

DIDACTIC BASIS OF DEVELOPING SPECIAL COMPETENCES OF FUTURE TEACHERS THROUGH DIGITAL TECHNOLOGIES

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Abstract

This article discusses the issues of improving the methodology for developing special competencies of future teachers through digital technologies. The need to modernize pedagogical activities in the education system, improve the professional skills of teachers and adapt to the modern labor market in the conditions of digital transformation is analyzed. The article studies international experiences such as UNESCO, OECD and DigCompEdu, as well as reforms in the education system of Uzbekistan. The methodological foundations of using digital platforms, virtual laboratories, multimedia tools and artificial intelligence technologies for future teachers are considered. The conclusion provides scientific and practical recommendations on the integration of digital technologies in pedagogical education.

Keywords: Future teachers, special competencies, digital technologies, digital pedagogy, methodology, quality of education.

Introduction

One of the most urgent tasks facing 21st century education is the formation and development of special competencies of future teachers using digital technologies. The process of digital transformation requires not only the widespread use of information and communication technologies in educational institutions, but also a new methodology of pedagogical activity. Globally, a teacher's digital literacy, pedagogical design and innovative approaches are being identified as one of the main indicators of professional competence.

The TPACK model (Technological Pedagogical Content Knowledge) is widely recognized as one of the modern methodological approaches in the training of future teachers, which represents the integration of a teacher's technological, pedagogical and content knowledge [Mishra, Koehler, 2006: 1019]. At the same time, the DigCompEdu framework developed by the European Union is used as a universal criterion for the development of teachers' digital competence. UNESCO also emphasizes in its ICT Competency Framework for Teachers that the digital competence of teachers is an important factor determining the quality of education. In recent years, international experiences have been introduced into the Uzbek education system. For example, within the framework of the digitalization policy, research is being conducted on the formation of teachers' skills for the effective use of the digital environment



in their professional activities. Uzbek researchers point to the need to combine traditional pedagogical design with digital design[1,1020].

Also, scientific research is being conducted on the use of virtual laboratories, remote platforms, multimedia tools and artificial intelligence technologies in modern education. This provides a new level of quality in the professional activities of the teacher, and in turn, increases the efficiency and competitiveness of the education system.

Thus, improving the methodology for developing special competencies of future teachers based on digital technologies not only improves the quality of education, but also ensures the competitiveness of teachers in the modern labor market. The purpose of this article is to reveal the theoretical foundations of professional training of future teachers using digital technologies and identify practical methodological directions.

Literature review. The issue of developing special competencies of future teachers has been widely studied in international and national scientific research. In world pedagogical thinking, one of the conceptual foundations in this area is the TPACK model (Technological Pedagogical Content Knowledge). Mishra and Koehler in their study substantiated that ensuring the seamless integration of pedagogical knowledge, subject content and technological literacy is central to the professional training of teachers. This approach indicates the need for a thorough mastery of digital technologies in the methodological preparation of future teachers.

The DigCompEdu framework developed by the European Union provides a systematic model for the development of digital competencies. In this document, Redecker reflects the digital pedagogical competencies of teachers in six main areas - professional activity, use of digital resources, work with students, assessment, development of student competencies and innovative development. This approach implies not only the use of digital technologies, but also the flexible, creative and interactive organization of the educational process.

The ICT Competency Framework for Teachers, developed by UNESCO, defines a global strategy for preparing teachers to use information and communication technologies in the educational process. It identifies three levels of teacher competence (application of knowledge, deepening of knowledge, creation of knowledge). This approach serves as an important methodological basis for preparing teachers to function effectively in the digital economy. In recent years, foreign researchers have also paid special attention to the issues of training teachers in the digital era. For example, Starkey in his article analyzes the theoretical and practical foundations of training teachers for the digital age and emphasizes the need to develop teachers' digital design and reflection skills. Engeness, in his study on the formation of a teacher's digital identity, shows the advantages of using personalized digital environments in the learning process of students[2,63].

Among the new studies, Jurāne-Bēmane analyzes the issues of developing pedagogical design based on the principles of digital assessment and proposes to develop effective mechanisms for monitoring the digital competence of teachers. This approach ensures transparent and objective assessment in the process of developing competencies for future teachers.

These issues are also actively studied in the national scientific literature. In his article, Kholmatov reveals the opportunities for the digitalization process to develop the professional competencies of future teachers and shows the advantages of using electronic resources and remote platforms in the educational process. Niyazov, analyzing the interrelationship of



traditional and digital education, pedagogical design and its security, justifies the need to create a safe digital environment in the methodological activities of the teacher.

Jurayev, on the other hand, developed interactive methods for assessing knowledge in digital education and substantiated the effectiveness of monitoring student activity through the use of information technologies. At the same time, Oknazarov has extensively covered the problems of developing teachers' information competence in virtual technologies in distance education in his DSc-level research.

