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VR and AR Technologies in the Practice of Future Educational Psychologists: Experience of Implementation in Secondary School and Impact on the Development of Students' Digital Competence

The article examines the experience of using VR and AR technologies in the professional practice of future educational psychologists and analyzes their impact on the development of digital competence among school students. Based on the analysis of studies, the relevance of integrating immersive technologies into the education system is justified, as they serve as effective tools for developing not only technical, but also psychological and pedagogical aspects of digital competence. Methodological basis of the research includes systematic, activity-based, competence-oriented, and practice-oriented approaches. The assessment of schoolchildren's digital competence was carried out according to five key components of the DigComp model, considering the psychological dimension — information literacy, digital communication, content creation, safety, and problem- solving. The article presents the results of an experiment conducted in a secondary school with the participation of 54 students divided into control and experimental groups. During the formative stage, a series of sessions were conducted using VR and AR technologies within the framework of psycho-pedagogical trainings developed by future educational psychologists. Scientific novelty of the research lies in the development and testing of a set of specific psychological and pedagogical measures, including detailed descriptions of educational scenarios, equipment, and software, aimed at purposefully developing students' digital competence.

Keywords: VR technologies, AR technologies, digital competence, psycho-pedagogical practice, digital safety, media literacy, immersive technologies, prevention of cyber risks.

Introduction

Digital technologies (hereinafter DT) have become an integral part of modern life. When we speak of digital technologies, we refer to any tools and systems that operate through computers, the Internet, and other electronic devices. Every day, through smartphones, tablets, and laptops we communicate with family and friends, follow the news on social media, shop online, book transportation, pay bills, and engage in learning. It is now difficult to imagine a person who does not rely on DT in some form. For this reason, skills such as finding and evaluating information, assessing the credibility of sources, working with documents and presentations, communicating and collaborating online, creating digital content, adapting to new technologies, and protecting personal data and privacy have become essential. Collectively, these abilities form what is known as "digital competence" (hereinafter DC) — a vital skill set for every individual in today's world.

DT are now applied across all areas of society, including education. This is evident in the widespread use of educational platforms such as Zoom and Google Classroom, electronic grade books, interactive whiteboards, various testing, and file-sharing applications, as well as virtual and augmented reality technologies integrated into teaching and learning processes. Addressing the challenges related to developing students' DC and effectively integrating digital tools into formal education, the Organisation for Economic Co-operation and Development (OECD) has emphasized the need for schools to promote and assess DC by 2025 [1].

Today, many countries are paying attention to the development of DC, underscoring the relevance of this issue. For example, the DigComp project, which has been in place since the beginning of previous decade, serves as a pan-European framework for shaping policies on digital skills, as well as for developing and accessing DC [2]. The Figure 1, below, presents the five key areas of DC according to the DC Framework for Citizens.

