсаты – әдебиеттерге анали-тикалық шолу жасау және кеңейтілген және виртуалды шындықты қолданудың белгілі әдістерін талдау, ғылымның әртүрлі мәселелерінде ең перспективалы шешімдерді ұсыну. Зерттеу материал-дары ретінде лицензияланған қазақстандық және шетелдік дереккорларда ғылыми және ғылыми-танымал жұмыстарды іздеу әдісі қолданылды. Толықтырылған және Виртуалды шындық техноло-гияларын, сондай-ақ виртуалды шындықты қолданатын оқыту әдістері ұсынылған. Оқушылар мен студенттерді кеңейтілген және Виртуалды шындық технологиялары арқылы оқытудың заманауи тәсілдері қарастырылған. Бүгінгі "инновациялық" нұсқаулықтардың көпшілігінде көрнекі жақсар-тулар немесе интерактивті мүмкіндіктер жетіспейді, бұл студенттерге оқуды жалықтырады. Интерактивті мүмкіндіктер студенттерге оқуды шаршатады. Егер мұғалім материалды қызықты ете алмаса, студенттерге оқуға көңіл бөлу өте қиын болады. Оқытуға шоғырлану үшін: олар жаңа ақпаратты жақсы меңгермейді немесе мүлдем үйренгісі келмейді.

Виртуалды шындық технологиясы оқу материалдарын оқушылар үшін қызықты және түсінікті етуге, сондай-ақ оқушылардың толық қол жеткізуге мүмкіндік береді. Студенттерді оқыту және оқу процесіне толық ену виртуалды кеңістіктің үш өлшемді виртуалды кеңістігін көбейту арқылы жүзеге асырылады. Сондай-ақ, көп нәрсе адамның қабылдауына байланысты: кейбір адамдар мәтінді баспа түрінде қабылдауды жеңілдетеді, ал басқалары медиа форматты қабылдауды жеңілдетеді. Олар үшін VR технологиялары оқу процесін қызықты әрі қызықты етеді.

Түйін сөздер: толықтырылған шындық, виртуалды шындық, білім беруді бағалау, иммерсивті оқыту, бағалау әдістері, виртуалды экскурсиялар, модельдеу, сыни ойлау.

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ТЕХНОЛОГИИ ДОПОЛНЕННОЙ И ВИРТУАЛЬНОЙ РЕАЛЬНОСТИ В ОБРАЗОВАНИИ: НОВОЕ ИЗМЕРЕНИЕ ОБУЧЕНИЯ

Аннотация

Технологии дополненной и виртуальной реальности исследуются на примере их использования в образовании в сфере образования. Предметом исследования является изучение известных и ранее разработанных методов обучения с помощью дополненной реальности и виртуальной реальности VR, преимуществ и недостатков с точки зрения их использования в образовательных целях. Цель работы – провести аналитический обзор литературы и проанализировать известные методы использования дополненной и виртуальной реальности, представить наиболее перспективные решения в различных задачах науки. В качестве материалов исследования использовался метод поиска научных и научно-популярных работ в лицензированных казахстанских и зарубежных базах данных. Представлены методы обучения с использованием технологий дополненной и виртуальной реальности, а также виртуальная реальность. Рассмотрены современные способы обучения школьников и студентов с помощью технологий дополненной и виртуальной реальности. Многим из сегодняшних "инно-вационных" руководств не хватает визуальных улучшений или интерактивных функций, которые делают обучение для студентов утомительным занятием. Интерактивные функции, из-за которых обучение кажется студентам утомительным. Если преподаватель не в состоянии сделать материал

интересным, студентам становится очень трудно сосредоточиться на обучении. Чтобы сконцентри-ровать-ся на обучении: они плохо усваивают новую информацию или вообще не хотят учиться.

