

Using Electronic Learning Environments to Develop Digital Competence of Future Teachers

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Abstract

To develop project-based competencies in future teachers, students must first acquire practical knowledge about how to solve problems and achieve the intended result, and secondly, form such cognitive skills as how to develop, monitor and evaluate the set goal, which is a constant main task in today's globalization environment.

The problem of developing educational outcomes is solved by organizing the development of new, including project-based, experienced teacher competencies and the preparation of future teachers for the implementation of project-based differentiated teaching.

To this end, the widespread introduction of digital technology tools into the continuous education system, as a result of which the level of quality and efficiency of their purposeful use in teaching, the formation of design skills, the rapid development of the use of electronic learning environments, platforms and artificial intelligence systems in the development of creative abilities, cognitive thinking and digital competence of future teachers is interpreted as one of the important components of education in today's globalization process.

This article examines the methods of forming the ability of future teachers to create content-rich, interactive electronic educational resources and developing competence in the products of the educational process, using the capabilities of digital technology tools effectively.

Keywords. Information, education, digital technology, artificial intelligence, resource, design, virtual, ability, cognitive thinking, competence, motivation, assessment.

Introduction

In today's developing society, the use of digital technologies plays a special role in increasing the efficiency of the educational process. In particular, the provision of educational information in digital format increases the interest of students in learning, expands their knowledge in various fields, improves the quality of learning, and facilitates feedback between teachers and students.

In the context of comprehensive digitalization of education, it is important not only to equip them with information and communication technologies, but also to have a wide range of electronic educational resources.

Therefore, it is difficult to imagine the modern educational process without electronic educational resources enriched with the latest information. During this period, the number of such materials has increased, and their content has been expanded by modern pedagogical programs such as electronic educational resources, educational websites, simulators, training programs, and other educational resources.

Of course, due to their correct and systematic use, learning methods are also developing along with them. One of the methods of learning using information technologies is distance learning.

Thus, the development of digital technologies and methods of information exchange allows the creation and use of new learning methods, including electronic web resources, textbooks, tests, dictionaries, questionnaires, wikis, video conferences, chats, etc.

In this regard, the use of digital educational resources for the effective organization of the educational process, improving the quality of education and the level of social competencies of students has become one of the mandatory conditions for the implementation of the State Educational Standard.

As a result, one of the current issues of today is the preparation of students for the use of electronic educational resources, which includes studying the didactic capabilities of software and mastering the technology of using it to solve professional problems. In particular, the diversity and constant emergence of new types of electronic educational resources, as well as the fact that software tools for developing electronic educational resources do not always meet the rapidly changing requirements of the educational process. This requires training future teachers not only to use existing electronic educational resources, but also to create electronic educational and methodological materials for lesson planning.

Literature review

In order to scientifically and theoretically explain our above ideas, based on the analysis of organized sources and scientific and pedagogical literature, it was found that the discussion of the development of electronic educational resources and the technologies for their creation by teachers will help create a single space for studying issues related to the creation and use of various electronic educational resources in education, as well as analyze and generalize interesting experiences in this area. For this purpose, firstly, it is necessary to systematically develop the quality of knowledge transfer in order to increase the efficiency of using electronic information and educational environments in the conditions of a continuous education system, and secondly, we need to improve the system of continuous training of future teachers, which provides for their comprehensive growth in purposeful continuous professional activity [1].

Also, in this regard, a number of leading scientists, including M.H. Lutfillayev [1], U.M. Mirsanov [2], R.A. Ruziyev [3], I.G. Zakharova [4]. The importance of developing various electronic educational resources, using the capabilities of digital technologies and multimedia educational environments has been reflected in the research works of Robert [5], M.P. Lapchik [6], A.I. Tillayev [7] and A. M. Quarles [8]. For example, in the research of M.H. Lutfillayev, the teaching methodology in multimedia electronic textbooks was analyzed in detail, in the scientific research of U.M. Mirsanov, the levels of effectiveness of introducing electronic information and educational resources into the educational process were determined, in the research of N.V. Sofronova, it was emphasized that the development of educational programs is largely consistent with the creation of mass-produced products and should be carried out in four stages: preliminary design, detailed design, technical design and testing[9].