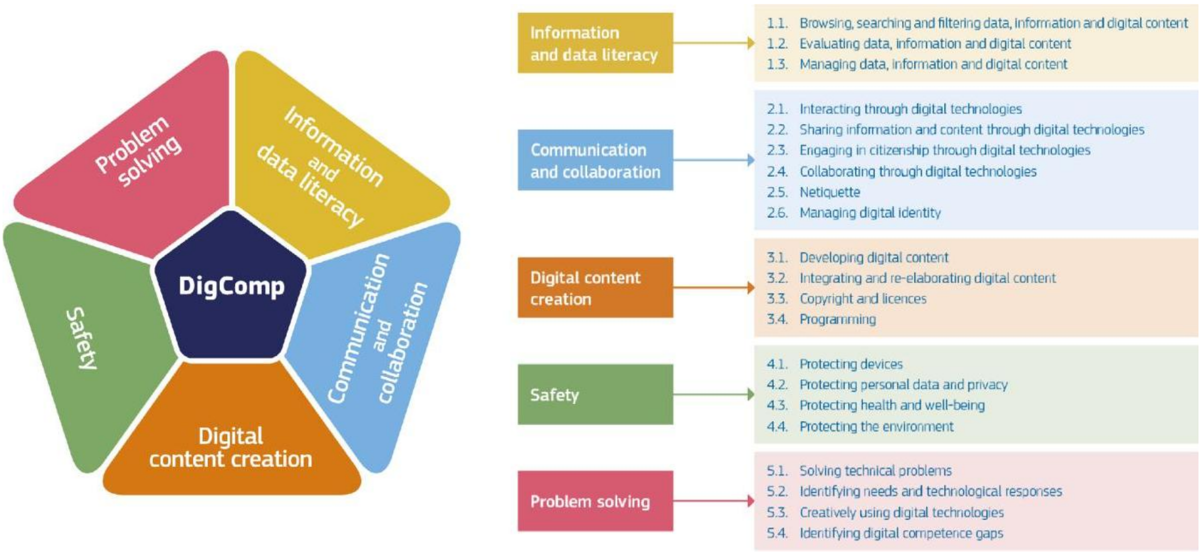

Figure 1. Key areas of digital competence of citizens, according to the DigComp model [3]

As shown in Figure 1, the presented model demonstrates a systematic approach to the development of DC, emphasizing not only technical skills but also critical thinking, responsibility, and the ability to adapt to digital challenges. Unlike narrowly focused frameworks, this model covers both basic and advanced levels, enabling the assessment of digital literacy as a dynamic, evolving process.

In the context of rapid digitalization of schools and the growing availability of online resources, teachers who lack digital skills risk becoming professionally outdated and unable to teach modern students effectively. Moreover, DC plays a crucial role in developing students' critical thinking, media literacy, and self-protection skills in the digital environment.

All the above highlights the relevance of our research focused on the use of VR and AR technologies in schools, as these innovative tools offer opportunities to modernize educational content and foster the development of DC. The integration of virtual and augmented reality into educational practice requires specialists to demonstrate confident digital skills, creative thinking, and the ability to organize the learning process in new formats.

The aim of the study is to determine the impact of using VR and AR technologies in the educational practice of future educational psychologists on the level of DC among secondary school students. To achieve this aim, the following objectives were set:

1. To analyze the global practice of developing digital competence of students;
2. To identify appropriate diagnostic methods and levels of digital competence based on existing models;
3. To assess the initial level of digital competence among schoolchildren prior to the implementation of VR and AR technologies;
4. To train future educational psychologists in the use of VR / AR and organize training sessions incorporating these tools in the school environment.
5. To conduct a follow-up assessment of students' digital competence and perform a comparative analysis of the results before and after the implementation of VR/AR
6. To develop practical recommendations for the effective integration of VR and AR technologies in schools.

Based on the identified problem and research objectives, the following research hypothesis was formulated: If VR and AR technologies are integrated into the practice of educational psychologist, then this will lead to a significant increase in the level of DC among secondary school students across all key components.

The concept of "digital competence" emerged at the intersection of rapid technological advancement and evolving educational needs. The first approaches to digital literacy appeared in 1997, when Paul Glister introduced the term "digital literacy", describing it as the ability to understand and use information from various sources [4]. Active attention to DC as an educational category began in 2006, when the European Commission included it among the eight key competencies for lifelong learning.

In 2013, the first version of the pan-European DigComp framework was developed, and by 2017, an updated DigComp 2.1 emerged with eight levels of ownership and five key components [5]. Since 2018, the DigCompEdu framework has been introduced, focusing on the digital competence of educators [6].

The COVID-19 pandemic in 2020 marked a turning point: educational institutions shifted to distance learning, and digital skills become a crucial factor for successful adaptation. Since 2023, attention has increasingly focused on immersive technologies — VR and AR — which offer new opportunities for learning while demanding the development of DC among both students and teachers.

Thus, digital competence has evolved from a purely technical skill into a strategically important priority in educational policy, particularly relevant for preparing students for life in the digital society.

Contemporary research conceptualizes digital competence as a multidimensional construct that extends beyond purely technical skills. G. Fallon argues that digital competence should be understood as an integrative framework incorporating cognitive, critical, ethical, and behavioral components [7]. Similarly, O. Erstad, S. Kjallander, and S. Jarvela emphasize that within the context of digital transformation in education, DC constitutes part of a broader pedagogical paradigm associated with learner autonomy, responsibility, and reflective engagement with technology [8].