Технология виртуальной реальности позволяет сделать учебные материалы интересными и понятными для учащихся, а также добиться полного погружения учащихся. Обучение студентов и полное погружение в процесс обучения достигается за счет воспроизведения трехмерного виртуального пространства virtual space. Также многое зависит от восприятия человека: некоторым людям легче воспринимать текст в печатном виде, в то время как другим легче воспринимать медиа-формат. Для них VR-технологии сделают процесс обучения увлекательным и интересным.

Ключевые слова: дополненная реальность, виртуальная реальность, оценка образования, иммерсивное обучение, методы оценки, виртуальные экскурсии, симуляции, критическое мышление.

Basic provisions. In the last decade, virtual reality technologies have begun to attract the attention not only of specialists from the gaming industry sector, but also of educators who have wondered about the potential of these technologies in teaching various subjects, both in the general education system and in the training of specialists at the secondary vocational education level and in higher education.

Virtual reality uses computer technology to create and simulate realistic immersive applications. Each user is given a sense of presence, an illusion, surrounded by a simulated three-dimensional realistic environment in a 360-degree sphere, allowing them to freely explore it, interact with visual objects, and participate in hands-on experimental tasks using a wide range of computing devices such as head-mounted displays (HMDs), trackers, and wearable sensors [1].

The abundance of computational resources and devices supporting new dimensions of virtual reality technologies, along with the realistic simulated accuracy of the representations of visual objects and elements created with computer graphics create unprecedented opportunities in teaching and learning.

Introduction. Initially, we would like to mention already available reviews in the scientific literature on the application of virtual reality in education. Melanie J. Maas and Janette M. Hughes in their paper presented one of the first reviews of the existing literature, combining research on the use of virtual (VR), augmented (AR) and mixed reality (MR) technologies in educational environments of general educational organizations [1]. The review examines peer-reviewed research studies conducted between 2006 and 2017 that included the use of virtual, augmented, or mixed reality technologies in the education of students in elementary, secondary school, and in higher education institutions. The literature identified common themes including interaction, communication, critical thinking, attitudes, engagement, learning, motivation, performance or achievement, and technology (used or proposed). This literature review made a strong contribution to the study area by clarifying definitions, reviewing existing research specific to educational environments in general education organizations, and identifying prospects for future research and directions [2]. A year later, the authors Pellas N., Mystakidis S., Kazanidis I. published a seminal article on immersive virtual reality in school and higher education, presenting a systematic review of the scientific literature over the last decade [3]. The authors have surveyed a large body of research papers on the development of VR technologies in various academic subjects. Specifically, twenty-one studies utilized virtual reality technology in general education subjects that include environmental science (Abdullah et al., 2019; Alrehaili and Osman, 2019; Wu et al., 2019), biology (Hite et al., 2019; Huang 2019; Huang et al. 2019; Wang et al. 2019), geology (Chang et al. 2018, 2019a, b), technology (Chen et al. 2019; Han 2019; Segura et al. 2019; Shi et al. 2019; Southgate et al. 2019), mathematics (Blume et al. 2019), history (Cheng and Tsai 2019; Ferguson et al. 2020; Taranilla et al. 2019), learning the English (Chien et al. 2019), and music (Innocenti et al. 2019).

In addition, other twenty-five studies by these authors used virtual reality in science-related subjects in higher education (Kartiko et al. 2010; Lamb et al. 2019; Limniou et al. 2009; Makransky et al. 2019; Markowitz et al. 2018; Meyer et al. 2019; Pirker et al. 2018; Shu et al. 2018; Šašinka et al. 2018; Yeh et al. 2013), technology (Alfalah 2018; Bailenson et al. 2009; Huang and Lee 2019; Kozhevnikov et al. 2013; Selzer et al. 2019; Starr et al. 2019; Bonfl et al. 2020; Webster 2016), nursing (Taçgın 2019), engineering (Gavish et al. 2015; Wolfartsberger 2019), cultural learning (Li et al. 2020), Dutch language learning (van Ginkel et al. 2019), legal education (McFaul and FitzGerald 2019), and library science (Lin et al. 2019).