Among Uzbek scientists, Dzhurayeva has assessed digital literacy as the main competence of today's teacher and emphasized the need for its continuous development in pedagogical activities. These ideas indicate that the effective use of digital technologies is of fundamental importance in the development of special competencies of a teacher.

Methods

This research methodology was developed based on the methods of competency approach, systematic analysis and comparative pedagogical analysis. The process of developing special competencies of future teachers was studied as a complex socio-pedagogical phenomenon, and its components were determined as the integration of theoretical knowledge, practical skills, digital literacy and innovative pedagogical activities.

The theoretical basis of the research is the methodological documents of international organizations such as UNESCO and OECD. In particular, the UNESCO ICT Competency Framework for Teachers was chosen as a global model for the development of digital competencies. The principles presented in the OECD Digital Education Outlook and DigCompEdu documents were used to analyze the methodology for using digital technologies in the pedagogical process[3,42].

The following approaches are considered basic in the methodology:

1. Comparative pedagogical analysis - identifying effective methods by comparing foreign and national experiences.
2. Systemic approach - considering the educational process as a single pedagogical system and determining the place of digital technologies in it.
3. Modeling method - modeling the process of developing special competencies of future teachers based on the chain "digital educational environment - methodological approach - result".
4. Diagnostic approach - using digital assessment methods and online monitoring tools to determine the effectiveness of developing competencies.

In the research process, scientific articles, dissertations and international documents were studied using the content analysis method. Also, reforms in the education system of Uzbekistan (distance learning, digital platforms, advanced training courses for teachers) served as the basis for practical experience.

Thus, the research methodology was organized based on a comparative analysis of theoretical foundations, adaptation of international experience to national conditions, and the development of effective methodological solutions in pedagogical practice.



Results

The results of the study showed that digital technologies serve as an effective tool in developing special competencies of future teachers. The structural-functional model developed on the basis of the analysis consisted of five main blocks: educational environment, methodological tools, innovative technologies, assessment and monitoring, and professional development.

The use of online platforms such as Moodle, Google Classroom, MS Teams as an educational environment increased the interactivity of the learning process, expanded the opportunities for independent learning for students.

The use of multimedia presentations, video lessons, and virtual laboratories as methodological tools significantly increased the effectiveness of mastering subjects.

Innovative technologies - tools based on VR/AR and artificial intelligence - have developed students' skills in solving professional situations, creativity and flexibility. In assessment and monitoring, the use of electronic portfolios, online tests and rating systems has ensured transparency and objectivity of educational achievements[7,515].

Within the framework of the professional development block, opportunities have been identified for training teachers based on DigCompEdu and UNESCO standards and for the systematic development of digital literacy through advanced training courses.

In general, the results of the study show that the methodologically correct integration of digital technologies is a key factor in the formation of specific competencies of future teachers. This, in turn, ensures the effectiveness of the educational process, the creative potential of students and the competitiveness of teachers in the labor market.

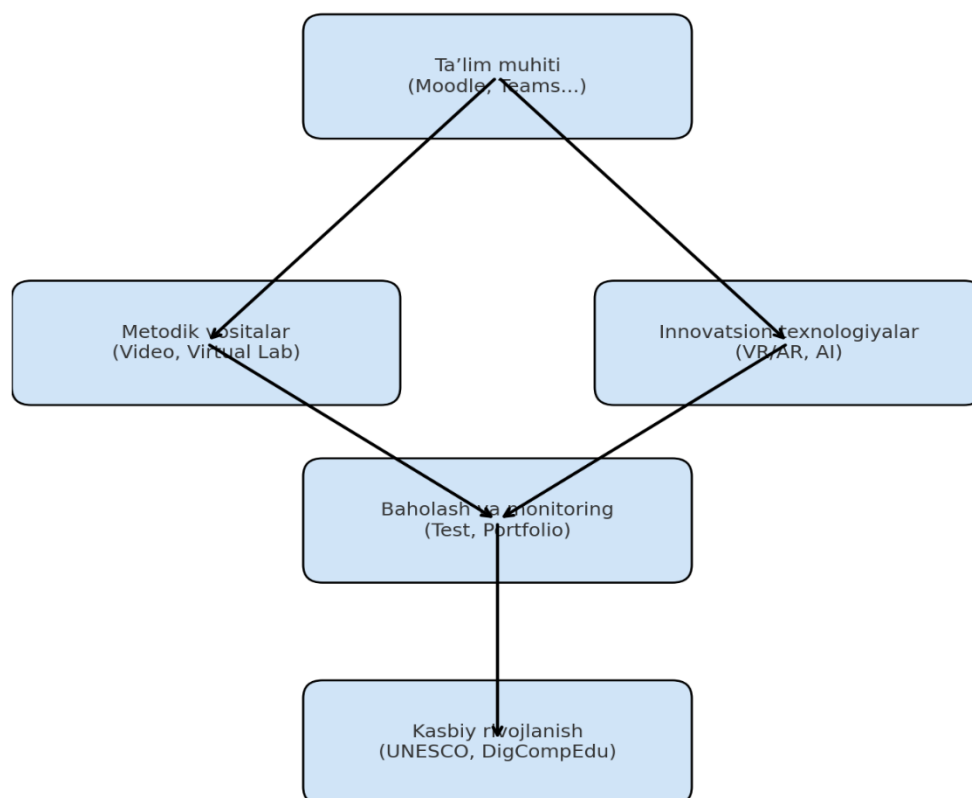


Figure 1. Structural-functional model of developing special competencies of future teachers based on digital technologies.



