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Fostering digital culture of future teachers via open educational environment in the Republic of Kazakhstan

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Abstract

In the field of teacher education, the role of digital culture is becoming increasingly important due to the rapid digitalization of education. Digital culture gives future teachers the opportunity to navigate the digital environment, manage educational resources, and engage in professional communication. This research work focuses on fostering digital culture among students of a pedagogical specialty through the integration of open educational environments into the learning process. The study was conducted at a Kazakh university and included the practical use of open digital platforms by future teachers. The aim of the study is to examine the effectiveness of such platforms in developing key digital competencies, including digital literacy, online communication ethics, critical thinking, and digital content management. As a result of the practical part "Involving students in open digital educational environments," it was revealed that constant participation in open platforms has a positive effect on students' willingness to learn in digital environments. Based on the results obtained, it is concluded that the integration of open educational environments into teacher training programs can significantly enhance the digital culture and professional training of future teachers.

Keywords: Digital competencies of future teachers, digital culture of pedagogical students, digital literacy, digitalization of higher education, educational technologies in the digital environment, open educational environment.

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1. Introduction

Currently, digital transformation is the main driving force behind the change in education systems worldwide. The emergence of blended and personalized learning models driven by the growing integration of online platforms and digital technologies is significantly changing the educational landscape. Over the past decade, there has been a growing gap between traditional pedagogical approaches and digital educational formats. This shift highlights the growing relevance of research on how digital tools and environments can enhance the quality of higher education, particularly through the development of a digital culture among future faculty.

Digital culture is a multifaceted phenomenon that includes digital literacy, critical thinking, responsible behavior in an online environment, and the ability to effectively manage and create digital educational content. The development of such competencies is especially important in the preparation of students in pedagogical specialties, as it directly affects their professional readiness to teach in a digital educational environment. In this regard, open educational environments offer great opportunities to improve learning outcomes by providing accessible, flexible, and interactive learning experiences.

This study analyzes the role of open educational environments in shaping the digital culture of future teachers. The study was conducted in one of the higher educational institutions of Kazakhstan to identify key trends, problems, and methodological approaches to the integration of digital tools into teacher training. The research includes both theoretical analysis and empirical work, showing how structured interaction with digital educational platforms contributes to the formation of necessary competencies in digital culture.

As part of this research, a training module called "Open Educational Environments and Digital Culture in Teacher Education" was developed. This module contains theoretical components covering concepts such as digital citizenship, educational media literacy, online collaboration, and ethical aspects of digital communication. It also includes practical tasks that involve students in a real digital environment, encouraging them to use digital tools for lesson planning, educational content creation, and distance learning.

In the experimental part of the study, teaching students participated in structured digital learning classes, after which their progress in various components of digital culture was assessed. The analysis revealed a marked improvement in students' digital competence, including better adaptability to technological tools, improved digital communication skills, and increased confidence in digital resource management. These results indicate that the purposeful integration of open educational environments into teacher education can serve as a catalyst for the training of future teachers who are able to navigate the complexities of digital pedagogy.

This study contributes to the discussion of digital transformation in higher education and highlights the need for teacher training programs for the active development of digital culture. Through evidence-based strategies and innovative practices, universities can better prepare future educators to meet the demands of a rapidly changing educational landscape.

2. Literature Review

The concept of digital culture in education has evolved significantly over the past two decades, reflecting broader technological and societal transformations. Early research by Hannafin et al. [1] laid the groundwork for understanding open learning environments as dynamic systems that support learner-centered instruction, long before the mainstreaming of digital platforms. Their work emphasized the importance of flexible pedagogical design, a principle that remains relevant in today's digital ecosystems.

Building on this foundation, Stromquist [2] highlighted the growing influence of digital media on social institutions, including education, arguing for a deeper understanding of the cultural implications of technological integration. This perspective has since become central to discussions on digital literacy and educational equity.

In the 2010s, many studies focused on the practical integration of digital tools in teacher education. Ehlers [3] introduced the concept of "open educational practices" (OEP) as an extension of open educational resources (OER), shifting the focus from content availability to the pedagogical use of digital technologies. Ehlers' framework underscores the importance of participatory culture, user-generated content, and networked learning, core elements of digital culture in education.

Deuze [4] contributed to the understanding of digital culture as a lived experience, characterized by interactivity, personalization, and constant connectivity. His work positions educators and learners as co-creators in a fluid, media-saturated environment. Around the same time, Levin [5] and Hegarty [6] explored how digital environments shape epistemological beliefs and professional identities in teacher education, emphasizing the interplay between values, practices, and digital tools.