Thus, the aim of this study is to complement and extend the existing knowledge on th application of virtual reality technologies in the study of different academic disciplines by reviewing and systematizing foreign research articles published between 2018 and 2022, indexed in various scientometric databases.

This scientific review covers 20 foreign publications on researching the application of virtual reality technologies in such fields as history, mathematics, woodworking, chemistry, anatomy, physics, design, robot

programming, professional safety training, animal husbandry, real estate, foreign language learning, teacher training, and the application of virtual reality technology. Foreign languages, science education, teacher training, and the use of virtual reality by elementary school teachers.

The current review is based in part on a protocol for systematic reviews of the literature proposed by Kitchenham B. et al. [4]. According to many authors, it is one most well documented and cited work for conducting a systematic review of scientific literature. For the initial selection of the scientific publication package, a manual search was conducted for of peer-reviewed international journal articles indexed in scientometric databases. For this review, the phrase "Virtual Reality" and "Immersive Technologies" were selected as keywords, after which the areas of focus were identified, among which only "Education" and "Computer Science" were retained.

Thus, the specific criteria consisting of two parts defining a sample of scientific publications are as follows:

– C1 is a string consisting of keywords related to virtual reality, such as "immersive technologies", "virtual reality".

– C2 is a string consisting of keywords related to education, such as "Education", "K-12", "elementary education", "secondary education", "general education".

The search logic and criteria for inclusion of articles are presented in Figure 1.
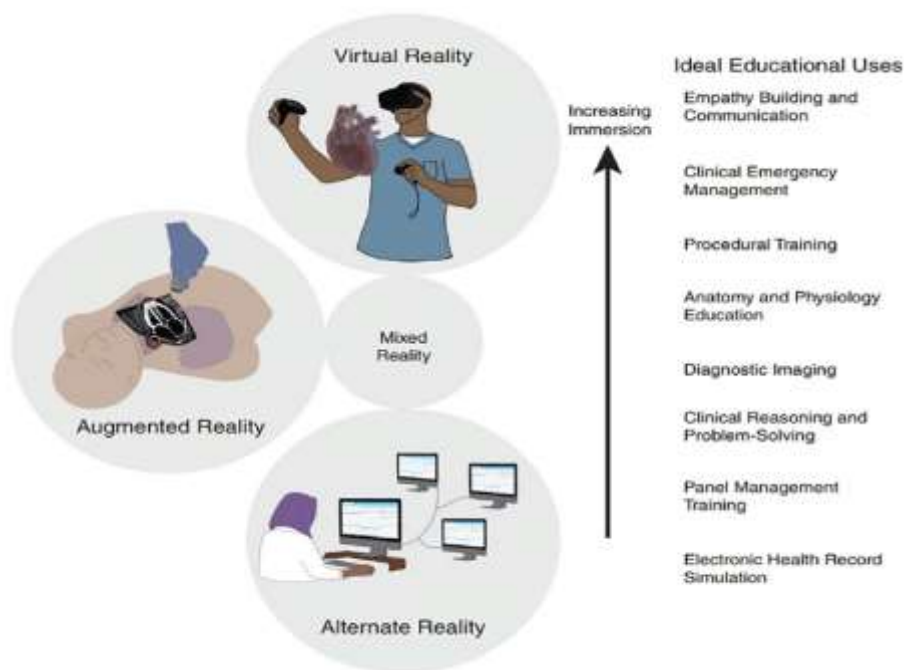

Figure 1. The virtual reality searching logic and criteria for inclusion

Materials and methods. Determining the opinions of undergraduate students studying history using virtual reality technology and, privately, on determining students' opinions about the use of virtual reality glasses in teaching was the aim of the study of the authors Yildirim, G., Elban, M. and Yildirim, S. [5]. In this study, the preference was given to the case study method. The sample was formed by selecting 25 undergraduate students. The data were collected through interviews and analyzed by content analysis method. According to the results of the study, it was concluded that. Virtual reality implementation was liked by the participants of the experiment. In addition, participants stated that using this technology in the learning process would be beneficial. It was believed that especially the sense of reality and presence in places that were recreated by virtual reality tools was one of the factors that influenced the participants and increased their interest in the history course.