Comparative analyses of international DC frameworks reveal diverse conceptual approaches to its structure and assessment. J. Mattar, C.C. Santos, and L.M. Cuque, in their examination of major international models (including DigComp and related frameworks), demonstrate that contemporary conceptualizations increasingly integrate critical thinking, media literacy, digital safety, and socio-emotional competencies [9]. This highlights the necessity of a systematic approach to assessing school students' DC, one that encompasses both technical and psychological dimensions of digital behavior.

Recent scholarship also underscores the psychological dimension of DC. Blanc et al. identify significant associations between students' DC levels, autonomy, digital attitudes, and problem-solving abilities. Likewise, A. Kreuder et al., in their analysis of research on adolescents, emphasize that DC development is intricately linked to self-regulation, critical information processing, and resilience to digital risks [10]. These findings support the interpretation of DC as a psycho-pedagogical construct integrating cognitive skills with personal and behavioral characteristics.

In recent years, growing attention has been devoted to the role of immersive technologies in education. A systematic-narrative review by M. Hamash, P. Tiernan, and G. Young indicates that Virtual reality in post-primary education enhances critical thinking, engagement, and practice-oriented skills, while also enabling the simulation of complex social scenarios [11]. VR and AR technologies are therefore viewed not only as motivation tools, but also as instruments for fostering comprehensive DC, including digital safety awareness and responsible online behavior.

Furthermore, research on digital well-being and safety stresses the importance of early development of responsible digital practices. M. Cowling and K.N. Sim demonstrate that structured instruction in digital safety and media literacy contributes to students' critical evaluation of online content and reduces vulnerability to manipulative digital influences [12]. These findings substantiate the relevance of integrating psychological training and immersive technologies into the development of students' DC.

In the Republic of Kazakhstan, this issue has become particularly significant, as digital fraud has risen to one of the leading types of crime in recent years. In 2024 alone, 22,900 cases of online fraud were registered, resulting in losses exceeding 11.4 billion tenge, and in 2025 the number of cases increased by 23 % compared to the same period of the previous year [13].

The Government recognizes the risks associated with low levels of digital literacy among the population and is implementing systematic measures to address them. Within the framework of the national program "Digital Kazakhstan", the Unified Digital Educational Environment (UDEE) has been introduced, providing schools with access to modern digital resources. Since 2022, mandatory courses have been introduced in all schools across the country, including modules on programming, 3D modeling and cybersecurity. In addition, national educational platforms such as "SMART Daryn" and "BilimLand" offer access to modern interactive resources that support learning and the development of digital skills. These measures represent an important component of state policy aimed at fostering sustainable digital skills among schoolchildren, highlighting the relevance of studying the effectiveness of new educational technologies.

Materials and methods

In current practice, the following international models are commonly used to assess digital competence:

- DigComp (Digital Competence Framework for Citizens), includes five competence areas described across eight levels of complexity (information literacy, communication and collaboration, digital content creation, safety, and problem solving).

- ICILS (International Computer and Information Literacy Study): an international study assessing students' digital skills, consisting of four levels, and including information literacy, digital content creation and working in digital environments.

- UNESCO DLGF (Digital Literacy Global Framework): this model considers global aspects and allows for the consideration of cultural and national contexts.

Considering the research objectives and the age group of participants, we decided to use an adapted version of the DigComp framework. The advantage of this model in our study lies in its universality and ease of adaptation for school students. Moreover, its inclusion of both technical and critical-semantic skills makes it particularly suitable for assessing the impact of VR and AR technologies.

The methodological basis of the study includes systematic, competence-based, activity-based, and practice-oriented approaches. A systematic approach allows viewing the development of DC as a result of the complex interaction between the educational environment, technologies, teaching methods, and student activity. The competence-based approach focuses on fostering specific knowledge, skills and abilities that enable effective functioning in the digital environment. The activity-based approach emphasizes students' practical engagement in the use of VR and AR technologies, encouraging active participation in modeling, experimenting, and solving practical tasks within immersive digital environments. The practice-oriented approach directs the study toward obtaining empirical data on how VR and AR technologies influence the development of students' specific practical digital skills.