Recent research has further deepened these insights. Knox [7] analyzed the pedagogical implications of algorithmic governance and datafication in digital learning environments, raising questions about autonomy and critical agency in educational decision-making. Kalimullina et al. [8] stressed the need to balance technological fluency with ethical awareness, especially in preparing future teachers to operate in complex, data-rich environments.

Gruszczynska et al. [9] as well as Falloon [10] provided empirical evidence of the challenges and benefits of digital integration in teacher training programs. Their work highlights issues such as the digital divide, institutional support, and the necessity of cultivating digital pedagogical content knowledge. More recently, From [11] and Alenezi et al. [12] have argued for the design of open educational environments that foster collaboration, digital communication, and adaptive learning pathways.

Zabolotska et al. [13] and Park [14] have examined the relationship between open education and the development of soft skills such as critical thinking, self-regulation, and intercultural communication, all of which are integral to digital culture.

The current research builds upon this rich body of literature, integrating classic models of open learning with contemporary studies on digital transformation. It considers digital culture as a multidimensional construct that includes

technical skills, cultural practices, and pedagogical competencies, and explores how this construct can be effectively developed in the context of Kazakhstani higher education through open educational environments.

By synthesizing older theoretical frameworks with recent empirical findings, this study aims to offer a holistic understanding of how digital culture can be cultivated among future teachers to meet the demands of 21st-century education.

3. Materials and Methods

Other studies claim that digital culture is the product and result of revolutionary technological innovations. Digital culture influences a person not only from the technological perspective but also from the humanitarian side, which leads to changes in the social environment and, in turn, in the individual himself. In particular, in the context of higher education in the Republic of Kazakhstan, digital culture not only forms a new educational environment but also contributes to the development of students in pedagogical specialties with the necessary skills to work in modern digital reality, changing approaches to learning and teaching.

One of the core beliefs of digital culture is that digital networks enhance opportunities for collaboration, communication, community building, and participation. A prime example of this can be digital platforms such as Facebook, Twitter, and YouTube, which are actively used not only for communication but also for the exchange of knowledge and experience. Platforms for online learning and educational interaction are also actively developing in Kazakhstan, which contributes to the expansion of digital opportunities in the field of education. Digital culture in this context includes the study of the role of the Internet, new media, and digital technologies in modern society, in business, politics, art, and everyday life, which directly affects the development of educational processes and the training of future teachers in the digital age.

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Moreover, digital culture presupposes the acquisition of key competencies such as digital literacy, network ethics, critical thinking, and media awareness [15]. In pedagogical education, these competencies are closely connected with the use of open educational platforms, learning management systems, and digital content creation tools. The integration of such technologies allows future teachers to become active participants in global educational ecosystems, fostering innovation in their professional practice and enhancing their readiness to work in schools that increasingly rely on digital pedagogies. Thus, digital culture becomes not only a technological but also a pedagogical imperative.

Several studies by scientists Uzelac [16], Park et al. [17], Leaning [18], and Koltay [19] claim that digital culture includes the following key components: media literacy, information, and ICT literacy, as well as the ability to communicate and collaborate. In connection with the development of digital culture, the following issues stand out that require attention:

Figure 1.
Key components of digital culture.

The analysis of scientific papers in the context of the development of digital culture of pedagogical students in higher educational institutions of the Republic of Kazakhstan shows that digital culture cannot be completely separated from the influence of traditional cultural practices and academic approaches [20]. It is important to highlight two key aspects of the relationship between the digital culture of students and the culture of the traditional academic process:

- The interpenetration of digital culture and pedagogical traditions. Digital culture actively influences the educational process in higher education institutions, but it does not replace traditional forms of education; instead, it adapts them. Students in the pedagogical profile learn how to use digital technologies in teaching, which allows them to improve the quality of education and make it more accessible, interactive, and personalized. At the same time, attention is paid to pedagogical traditions and values based on interpersonal communication and critical thinking.
- Redistribution of educational resources through digital technologies. The introduction of open educational platforms and digital technologies into the educational process creates new opportunities for students in pedagogical specialties in terms of acquiring knowledge and skills that are relevant to the modern educational environment. This makes it possible to ensure equal access to educational materials, improve communication between students and teachers, and integrate cultural and linguistic diversity into education. At the same time, it is important to take into account the cultural peculiarities of Kazakhstan, including issues of preserving and developing the Kazakh language and identity in a digital educational context.