Results. Another study based on the application of virtual reality technologies in the study of history was presented by the authors Calvert, J., Abadia, R [6]. The experiment involved students using virtual reality, which moved students to the center of historical events of the Second World War. Two separate studies were conducted two separate studies: one with high school students in Australia, who study the topic

traditionally; and the other, with university students in India who had no prior knowledge of the topic. Student participants used one of two different versions of Kokoda VR: virtual reality with six degrees of freedom or 360-degree video. Both university students and high school students using the technology virtual reality reported higher engagement, a sense of the effects of presence, empathy, and better mastery of knowledge than in groups with 360 degrees. These characteristics were also slightly higher in the university student group than in the high school student group, with the exception of knowledge mastery, where high school students performed better. These results suggest that immersive immersive VR has more potential than 360-degree video.

The next article covered in this review was a study of the impact of the of the VR learning game "Kesfet Kurtul" on the academic performance of fourth grade students learning fractions and their engagement in learning math [7]. The experimental study was conducted using a quasi-experimental design. The educational VR game was used in the experimental group with 32 participants. The comparison group (32 participants) utilized the traditional method used in the school, involving mainly mobile applications developed for learning fractions. As a result of the study, it was found that the educational VR game "Kesfet Kurtul" improves academic performance and increases the level of engagement of students in learning mathematics. In addition, in terms of the social component of student engagement, it was observed that "Kesfet Kurtul" was more effective than the traditional method used in school.

Another study conducted in Taiwan and Vietnam describes the experience of using virtual reality technology in woodworking [8]. With the help of technology virtual reality, this study used a simulation of furniture production lines in a large Vietnamese factory, allowing students to experience and observe the production process of furniture making using VR. In doing so, the author of this article recruited 29 freshman students majoring in furniture and Woodworking", after which they were divided into experimental and control groups. The results showed that students in the experimental group, where the training was built on the use of VR, evaluated the concept of furniture mass production better. This indicates that the application of virtual reality technology in the vocational training of serial furniture production effectively improved learning.

In addition, the author summarizes that the current COVID-19 pandemic may be a driving force for the development of virtual reality applications in vocational training in the future. Among the research publications describing the experience of learning chemistry using virtual reality technology is the work of Heta A. Gandhi et al., devoted to interactive modeling and visualization of organic molecules in real time [9]. This work describes a virtual reality application that can generate three-dimensional simulations of molecular dynamics (MD) processes from arbitrary molecular structures and visualize the trajectory of this MD simulation on a virtual reality headset in real time. This system uses the ZeroMQ (ZMQ) messaging infrastructure to multi-simulate into a multi-client VR visualization of a CBM simulation. All simulations CBM are run in the HOOMD-blue simulation engine, and graphics for virtual reality are rendered in Unity3D. The key feature that differentiates this software from previous 3D viewers is the simulation is real-time and hence the ability to manipulate thermodynamic variables such as temperature on the fly. This allows viewers to gain an intuitive understanding of the effects of thermodynamic state variables in a practical way. Another study describing the learning of organic chemistry evaluated the impact of the of virtual reality application on the academic performance of university students [10]. As results, a significant improvement in the final examination scores in students whose learning was linked to virtual reality. In addition

In addition, other authors of a similar study (Jang, S., Vitale, J. M., Jyung, R. W., & Black, J. B.) noted that medical students studying anatomy can utilize the immersive virtual reality to better understand and memorize the structure of individual organs and how they function [11]. The authors note the fact that virtual simulations are particularly effective in developing visual cognition and spatial reasoning, also making them suitable for teaching chemistry and physics. Computer-based learning systems such as virtual laboratories are becoming increasingly common in physics teaching. For physics, the use of virtual laboratories is of great importance because it allows modeling of processes that cannot be seen or reproduced. Augmented reality and virtual reality help to create physics visualizations. In the study scientists in Kazakhstan presents a virtual laboratory that allows users to solve various practical problems in physics with the help of three-

dimensional visualization of processes, performed in three different ways (desktop virtual reality, augmented reality and virtual reality using Leap Motion controller) [12]. This study details the functionality and implementation of the virtual laboratory. As an experiment, three schools were provided with the necessary hardware and software. 50 9th grade students used the developed virtual lab for six months, after which they participated in a comprehensive survey. About 88% of them found the virtual laboratory useful for studying physics, were satisfied with its functionality and usability.