The importance of methods and technologies for organizing electronic information and educational resources in improving the quality of teaching in educational institutions is substantiated in the research works of scientists such as N. T. Tuspek Nazerke Tleubekkyzy [10], H. Setyawan [11], Olivia Susan Ochoo[12], D. Glover, J. Seaman, J. M. Spector, D. Kegan, E. Johnson, J. Locard. These analyses explain that in an era when the digitalization process is rapidly developing, educating the younger generation, developing their competences in using electronic educational resources, and comprehensively assessing their readiness for digital technology competence are considered one of the urgent issues.

Research methodology

This research uses competency-based and activity-based approaches to create conditions for active, specialized training of future teachers within the framework of professional training. The purpose of this training is to expand the information experience of future teachers through the use of digital technologies to solve various problems in the field of experience and pedagogical practice, which in turn contributes to the development of their digital competence. Therefore, the main idea of our research is to study the level of complexity and specific features of

the formation of young specialists' readiness to use digital tools and the capabilities of the modern education system in their professional activities.

Thus, based on the trends in the digitalization of education in the development of future teachers' competence in using electronic educational resources, the following principles influence the development of this phenomenon:

1. The principle of integration, which allows teachers to effectively solve professional problems in the educational and industrial-technological environment, combining knowledge from various fields such as pedagogy, psychology, engineering and informatics.
2. The principle of a scientific approach implies that the information received by teachers should be reliable and correspond to modern achievements of science and technology. This includes the introduction of advanced technologies into the process of developing information competence.
3. The principle of focusing on a value-based attitude to information ensures that future teachers understand the importance of scientifically based information and technologies for their successful and effective functioning.
4. The principle of openness and flexibility reflects the characteristics of the digital competence of students and teachers, adapting content and tools to the requirements of a changing society and a continuous education system.
5. The principle of relevance to the professional field activates students' information activities related to their future profession, develops skills in working with professional information sources, specialized programs and devices.

The methodological framework for developing digital competence in future teachers during their professional training includes international standards, standardization, technologization and individualization. The identified methodological approaches create a scientific basis for the development of pedagogical technologies for developing digital competence in future teachers, which will be tested step by step during their specialized training. This will serve as a basis for increasing the motivation of talented young people and realizing their desire to independently improve their level of competence using digital educational technologies.

Analysis and results

Today, in modern research, there are many problems that are being solved regarding the prospects and trends in the development of digital education [13,14,15]. To this end, the following are taken as the main goals in the search for solutions to such problems and as the prospects for the development of educational technologies. In particular, expanding opportunities for additional education; increasing the efficiency of educational technologies; adapting all forms and levels of education to the conditions of the digital economy; developing the integration of economy, science and production; ensuring the availability of continuing education for professionals of various categories, etc.

As a result, the higher education system requires graduates with IT competencies from trained specialists. A qualified employee should have the ability to use computer and digital technologies and be ready to work in a production environment that is being transformed by digitalization. Therefore, the widespread use of modern educational tools, especially the presentation of electronic educational resources in a more interesting and convenient format, easier to master than in the traditional approach, each of the presented materials should be multimedia, rich in animation.