The study was conducted in the form of a pedagogical experiment, which included initial diagnostics at the ascertaining stage, training with the use of VR and AR technologies during the formative stage, and follow-up diagnostics to analyze the dynamics of digital skills development at the control stage.

Data collection methods included questionnaires, testing, practical case-based studies, observation, as well as t-test to assess the significance of differences between groups before and after the experiment.

The implementation of VR and AR technologies in the educational process of the school was carried out during the internship by future educational psychologists — students of the Faculty of Education at Buketov Karaganda National Research University. Under the guidance of experienced instructors and through continuous consultations, they received targeted training in the methodology of integrating immersive technologies into their pedagogical practice. The training program included a series of practical sessions and workshops focused on the pedagogical design of VR/AR-based lessons, the development of interactive digital scenarios, and the application of virtual environments in psychological counseling and social skills training.

The research was conducted at the N. Nurmakov Boarding School in Karaganda. The total sample consisted of 54 10th grade students, who were divided into experimental and control groups.

Recent studies demonstrate that the use of immersive technologies (VR/AR) stimulates students' cognitive activity, promotes the development of information-seeking skills, critical evaluation of digital sources, creation of multimedia content, and fosters online safety in the digital environment. In addition, AR has a positive impact on students' creativity, behavior, and pedagogical strategies, with the teacher's professional competence serving as an important moderating factor in this process [14]. VR/AR expand opportunities for interactive, visual, and engaging learning, particularly in STEM and humanities fields [15].

Given that the DigComp framework was selected for this study, Table 1 presents the adapted levels of digital competence for schoolchildren.

Table 1

The adapted levels of digital competence for schoolchildren

Competence	Basic Level (A)	Intermediate Level (B)	Advanced Level (C)
Information literacy	Able to search for information using keywords	Analyzes and filters sources	Evaluates credibility and processes information critically
Content Creation	Prepares simple documents	Creates presentations and short videos	Creates complex multimedia content
Safety	Follows basic safety rules	Recognizes threats and protects data	Actively applies advanced security measures
Problem solving	Operates according to instructions	Selects solutions independently	Adapts and combines new digital tools

The following table presents the diagnostic tools used to assess competence level according to the required criteria, along with explanations for level distribution. (Table 2).

Table 2

The diagnostic tools used to assess competence level according to the required criteria

Compe-tence	Task	Assessed criteria	Distribution of results by levels
Information literacy	"Evaluate the authenticity" Students are provided with 3 short news reports from the Internet (real and fake). Participants should identify which ones are in doubt and explain the reason.	- Ability to critically analyze information; - Identification of manipulative and unreliable sources.	A) Has difficulty verifying the credibility of information and often trusts any information found online.
			B) Able to analyze information, paying attention to signs of reliability of sources.
			C) Critically and systematically evaluates complex information flows, identifies manipulations, fake content, and hidden threats.
Communication	"Digital behavior in social networks" Students are presented with 3 simulated situations: a conflict in a messaging app, posting offensive content, and sharing personal data. Participants are asked to explain how they would respond in each scenario.	- Emotional self-regulation in conflict situations; - Awareness of the consequences of digital behavior; - Ethics of online interaction	A) Does not recognize the consequences of their behavior in the digital environment.
			B) Aware of responsibility for their digital behavior and demonstrates basic digital ethics.
			C) Actively applies principles of digital ethics and able to regulate the behavior of others in collective digital activities.
Content Creation	"Create a presentation for an online group" Students are assigned to create a short presentation (3-5 slides) on the topic "How to communicate safely online?", including images, recommendations, and practical tips.	- Content relevance and coherence; - Ability to use multimedia elements; - Accuracy of safety recommandations.	A) Able to create simple digital content based on a sample without self-structuring.
			B) Independently creates structured digital content using multimedia elements.
			C) Creates creative, complex digital content (interactive projects, presentations with elements of video, 3D, VR/AR).
Safety	"Digital Safety Test" Students are given an online test containing questions such as: - What is phishing? - How do you create a strong password? - What should you do if a stranger asks you to share personal information?	- Basic knowledge of data protection; - Awareness of personal safety issues online.	A) Has limited knowledge of the risks associated with sharing personal data.
			B) Understands basic security threats and follows fundamental rules for protecting personal data.
			C) Applies advanced data protection methods and understands modern risks (social engineering, cyberbullying, data leakage).
Problem-solving	"Digital incident" (case study task) Students are presented with a situation and asked to answer several questions. Scenario: A classmate posted a photo of another student online without his consent, causing negative comments. Questions: - What would you advise in this situation? - What are the possible consequences? - Who should intervene? What would you do?	- Ethical digital problem-solving skills; - Awareness of the consequences of digital behavior; - The ability to make constructive decisions.	A) Seeks help immediately when problems arise and acts strictly according to instructions.
			B) Able to search for solutions online (video tutorials, forums) and analyzes the causes of basic digital errors.
			C) Demonstrates a high level of self-regulation in conflict situations, acts as a mediator.