The impact of virtual reality technology training on enhancing the effectiveness of creative design and creative learning processes should be noted. Drawing and sketching in a virtual reality environment is challenging for users using handheld tracker controllers for sketching. Task for users who use handheld tracker controllers for sketching. In, Türkmen, R., et al. investigated visual guides (discrete and continuous) that help users to improve stroke accuracy and enhance the drawing skills in a virtual environment [13].

The study was conducted with eye-tracking, which compares the use of continuous, discrete guides and their absence during basic drawing tasks. In the experiment, participants were asked to draw a circle and a line using three different types of guides, three different sizes, and two different orientations. The results show that discrete guides are more user-friendly for the user than continuous guides, while no difference was found in speed and accuracy compared to continuous guides. This could potentially be related to different gaze strategies, as the discrete guides caused users to move their gaze more frequently between the guide points and the cursor drawing. The results of this study may inform research in the field of 3D drawing and how gaze tracking can become a tool to aid in sketching.

Based on a panel study by Chang Y. Sh. et al. with a sample of 138 middle school seventh graders, it was found that virtual reality has a significant positive effect on creative design processes, especially in the stages of design and planning, testing and revision, and reflection and evaluation [14]. The authors noted that virtual reality has a significant positive impact on creative design outcomes with effects on creative design and functional usability respectively. Modeling as a powerful tool that helps people understand or learn how to use laboratory equipment, with the advent of virtual reality simulation tools can be upgraded to improve areas such as immersiveness and accuracy. Thus, in the work of authors Hurtado C. V. et al [15]. Presented a Unity-based open source learning system for virtual interaction with a universal robot "UR5e". This system utilizes a virtual controller "URSim" (universal robot simulator) in conjunction with an open source platform programmed for the case of no access to the robots during lockdowns or similar situations.

The enhancement of presence through immersive immersion of students is also important in professional training. In vocational training, particularly when seeking to develop their judgment and decision-making skills when faced with real-life occupational safety situations. However, in conventional training programs, it is sometimes difficult to teach students in real-world settings due to considerations of high cost and potential risk. Researchers have indicated that the lack of opportunity to experience real-world experience can seriously affect learning outcomes [16, 17], so it is important to provide learners with a realistic learning situation or environment in which they can actually conduct learning instead of passively receiving information without practice [18].

To address this problem, a study by Hwang G., Chang C., Chien S. proposes a spherical video-based virtual reality professional learning approach based on the Attention, Relevance, Confidence, and Satisfaction (ARCS) model to immerse learners in an authentic learning environment to test the processes of solving practical situations before they encounter real-world cases [19]. To evaluate the effectiveness of the approach, the hospital conducted an experiment. In which 70 nurses were randomly assigned to an experimental group trained using the spherical video approach and a control group trained traditionally.

Experimental results show that the proposed approach outperformed the traditional approach in terms of developing students' sense of presence and achievement, as well as their problem-solving and critical thinking abilities. Students' sense of presence and achievement, as well as their problem-solving and critical thinking disposition. Moreover, students in the group with spherical video-based learning also showed higher perception of technology than the the traditionally taught group. As more students enter higher education programs in animal science without prior exposure to animals, the need for real-life hands-on experience has increased dramatically. The lack of such experience in handling with livestock exists for a variety of reasons such as accessibility, liability, time, and cost. In such situations, the solution becomes the use of virtual