Thus, it was determined that electronic educational resources based on digital tools should be created based on the following concept, as formulated by V. A. Krasilnikova[16]:

- flexibility - facilitating the learning process, reducing the time spent by the student on understanding and learning the material;
- informatization - transferring the information necessary for education and professional training;
- reliability - the ability to prepare high-quality educational material in terms of content for a wide audience of students;

- accuracy - the widespread use of digital technology tools and computer capabilities in presenting educational or information and educational resources;
- virtuality - demonstrating existing processes or phenomena that cannot be described in reality in the formation of searchability;
- demonstration - providing the necessary types of tools for student and teacher activities;
- interactivity - the ability to implement the principle of individual learning of students;
- cognitive - significantly reducing time savings due to the development of direct communication processes in electronic educational resources;
- independence - the ability to use computer tools at a convenient time and place to improve the quality of students' independent thinking and independent learning competencies using digital educational resources;
- generality - the ability to provide knowledge and control a large number of students working with digital technology tools according to a personally oriented model;
- effectiveness - the ability to summarize the theoretical and practical knowledge obtained, analyze and present the results as needed.

The ability to use digital educational resources that embody such capabilities helps to control the quality of the learning process, monitor the ability of each student to apply theoretical knowledge in practice, and improve the skills of students to work independently in their studies. Thus, well-designed electronic digital educational resources, scientifically and pedagogically sound from a methodological and technological point of view, focused on developing competence, create the conditions for solving many educational problems facing learners.

Another practice-oriented approach to understanding the digital literacy of future teachers is the approach developed by a group of experts from different countries of the world [17]. This approach distinguishes several components: cognitive, activity-based and value-based (Table 1).

As we can see, the structure of digital competence is very diverse and complex. All the definitions proposed above note a common component: the ability to communicate in a digital environment and technical skills related to searching, selecting and processing information.

Thus, the future teacher's level of use of digital technologies and the development of awareness of innovations, gaining experience in the use of new digital technologies and tools, involving students in the practice of using digital technologies in the educational process, and increasing the personal level of digital competence of each student in the exchange of experience are determined. All these processes require educational institutions not only