4. Results and Discussion

Redistribution of educational resources through digital technologies. The introduction of open educational platforms and digital technologies into the educational process creates new opportunities for students of pedagogical specialties in terms of acquiring knowledge and skills that are relevant to the modern educational environment. This makes it possible to ensure equal access to educational materials, improve communication between students and teachers, and integrate cultural and linguistic diversity into education. At the same time, it is important to take into account the cultural peculiarities of Kazakhstan [21, 22], including issues of preserving and developing the Kazakh language and identity in a digital educational context.

To achieve success, students completed test tasks after each topic was covered, and also used blocks of reference and additional materials, including video files, reference manuals, recommendations, and a psychological and pedagogical dictionary [23]. These resources contributed to the in-depth learning of the material and provided additional opportunities for self-study and self-control of knowledge.

Students' independent work as part of the tasks for the development of digital culture in an open educational environment ensured their ability to manage learning activities. In the course of this work, students independently determined learning goals, selected the content and strategy of the educational process, and used digital technologies to select methods and techniques of self-education [24]. In addition, they conducted an objective self-assessment of their work, which contributed to the development of self-regulation and critical thinking skills in the context of the digital educational environment.

During the formative stage of the experiment on the development of a digital culture among pedagogical students through the practice of an open educational environment in higher educational institutions of the Republic of Kazakhstan, the following methods and techniques were implemented:

- Computer role-playing games. Digital games that include elements of modeling real and hypothetical situations create virtual environments for learning and practical interactions. The use of these games allows students to develop functional and role-playing interests, as well as set and solve learning tasks, which contribute to the development of critical thinking and technological literacy.
- The method of group learning activities. As part of the experiment, students performed both individual and group projects using Skype, e-mail, and cloud technologies. These forms of learning encourage interaction and collaboration between students, which contributes to improved cognitive development and understanding of various educational concepts. The teacher acts as a facilitator, guiding students in the process of creating knowledge based on their experience.
- Scientific research technique. Students actively interact with scientific literature, analyze the approaches of various authors, compare concepts, and conduct reviews of scientific research on pedagogical and digital technologies. This contributes to the formation of a scientific approach to teaching and the development of critical analysis skills in the context of digital technologies in pedagogical practice.

Diagnostic procedures made it possible to visually assess the success of work on the formation of students' digital culture (in %, n=120). The arithmetic mean was calculated using the formula:

$$\bar{X} = \frac{\sum X_i}{n} \quad (1)$$

where:

X_i- The total value of all contributions from study participants.

X - The average of the diagnostic results.

Table 1.

The development of the digital culture among pedagogical students through the implementation of open educational resources in higher education institutions in the Republic of Kazakhstan.

Indicators	Before OER %	After OER %
The ability to critically evaluate the level of information and educational resources obtained.	23%	77%
The ability to find the necessary information and apply it in pedagogical practice.	29%	71%
The ability to understand the social, cultural, and ethical implications of the use of digital information in education.	26%	74%
The ability to adhere to ethical and legal standards when accessing and utilizing educational digital resources.	19%	81%
The ability to analyze, compare and critically evaluate the accuracy and reliability of educational information and sources.	24%	76%
Personalized approach to communication and collaboration through digital technologies in educational settings.	24%	76%

A personalized approach to communication and collaboration using digital tools in educational settings.

1. High - the student is able to adequately articulate their need for information, critically evaluate the level of information and resources received, understand the economic, legal, and social aspects of information use, adhere to ethical and legal standards when accessing and utilizing information, effectively utilize digital technologies in the learning process, and actively apply IT skills in teaching.
2. Above average - the student is able to critically assess the level of information and resources received, independently enter information into educational databases, and systematically use IT competencies in educational and research activities. However, the culture of information selection and search is not fully developed, and there are some issues with the use of open educational technologies.
3. The average student has a basic understanding of the concept of "digital culture" and knows how to use automated tools for searching and working with information. However, there is a lack of collaboration and limited activity in interactive communication, as well as in using open educational platforms.

4. Low - the student is characterized by a superficial knowledge of digital competencies and information literacy (the ability to formulate information needs, search for and extract digital data), occasional and random use of digital technologies for educational and scientific work, and insufficient involvement in practicing working with open educational resources.
5. Unacceptable - The student has a basic understanding of analyzing, comparing, and evaluating the reliability of data sources and information, but their knowledge of the economic, legal, and social aspects of using information is extremely limited. They have serious gaps in their understanding of ethical standards for accessing and using information, and there are several components of digital culture that they do not fully understand.

As can be seen from the table, after introducing OER, all key indicators of students' digital culture have significantly improved, indicating the positive impact of an open educational environment.

To gain a better understanding of the changes, we conducted a variance analysis to verify the statistical significance of the differences between the indicators before and after the implementation of OER. The results of the ANOVA test showed the following. Table 2 shows the calculation results for comparing data before and after the implementation of the OER.