reality technology in the format of simulation games (edugames) that can provide opportunities to overcome the lack of experiential learning by providing similar interactions in a virtual context. The authors Free N., Menendez H., Tedeschi L. in managed to document the design and development phase of the virtual livestock management simulator CowSim, and to analyze the preliminary data of the study, where the relationship between the learners' perceptions of mishandling livestock in relation to learners' prior experience with animals. In addition, students with prior cattle handling experience did not feel more prepared to handle cattle after playing CowSim, but students with prior experience indicated that they learned more about cattle handling after playing the simulation game [20]. Participants experiment felt that playing CowSim was realistic enough to increase their level of preparedness for handling livestock, as well as adaptive for visualizing complex concepts.

The new learning model, integrated with VR technology to deliver a course on real estate, has demonstrated its ability and potential to promote and enhance students' sense of value and place, and to increase the communicative effectiveness of real estate research and trade process analysis described in the article by Hou, H.(C)., Wu, H. [21]. This paper examines the integrative effect of VR technology in a real estate course. The paper utilizes a case study method, shows the design, development and implementation of an innovative learning model with integrated virtual reality. In order to obtain feedback, a survey of participating students was conducted regarding such innovations in learning. It identifies the role and value of implementing virtual reality technology in real estate education as a pedagogical tool.

The authors note that the crucial role of information technology in revolutionizing the global economy and its real estate sector is evident. The global economy and its real estate sector is evident, although there are several studies that have already explored attempts and experiences in integrating virtual reality technology into real estate education to directly relate to industry practices. reality into real estate education for direct linkage with industry practices. In addition to virtual experiments, it is important to pay attention to the application of virtual reality technology in the context of influencing speech development. In the study of. Alfadil, M. investigated the effect of the virtual game "House of Languages" on the vocabulary acquisition of English as a foreign language by middle school students [22].

Discussion. The quasi-experimental work helped to determine the impact of virtual reality on the learning process compared to the traditional method of vocabulary acquisition. The results of this study of independent t-tests at the end of the experiment showed, that learners using the virtual game "House of Languages" made greater success in vocabulary acquisition than those who used the traditional method of vocabulary acquisition. Utilizing new virtual reality technology as an effective method of vocabulary acquisition in the learning process can be used to improve vocabulary acquisition and go beyond beyond other methods to improve school achievement. Virtual reality provides students with a unique experience of effective science learning by transporting them to a virtual world where they can directly interact with scientific phenomena. In virtual reality, it is possible to create realistic three-dimensional spaces in which students can manipulate objects, hear, see, and sometimes feel the environment, and explore places that mimic features of the real world [23].