DIGITAL LITERACY: COMPONENTS

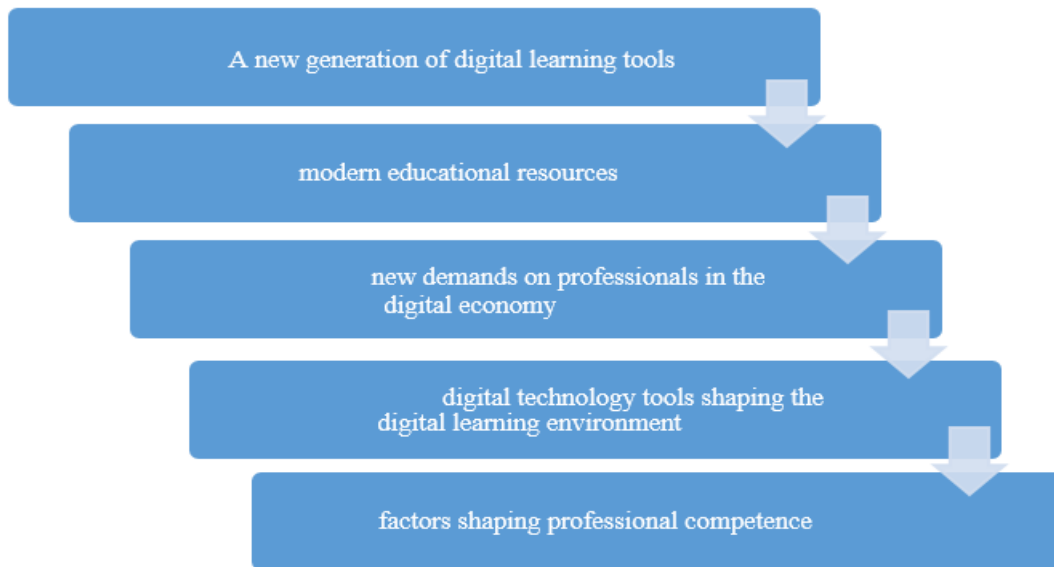
TABLE 1

Information literacy	Knowledge	Skills	Qualification
	understanding the role and impact of information in human life	the ability to search and find information in various sources	understanding the benefits and harms of information
Computer literacy	understanding the technical components of a computer and the principles of their interaction	ease of use of digital devices regardless of platform/interface	understand the purpose of a computer and how to use it
Media literacy	understanding the diversity of information sources, forms and ways of its distribution	the ability to search for news from various sources, check their completeness and reliability	news reports, critical attitude to news
Communicative literacy	understanding the difference between digital communication and live communication	ability to use modern communication tools (social networks, messengers)	awareness of the existence of special ethics and norms of communication in the digital environment
Attitude towards innovative technologies	understanding technology trends	willingness to work with new and modern technologies (apps, gadgets)	understand the benefits of technological innovations for both societal development and personal development

to constantly master and introduce rapidly developing educational tools and technologies, but also to reconsider their role, taking into account the specifics of the educational process of vocational education and training, and to take appropriate organizational measures in interaction with the internal and external environment.

Setting goals for transforming the educational process stems from the key components of the digital society (Figure 1).

As part of the digital transformation of the educational process, the development of an e-learning environment has



become a priority and goal (Figure 2).

Figure 1. Factors shaping the digital learning process.



Figure 2. Integration of digital technologies.

In this regard, the following tasks are required to be solved to achieve these goals.

1. Develop unified requirements for the structure of the content of electronic educational resources in the context of digital transformation of the educational process.

2. Enrich the level of application of electronic education (distance learning) in the educational process in each specific subject (module) within the framework of each educational program.
3. Identify and improve the quality of the use of electronic educational resources (existing and under development) in accordance with state standards.
4. Accelerate the digitalization of the educational process.
5. Develop the educational process using electronic education (distance learning) and create a regulatory and legal framework.
6. Develop, test and implement a model for organizing the educational process of electronic education.

Conclusion

As the modernization of education and the process of digitization in the development of society become the main factor in human life, it is fundamentally changing the content, form and methods of the education system. As a result, digitization creates the need to train specialists with universal competencies. This requires us, in educating young people who think completely differently today, who have digital and universal competencies, to develop methods for developing a modern digital education system of electronic educational resources on a scientific basis.

Thus, the hypotheses put forward in organizing the educational process in the context of digitization are scientifically sound and consistent with modern socio-economic conditions. Therefore, the importance of introducing digitization in accordance with pedagogical objectives and on a methodological basis, the decrease in human communication as a result of technology, requires teachers to develop methods for introducing digital competencies in accordance with global trends. Of course, overcoming these obstacles can be achieved through individualization of education.

To summarize, taking into account the theoretical and practical aspects of the problem, we can say: including expanding educational opportunities taking into account the dynamics of student development (motivating participants along with providing knowledge, creating problem situations); transparency, allowing for real-time monitoring of educational monitoring; exchange of experience, cooperation in real space (holding forums), as a result of which professional skills and the quality of education increase; motivation and activity of future teachers in the educational process are increased; effective use of digital tools, the emergence of electronic educational resources to a new level are the basis for the development of competencies.

Thus, digital technologies (LMS, multimedia platforms, interactive programs, artificial intelligence tools) and new forms of electronic educational resources become an important component of professional competence for future teachers, helping to increase their motivation, innovative thinking and activity.

References

1. Lutfillayev M.H., Fayziyev M.A. Teaching methods in multimedia electronic textbooks // Continuous education. –Tashkent, 2002. -№4. -P. 79-81.Omonov A.A., Rasulov U.M. Raqamli ta'lim ishtirokchilari kompetentligi oshirish muammolari (2022). Pedagog's international research journal, 2(1), 150–153. <https://doi.org/10.5281/zenodo.5919934>
2. Mirsanov U.M. (2017). Experience of foreign countries in introducing electronic information and educational resources in exact sciences into the educational process // News of the National University of Uzbekistan. – Tashkent, 2017. – No. 5. – P. 237-240.
3. Ruziyev R.A.(2025) Priority areas and goals of effective use of digital tools by future teachers // Universal journal of mathematical theory and computer sciences, 3(31), 16-21. <https://science-research.org.uz/index.php/UJMTCS/article/view/1336>
4. Zakharova I.G. Formirovanie informatsionnoy obrazovatelnoy sredy vysshego uchebnogo zadevaniya [Text] : autoref. dis. ... Dr. ped. date: 13.00.01 /I.G. Zakharova. - Tyumen, 2003. - 46 p.