Table 2.
The results of the analysis of variance (ANOVA) for indicators of students' digital culture before and after the implementation of the OER.

The source of the variation	Sum of squares (SS)	Degrees of freedom (df)	Average square error (MS)	F-value	P-value
Intergroup variation	197,852.90	1	197,852.90	730.24	0.000000000111
Intra-group variation	14,000.67	5	2,800.13		
The general variation	211,853.57	6			

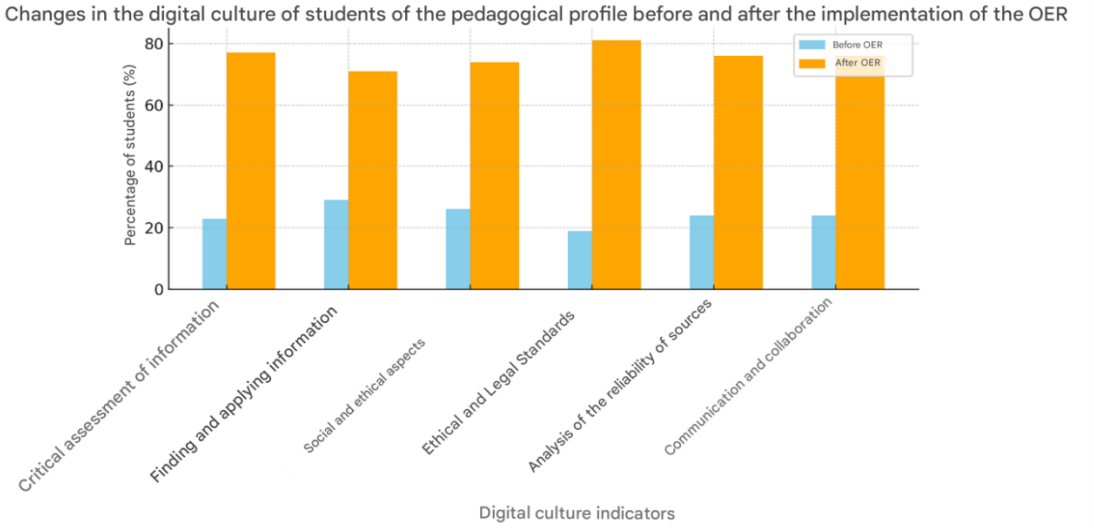

Figure 2.
Digital culture indicators.

Figure 2 illustrates the change in the digital literacy of pedagogical students before and after the introduction of an open educational environment (OER). The blue bars represent data collected before the implementation of OER, while the orange bars represent data after its implementation. The graph clearly demonstrates significant improvements in all metrics.

Table 3.
Levels of formation of the digital culture of pedagogical students through the practice of an open educational environment.

Levels	Before OER	After OER
Unacceptable	12.8%	3.2%
Low	32.0%	8.9%
Average	30.8%	41.3%
Above average	18.7%	28.7%
High	5.7%	17.9%

Table 3 demonstrates how the level of digital culture development among pedagogical students changes before and after implementing the practices of an open educational environment in higher education institutions.

5. Conclusion

The analysis of the study results reveals that the introduction of open educational environments in the higher education institutions of Kazakhstan has a significant impact on the development of digital culture among pedagogical students. The transition to a digital learning model not only enhances access to educational resources but also fosters the emergence of new socio-cultural practices associated with the use of digital technologies in teaching.

However, it is crucial to acknowledge that the extensive use of digital platforms for educational purposes can present new challenges, such as cyber addiction and the digital divide.

In order to effectively develop the digital culture of pedagogical students through the use of open educational environments, the following recommendations can be offered:

1. Implementation of mechanisms to monitor compliance with ethical and legal standards when accessing and utilizing digital educational resources within open educational environments.

2. Providing students with information about their rights and opportunities to protect personal information and data while interacting with online learning platforms.

3. Organizing training sessions, master classes, and open lectures to raise students' awareness about the social, economic, and legal implications of using digital technologies in education.

4. Utilizing feedback mechanisms and digital platforms to enhance the effectiveness of communication between teachers and students.

Actively promoting media and digital literacy among students so that they can safely and effectively utilize open educational resources and platforms in their future professional endeavors.

References

[1] M. Hannafin, S. Land, and K. Oliver, *Open learning environments: Foundations, methods, and models. In Instructional-design theories and models*. UK: Routledge, 2013.

[2] N. P. Stromquist, *Education in a globalized world: The connectivity of economic power, technology, and knowledge*. USA: Rowman & Littlefield, 2002.