Hite, R. persuades that virtual reality is very useful in science education, engaging students in scientific topics that may otherwise be inaccessible to them in the real world. This inaccessibility may be due to content, safety issues, lack of access to materials, the presence of physical or cognitive disabilities, due to the presence of cultural, religious or ethical issues, related to the conduct of specific scientific experiments. Her work discusses how three key types of virtual reality equipment (virtual reality viewers, virtual reality desktop systems, and HMD headsets) can be incorporated into educational standards, curriculum and recommendations for science learning [23]. The inclusion of recommendations for the implementation of virtual reality technology in educational standards and curricula raises the issue of teacher training. The rapid development of virtual reality technology increases the expectation of how it can be used in teaching and requires teachers to engage in professional development. Although recent research has been conducted, that explores how this new technology can facilitate learning in the classroom, little research shows what limitations and opportunities arise. Research shows what limitations and opportunities arise when designing and implementation of virtual reality learning applications and how teacher knowledge and teacher beliefs during this process.
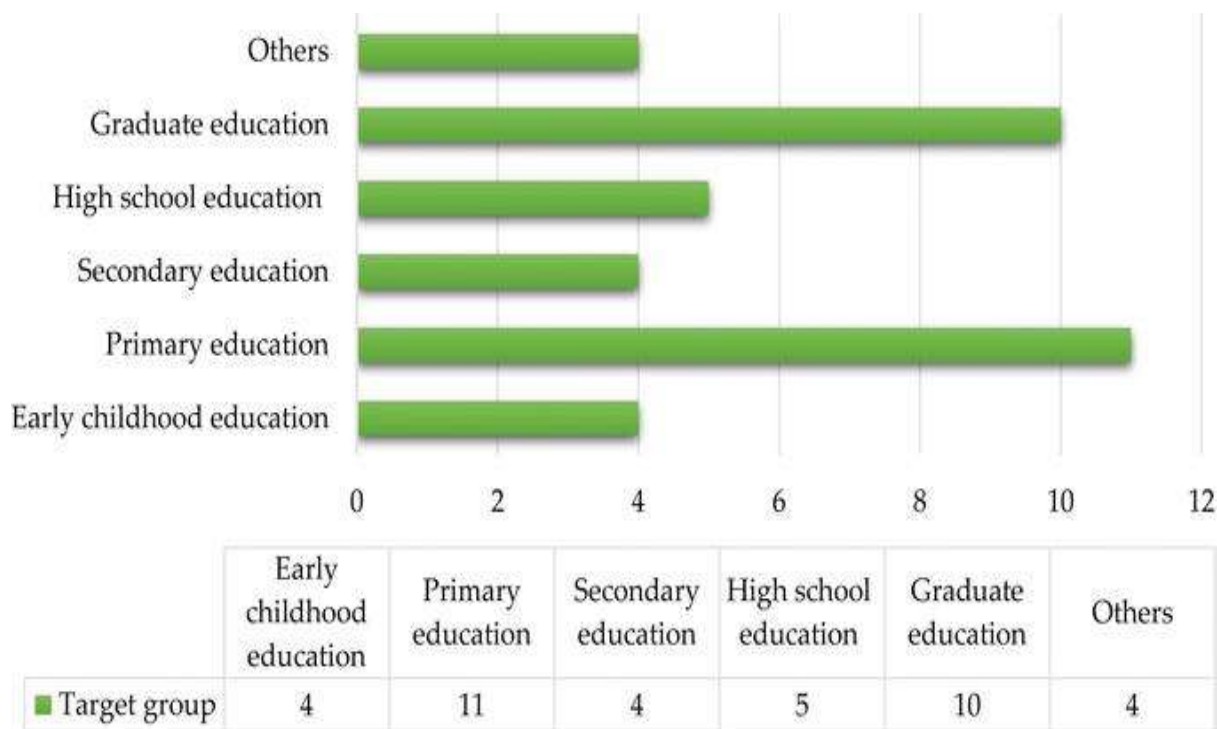
	Early childhood education	Primary education	Secondary education	High school education	Graduate education	Others
■ Target group	4	11	4	5	10	4

Figure 2. The period of rapid development of virtual reality technologies

This problem was studied by Han, I. and Patterson, T. in the context of the processes of developing an instructional virtual reality application by an advanced teacher during the during the preparation and delivery of virtual reality lessons in an elementary school. The participant in this study is a teacher working in a private elementary school in a metropolitan area of South Korea. The participant is a teacher with a unique combination of experience in pedagogy and technology [24].

During two iterations of virtual reality lesson design and delivery, the authors collected qualitative data in the form of participants' written reflections, videotapes of classroom activities conducted, field notes of observations, and follow-up interviews after each observation. In the experiment, data were coded based on an interrelated teacher professional development model (IMTPG) and a knowledge framework of technological pedagogical content (TPACK).

As a result, changes were observed in the TPACK participant's TPACK, his perceptions of students, and his predisposition to use virtual reality. Most of the changes during the development phase appeared to inspire the participants' TPACK development and culminated in the development of virtual reality learning applications reality applications based on the utilization of new knowledge. Participant involvement in the experiment led to changes in learning outcomes for both the teacher and his students, which then either changed his practice of teaching or changed and strengthened his knowledge. The findings support the nonlinear, continuous and iterative approach in teacher development.