5. Robert I.W. Sovremennye informatsionnye tehnologii v obrazovanii [Text] /I.V. Robert. M. : – Shkola-Press, 1994. – 205 p.
6. Lapchik M. P. Preparation of pedagogic personnel and informatization training: textbook / M. P. Lapchik. - M.: BINOM, 2013. – 182 p. – Friendly mode:http://prof.notoproject.org/courses/formation_of_information_competence_of_a_teacher_in_the_field_of_development_of_digital_educational_resources/
7. Tillayev A.I. (2023) The use of multimedia software in teaching digital and information technologies. *Academic Research in Educational Sciences*, 4(4), (2023). P. 512–518.
8. Quarles, A. M. Integrating digital/mobile learning strategies with students in the classroom at the historical black college/university (HBCU) / A. M. Quarles, C. S. Conway, S. Harris, J. Osler, L. Rech // *Handbook of Research on Digital Content : Mobile Learning, and Technology Integration Models in Teacher Education*. - 2017. - 13 July. - Pp. 390-408. - Text : unmediated.
9. Sofronova N.V. Theoretical and technological foundations of providing the educational process with software and methodological tools [Text]: diss... Dr. of Pedagogical Sciences: 13.00.01 / N.V. Sofronova. - Cheboksary, 1999. - 332 p.
10. N. T. Tuspek Nazerke Tleubekkyzy(2025). The Effectiveness of Digital Educational Resources in Teaching English at Higher Education Institutions// *Eurasian Science Review*. <https://doi.org/10.63034/esr-601>
11. H. Setyawan, Sukardi, Risfendra, N. Jalinus, J. Mardizal, G. F. Ananda(2024) Effectiveness of E-Learning-Based Learning in the Era of Digital Transformation: A Meta-Analysis // *Indonesian Journal of Educational Research and Review*. <https://doi.org/10.23887/ijerr.v7i2.76166>
12. Olivia Susan Ochoo, Dr. Shem Mwalw’a, Dr. Elizabeth Nduku(2023). Effectiveness of E-Learning on Students’ Learning Process at Catholic University of Eastern Africa// *Journal of Education and Practice*, Vol. 7 No. 6. <https://doi.org/10.47941/jep.1466>
13. Ruziev R. and others. Basics of Developing the Competence of Future Computer Science Teachers Using Digital Technologies// *Proceedings of the IV International Conference on Advances in Science, Engineering, and Digital Education*. AIP Conf. Proc. 3268, 070022-1–070022-5(2025); <https://doi.org/10.1063/5.0257131>
14. Ruzieva D.R. Practical effectiveness of information and educational environments in teaching programming languages // *Scientific and methodological journal of electronic education*. – Navoi, 2022. Volume 3, –№ 2 ISSN2-181-1199. – B. 16-20. (ej.nspi.uz).
15. Skivko M. O. Challenges for Modern Higher Education in the Context of Social, Digital, Technological, and Sustainable Trends // *Sociology of Science and Technology*. 2021. Vol. 12, n.2. Pp. 130-142. DOI: 10.24412/2079-0910-2021-2-130-142.
16. Krasilnikova, V.A. *Competence and competencies of the future teacher of informatics*. [Electronic resource] / V.A. Krasilnikova // *Actual problems of the ...*
17. “E-Learning in the Republic of Korea” Dae Joon Hwang | Hye-Kyung Yang | Hyeonjin Kim UNESCO Institute for Information Technologies in Education, 2010.