The experiment was conducted over a period of 10 weeks (ascertaining stage — 2 weeks, formative stage — 6 weeks, control stage — 2 weeks). Students were divided into two groups: Class A (experimental group) and Class B (control group).

At the ascertaining stage, the initial assessment of students' DC was carried out using the diagnostic tools described in Table 2. During the formative stage, future educational psychologists who had previously been trained in working with VR and AR technologies conducted a series aimed at developing various components of DC, considering the psychological aspects of digital behavior. Interactive and immersive technologies made it possible to simulate complex social and emotional situations, allowing students to safely practice self-regulation, emotional resilience, and critical evaluation of information.

Through VR scenarios, students participated in emotional intelligence training sessions: by recreating various conflict and stressful situations, they learned to recognize their own emotions, regulate behavior, and understand the influence of the digital environment. In AR modules focused on developing media literacy, simulated situations involved the spread of fake information and manipulative messages, allowing participants in the experimental group to practice critical evaluation of digital sources. In addition, thematic training-game sessions were conducted to prevent cyberbullying, promote responsible handling of personal data, and raise awareness of phishing and social engineering threats. Table 3 presents a set of measures carried out during the formative stage for the experimental group.

Table 3

A set of measures carried out during the formative stage for the experimental group

№	Activity Format	Purpose	Tools (location, equipment)
1	VR training on emotional intelligence development	Training in self-regulation and recognition of emotions in complex social situations	VR headsets (Oculus Quest, Pico); VR applications: "Virtual Reality Therapy", "Emotion Recognition VR"; psychologist's office
2	AR scenarios on Media Literacy (Fake News Simulation)	Developing critical thinking and information analysis skills in a digital environment	AR applications (Quiver Merge Cube); projector, tablets, case studies with fictional information, Internet
3	VR scenarios for preventing cyberbullying and secure digital behavior	Practicing constructive behavior in situations of online aggression	VR platforms: Cyberbullying Prevention VR, 360-degree cases; psychologist's office with a VR zone.
5	VR-career guidance tours of the professions of the future	Formation of students' awareness of the importance of digital competencies in their future profession	VR programs: "Job Simulator VR", "VR Career Exploration", career guidance room, VR equipment
6	Group discussions and reflection after each session	Students' awareness of their own digital behavior and competencies, formation of self-reflection	Discussion circle, psychologist's office

The final control stage included repeated diagnostics using identical techniques, which made it possible to assess the dynamics of changes in the levels of digital competence of schoolchildren.

Results and Discussion

To determine each student's competence level, we applied an integral assessment algorithm for DC. Each task from Table 2 was evaluated separately according to the following procedure:

- Basic Level (A) = 1 point;
- Intermediate Level (B) = 2 points;
- Advanced Level (C) = 3 points.

Next, we calculated the total score by summing all points and determined the competence level according to the following scale:

5-7 points — Basic Level (A);

8-11 points — Intermediate Level (B);

12-15 points — Advanced Level (C).

For clarity, we decided to present in Table 4 the results of DC assessment for both groups before and after the experiment.