Conclusion. The conducted analysis allows us to draw a general conclusion that learning in virtualized environments gives a guaranteed positive result in the field of education, so recently, many schools have begun to implement virtual reality educational platforms, where learning in virtual reality creates favorable conditions for human interaction with technology. Nowadays, virtual reality educational platforms are becoming an important tool in schools. They focus on interactive learning and bridge the gap between hands-on experience and learner knowledge, and virtual reality itself connects learners around the world and develops accessibility of learning. It is noted that there is currently a need to create know-how on effective educational applications of virtual reality, as well as to establish under which circumstances and conditions under which researchers, educators, and educational leaders can it is noted that there is now a need to create know-how on effective educational applications of virtual reality and to establish under what circumstances and conditions researchers, educators and educational leaders can harness the potential of VR technologies, taking into account the specificities of teaching methods and the challenges that need to be overcome in order to enhance the experience of using these technologies.

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**ИНКЛЮЗИВТІ БІЛІМ БЕРУДЕ ӘЛЕУМЕТТІК ЖӘНЕ
ПЕДАГОГИКАЛЫҚ ТҰҒЫРДЫ ҚОЛДАНУ**

Аңдатпа

Мақалада ерекше білім беру қажеттіліктері бар балаларды оқыту контекстін интеграциялау тұрғысынан инклюзивті білім беру тұжырымдамасы қарастырылады. Авторлар инклюзивті білім берудің философиясын, принциптері мен мақсаттарын талдап, оның қазіргі қоғамдағы маңызды-лығын көрсетеді. Зерттеулер мен практикалық тәжірибеге сүйене отырып, ерекше білім беру қажет-тіліктері бар студенттерге әлеуметтік өмірге белсенді қатысу мүмкіндігін қамтамасыз ететін бейім-делгіш білім беру ортасын құрудың маңыздылығы атап өтіледі. Сондай-ақ инклюзия және интеграция философиясының арасындағы айырмашылықтар талқыланады, бұл оқушылардың деректерін тиімді оқыту үшін мұғалімдердің ерекше кәсіби құзыреттілігінің қажеттілігін көрсетеді. Зерттеу мұғалімдер мен оқушылардың өзара әрекеттесуінің негізгі аспектілерін анықтайды, сонымен қатар білім беру мекемелерінде инклюзивті мәдениетті құру бойынша ұсыныстар жасайды. Мемлекеттің білім беру және әлеуметтік саясатының бір бөлігіне айналған АҚШ-та инклюзивті білім беруді енгізудің табысты тәжірибесі қарастырылуда. Авторлар Ресей, Беларусь, Украина, Қырғызстан және Өзбекстан сияқты ТМД елдеріндегі инклюзивті білім беру мысалдарын талдайды. Инклюзивті білім берудің артықшылықтары мен қиындықтарын талдай отырып, ынтымақтастық оң әлеуметтік атмосфераны құруға және оқшаулаудан аулақ болуға ықпал ететін инклюзивті білім берудің негізгі қағидасы болып табылады. Инклюзивті білім беруді одан әрі дамыту және барлық оқушылар үшін қол жетімді және әділ білім беру ортасын құру үшін қорытындылар мен ұсыныстар негізделген.

Түйін сөздер: инклюзивті білім беру, инклюзия, интеграция, мүмкіндігі шектеулі балалар, ерекше білім беруді қажет ететін балалар, білім алу құқығы.

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**ПРИМЕНИЕ СОЦИАЛЬНО-ПЕДАГОГИЧЕСКОГО ПОДХОДА
В ИНКЛЮЗИВНОМ ОБРАЗОВАНИИ**

Аннотация

В статья рассматривается концепция инклюзивного образования в разрезе интеграции контекста обучения детей с особыми образовательными потребностями. Авторы анализируют философию, принципы и цели инклюзивного образования, обозначая его важность в современном обществе. Основываясь на исследованиях и практическом опыте, подчеркивается важность создания адап-