[3] U. D. Ehlers, *Open learning cultures*. Berlin: Springer-Verlag Berlin and Heidelberg GmbH & Company KG, 2013.

[4] M. Deuze, "Participation, remediation, bricolage: Considering principal components of a digital culture," *The Information Society*, vol. 22, no. 2, pp. 63-75, 2006.

[5] I. Levin, "Academic education in era of digital culture," in *SMART2013 Social Media in Academia: Research and Teaching, Conference Proceedings, Bologna: Medimond*, 2013, vol. 11, pp. 1-6.

[6] B. Hegarty, "Attributes of open pedagogy: A model for using open educational resources," *Educational Technology*, pp. 3-13, 2015.

[7] J. Knox, "Digital culture clash:“massive” education in the E-learning and Digital Cultures MOOC," *Distance Education*, vol. 35, no. 2, pp. 164-177, 2014.

[8] O. Kalimullina, B. Tarman, and I. Stepanova, "Education in the context of digitalization and culture," *Journal of Ethnic and Cultural Studies*, vol. 8, no. 1, pp. 226-238, 2021.

[9] A. Gruszczynska, G. Merchant, and R. Pountney, "Digital futures in teacher education": Exploring open approaches towards digital literacy," *Electronic Journal of e-Learning*, vol. 11, no. 3, p. 193-206, 2013.

[10] G. Falloon, "From digital literacy to digital competence: The teacher digital competency (TDC) framework," *Educational Technology Research and Development*, vol. 68, no. 5, pp. 2449-2472, 2020.

[11] J. From, "Pedagogical digital competence--between values, knowledge and skills," *Higher Education Studies*, vol. 7, no. 2, pp. 43-50, 2017.

[12] M. Alenezi, S. Wardat, and M. Akour, "The need of integrating digital education in higher education: Challenges and opportunities," *Sustainability*, vol. 15, no. 6, p. 4782, 2023.

[13] O. Zabolotska, N. Zhyliak, N. Hevchuk, N. Petrenko, and O. Alieko, "Digital competencies of teachers in the transformation of the educational environment," *Journal of Optimization in Industrial Engineering*, vol. 29, no. 3, pp. 1-25, 2021.

[14] Y. Park, "A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types," *International Review of Research in Open and Distributed Learning*, vol. 12, no. 2, pp. 78-102, 2011.

[15] A. T. Junaedi, N. Renaldo, I. Yovita, K. Veronica, and S. Sudarno, "Digital culture as a moderating factor in increasing digital literacy," *Reflection: Education and Pedagogical Insights*, vol. 1, no. 3, pp. 116-127, 2023.

[16] A. Uzelac, "How to understand digital culture: Digital culture-a resource for a knowledge society," *Digital Culture: The Changing Dynamics*, vol. 12, pp. 7-24, 2008.

[17] H. Park, H. S. Kim, and H. W. Park, "A scientometric study of digital literacy, ICT literacy, information literacy, and media literacy," *Journal of Data and Information Science*, vol. 6, no. 2, pp. 116-138, 2021.

[18] M. Leaning, "An approach to digital literacy through the integration of media and information literacy," *Media and Communication*, vol. 7, no. 2, pp. 4-13, 2019.

[19] T. Koltay, "The media and the literacies: Media literacy, information literacy, digital literacy," *Media, Culture & Society*, vol. 33, no. 2, pp. 211-221, 2011.

[20] Z. Zulpykhar, M. Ongarbayeva, A. Tungatarova, and Z. Altynbekova, "On-line examinations with proctoring: Features, students’ preferences and related factors, academic honesty," *World Transactions on Engineering and Technology Education*, vol. 21, no. 4, pp. 287–292, 2023.

[21] N. Karelkhan, A. Kadirbek, B. Kuanbayeva, and G. Zhusupkalieva, "Results of geoinformation system training in higher education," *World Transactions on Engineering and Technology Education*, vol. 22, no. 1, pp. 24–30, 2024.

[22] A. Orynbayeva, N. Shyndaliyev, and A. Aripbayeva, "Improving statistical methods of data processing in medical universities using machine learning," *World Transactions on Engineering and Technology Education*, vol. 21, no. 1, pp. 58-63, 2023.

[23] Z. Zulpykhar and A. Azamat, "Implementing virtual reality technologies to enhance digital literacy in primary education," *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 2, pp. 3993–3999, 2025.

[24] M. Serik, G. Nurbekova, M. Mukhambetova, and Z. Zulpykhar, "The educational content and methods for big data courses including big data cluster analysis," *World Transactions on Engineering and Technology Education*, vol. 20, no. 3, pp. 203-208, 2022.