Table 4

Results of digital competence assessment for both groups before and after the experiment

Experimental group						**Control group**					
At the ascertaining stage			At the control stage			At the ascertaining stage			At the control stage		
A pers./%	B pers./%	C pers./%	A pers./%	B pers./%	C pers./%	A pers./%	B pers./%	C pers./%	A pers./%	B pers./%	C pers./%
10/ 37 %	14/ 52 %	3/ 11 %	2/ 7 %	11/ 41 %	14/ 52 %	9/ 33 %	15/ 56 %	3/ 11 %	8/ 30 %	16/ 59 %	3/ 11 %

As shown in Table 4, the initial assessment of DC revealed comparable results between both groups at baseline. In the experimental group, 37 % of students demonstrated a basic level, while this figure was 33 % in the control group. At the intermediate level, 52 % of students were recorded in the experimental group and 56 % in the control group. The proportion of students at the advanced level was identical in both groups, with 11 % each.

After completing the formative stage, which includes integrating VR and AR technologies for future psychology teachers, a significant increase in the level of digital competence of students were observed in the experimental group. For students with basic skills, it decreased from 37 % to 7 %, while the proportion of students with advanced level increased to 52 %.

To assess the statistical significance of changes in the level of digital competence in the experimental and control groups, data analysis was conducted using the paired Student's t-test.

In the experimental group, the mean integral score of digital competence before the intervention was 1.59 (SD = 0.50), and after the implementation of VR and AR technologies, it increased to 2.70 (SD = 0.47). The t-test was calculated using the following formula:

$$t = \frac{\bar{D}}{SD / \sqrt{n}}$$

where: $\bar{D}$ — mean difference (mean gain);

SD — standard deviation of the differences;

n — number of participants.

The result demonstrated a high level of statistical: t = 8.27 at n = 27, corresponding to a significance level of $p<0.001$. This indicates a reliable positive effect of the formative stage involving immersive technologies on the development of schoolchildren's DC.

The positive shifts observed are presented in Figure 2.

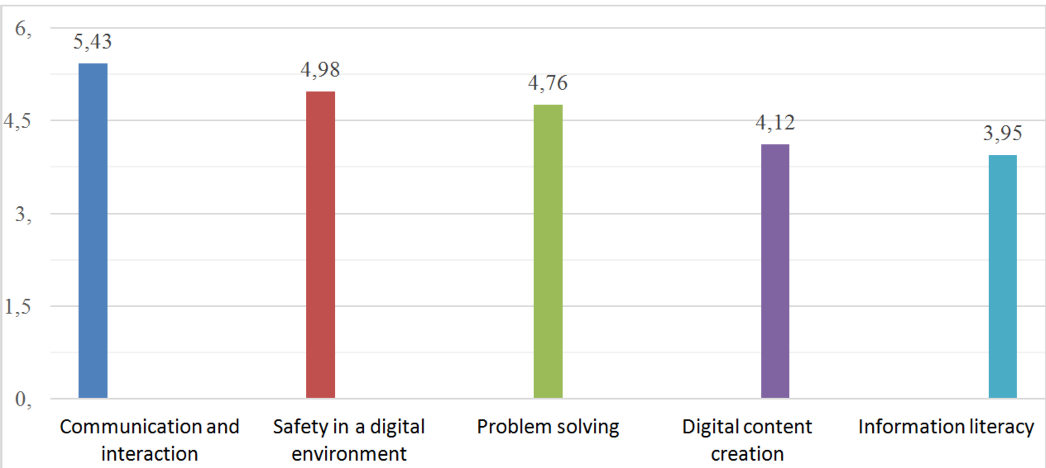

Figure 2. Observed positive shifts

According to the data presented in Figure 2, the most significant positive shifts were observed in the following competence areas:

- **Communication and interaction** (mean score before the experiment — 1.7, after the experiment — 2.6; $t = 5.43$, $p<0.001$);
- **Safety in a digital environment** (mean score before the experiment — 1.8, after the experiment — 2.6; $t = 4.98$, $p<0.001$);
- **Problem solving** (mean score before the experiment — 1.6, after the experiment — 2.4; $t = 4.76$, $p<0.001$);
- **Digital content creation** (mean score before the experiment — 2.0, after the experiment — 2.7; $t = 4.12$, $p<0.001$);
- **Information literacy** (mean score before the experiment — 1.9, after the experiment — 2.5; $t = 3.95$, $p<0.001$).

In the control group, the mean scores before and after the experiment remained unchanged (1.59; SD = identical), which was confirmed by t-test result: $t = 0.0$ $p>0.05$. This indicates the absence of significant changes under traditional teaching conditions.

The obtained results demonstrate the effectiveness of using VR and AR technologies by educational psychologists to develop various components of students' DC, particularly in psychological aspects such as communication, digital safety, and problem-solving in digital environments.

Conclusions

Based on the results obtained, we can conclude that the research aim — to determine the impact of using of VR and AR technologies in educational practice of future educational psychologists on the level of digital competence among secondary school students — was successfully achieved.

Within the framework of the first task, an analysis of the global practice in the development of DC was conducted. The examination of international approaches (DigComp, DigCompEdu, ICILS, UNESCO DGLF) confirmed the high relevance of developing digital skills, that include not only a technical but also a psychological component such as critical thinking, digital ethics, and safe online behavior.

In addressing the second objective, the DigComp model was adapted for the school-age population with a focus on psychological and pedagogical aspects. Diagnostic tools were developed to assess students' DC across five key components: information literacy, communication, content creation, digital safety, and problem- solving.

At the ascertaining stage (objective 3), it was established that most students in both groups demonstrated basic and intermediate levels of DC, with no significant differences between the experimental and control groups.

As part of the fourth objective, future educational psychologists received training in the application of VR and AR technologies within psychological and pedagogical practice. During the formative stage, they conducted a series of sessions aimed at developing students' self-regulation skills, critical analysis of information, safe behavior in digital environment, and creating high-quality digital content.

Based on the results of follow-up assessment (objective 5) conducted after the formative stage, a statistically significant increase in digital competence was recorded in the experimental group ($t = 8.27$, $p<0.001$), while no changes were observed in the control group ($t = 0.0$, $p>0.05$). The most pronounced improvements were noted in communication, self-regulation in digital interactions, digital safety, and critical evaluation of information.

Thus, the use of VR and AR technologies in psychological and pedagogical practice has proven to be highly effective not only in developing the technical aspects of digital competence, but also in fostering students' psychological readiness for responsible and safe behavior in a digital environment.

In conclusion, we find it appropriate to propose the following practical recommendations, which may contribute to the further development of students' DC in educational practice:

- Introduce VR and AR technologies into the work of school psychologists as an effective tool for developing psychologically resilient digital behavior among students.
- Use immersive training scenarios to develop self-regulation skills, emotional intelligence, and constructive behavior in situations involving digital conflicts.

- Incorporate media literacy modules into school curricula using AR technologies to foster students' critical evaluation skills regarding digital information.
- Organize systematic training for educational psychologists in the application of VR and AR tools in both educational and corrective activities.
- Develop comprehensive methodological guidelines and practical manuals for educational psychologists on the use of VR and AR technologies for cyberbullying prevention, digital ethics formation, and digital safety.
- Conduct further research with an expanded sample to confirm the stability of the observed trends across different age groups and various social contexts.

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Болашақ педагог-психологтардың тәжірибесіндегі VR және AR-технологиялары: орта мектепте енгізу тәжірибесі және оқушылардың цифрлық құзыреттілігін дамытуға әсері

Мақалада болашақ педагог-психологтардың кәсіби қызметінде VR және AR-технологияларын қолдану қарастырылып, олардың орта мектеп оқушыларының цифрлық құзыреттілігін дамытудағы әсері зерттелген. Шетелдік және отандық зерттеулерді талдау негізінде иммерсивті технологияларды білім беру жүйесіне енгізудің өзектілігі дәлелдене отырып, аталмыш технологиялар тек техникалық қана емес, сонымен қатар психологиялық-педагогикалық аспектілерді де дамытуға ықпал ететін тиімді құрал ретінде есептеледі. Зерттеудің әдіснамалық негізі ретінде жүйелік, іс-әрекеттік, құзыреттілік және тәжірибеге бағытталған тәсілдер қолданылды. *DigComp* моделінің бес негізгі компоненті бойынша (ақпараттық сауаттылық, цифрлық коммуникация, контент құру, қауіпсіздік және мәселелерді шешу) оқушылардың цифрлық құзыреттілік деңгейіне психологиялық аспектіні ескере отырып диагностика жүргізілген. Мақалада бақылау және эксперименттік топтарға бөлінген 54 оқушының қатысуымен Қарағанды қаласының мектебінде жүргізілген эксперимент нәтижелері келтірілген. Қалыптастырушы кезеңде болашақ педагог-психологтар әзірлеген психологиялық-педагогикалық тренингтер шеңберінде VR және AR-технологияларын қолдану арқылы бірқатар сабақ өткізілді. Зерттеудің ғылыми жаңашылдығы ретінде оқушылардың цифрлық құзыреттілігін мақсатты түрде қалыптастыруға мүмкіндік беретін оқу сценарийлерін, жабдықтар мен бағдарламалық қамтамасыз етуді сипаттайтын нақты психологиялық-педагогикалық іс-шаралар кешенін әзірлеу және сынақтан өткізу процесі зерделенген. Цифрлық қауіп-қатерлердің алдын алу және оқушылардың цифрлық қоғамдағы өмірге психологиялық дайындығын арттыру үшін білім беру ұйымдарында әзірленген үлгіні пайдалану мүмкіндігі аталмыш жұмыстың практикалық маңыздылығы болмақ. Зерттеу нәтижелері педагог-психологтарға, әдіскерлерге, білім беру менеджерлеріне және цифрлық сауаттылықты арттыру бағдарламаларын әзірлеуші мамандар үшін пайдалы болмақ.

Кілт сөздер: VR-технологиялар, AR-технологиялар, цифрлық құзыреттілік, психологиялық-педагогикалық практика, цифрлық қауіпсіздік, медиа сауаттылық, иммерсивті технологиялар, киберқауіптердің алдын алу.

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VR и AR технологии в практике будущих педагогов-психологов: опыт внедрения в средней школе и влияние на развитие цифровой компетентности школьников

В статье рассматривается опыт использования VR- и AR-технологий в практике будущих педагогов-психологов и анализируется их влияние на развитие цифровой компетентности учащихся средней школы. На основе анализа зарубежных и отечественных исследований обоснована актуальность интеграции иммерсивных технологий в систему образования как эффективного средства развития не только технических, но и психолого-педагогических аспектов цифровой компетентности. В качестве методологической основы исследования использовались системный, деятельностный, компетентностный и практико-ориентированный подходы. Диагностика уровня цифровой компетентности школьников проводилась по пяти ключевым компонентам модели DigComp с учетом психологической составляющей — информационной грамотности, цифровой коммуникации, создания контента, безопасности и решения проблем. Статья содержит результаты эксперимента, проведенного в школе города Караганды с участием 54 учащихся, разделенных на контрольную и экспериментальную группы. Формирующий этап включал проведение серий занятий с применением VR- и AR-технологий в рамках психолого-педагогических тренингов, разработанных будущими педагогами-психологами. Научная новизна исследования заключается в разработке и апробации комплекса конкретных психолого-педагогических мероприятий с описанием учебных сценариев, оборудования и программного обеспечения, позволяющих целенаправленно формировать цифровую компетентность школьников. Практическая значимость заключается в возможности использования разработанной модели в образовательных организациях для профилактики цифровых рисков и повышения психологической готовности учащихся к жизни в цифровом обществе. Результаты исследования могут быть полезны педагогам-психологам, методистам, управленцам образования и разработчикам программ повышения цифровой грамотности.

Ключевые слова: VR-технологии, AR-технологии, цифровая компетентность, психолого-педагогическая практика, цифровая безопасность, медиаграмотность, иммерсивные технологии, профилактика киберрисков.

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