The figure shows the main blocks of the process of forming special competencies of future teachers. The educational environment (Moodle, Google Classroom, MS Teams) as a central point ensures the interactivity of the educational process. Based on it, methodological tools (video lessons, multimedia presentations, virtual laboratories) and innovative technologies (VR/AR, artificial intelligence) expand the knowledge and skills of future teachers. In the effective organization of this process, assessment and monitoring (online tests, portfolios, rating systems) allow determining and controlling the results. The final stage is the professional development block, which ensures continuous professional development of teachers and their competitiveness in the labor market based on UNESCO and DigCompEdu standards.

Discussion. The results of the study showed that digital technologies are an important factor in the development of special competencies of future teachers. Nevertheless, a number of limitations and problems were also identified in the process of analyzing the results.

Firstly, there are cases where the infrastructure and technical resources for using digital technologies are not sufficiently provided. In particular, the lack of high-speed internet, modern computer classes or virtual laboratories in some educational institutions limits the activities of teachers and students.

Secondly, future teachers themselves have different levels of training in digital literacy. This directly affects the effectiveness of the methodological process. For example, some students are ready to actively use multimedia tools, while others have difficulty moving away from traditional methods[8,290].

Thirdly, the issue of pedagogical design in organizing the educational process using digital technologies requires sufficient attention. A thorough methodological plan is necessary for the effective implementation of innovative technologies such as VR/AR or artificial intelligence. Otherwise, although the technology is included in the educational process, it may not produce the expected effect.

Fourthly, there are also some shortcomings in the assessment and monitoring systems. While online tests or e-portfolios are effective, filling them with quality content and adapting them to students' personal development remains a pressing issue.

The results of the discussion show that the following conditions are important for the effective development of special competencies based on digital technologies:

- providing educational institutions with modern technical resources;
- establishing digital literacy courses for future teachers;
- creating methodological guides based on the principles of pedagogical design;
- adapting assessment and monitoring systems to international standards.

Thus, the analysis of the results showed that digital technologies have the potential to increase educational efficiency, but their implementation requires solving methodological and organizational problems[10,102].

Conclusions and suggestions. The results of the study showed that the development of special competencies of future teachers using digital technologies is a relevant and promising direction. In the context of digital transformation, the education system requires teachers to have a high level of digital literacy, methodological flexibility, and innovative approaches. The structural-functional model developed on the basis of the analysis - in terms of educational environment, methodological tools, innovative technologies, assessment and monitoring, and professional



development blocks - allows for the systematic development of the competencies of future teachers.

The problems identified during the study (insufficient technical infrastructure, differences in digital literacy levels, weak pedagogical design, and problems in assessment systems) showed that the current process needs to be improved.

REFERENCES:

1. Incorporating modules such as “Digital Pedagogy” and “Pedagogical Design” into the mandatory curriculum in pedagogical universities.
2. Providing educational institutions with high-speed Internet, multimedia laboratories and virtual learning platforms.
3. Organizing special courses and trainings on digital literacy for future teachers.
4. Developing digital assessment systems (portfolios, adaptive tests, rating systems) based on international standards.
5. Supporting the continuous professional development of teachers and training them based on the UNESCO and DigCompEdu competency frameworks.

In general, improving the methodology for developing the special competencies of future teachers through digital technologies will not only increase the quality of education, but also ensure the competitiveness of future teachers in the labor market and serve to bring the education system of Uzbekistan closer to global standards.

REFERENCES:

1. Mishra P., Koehler M. Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge // Teachers College Record. – 2006. – Vol. 108, № 6. – P. 1017–1054.
2. Redecker C. European Framework for the Digital Competence of Educators: DigCompEdu. – Luxembourg: Publications Office of the European Union, 2017. – 101 p.
3. UNESCO. ICT Competency Framework for Teachers. Version 3. – Paris: UNESCO, 2018. – 68 p.
4. Starkey L. A review of research exploring teacher preparation for the digital age // Cambridge Journal of Education. – 2020. – Vol. 50, № 1. – P. 37–56.
5. Engeness I. Developing teachers’ digital identity: towards the pedagogic design principles of digital environments to enhance students’ learning in the 21st century // European Journal of Teacher Education. – 2021. – Vol. 44, № 1. – P. 96–114.
6. Jurāne-Brēmāne A. Developing Pedagogical Principles for Digital Assessment // Education Sciences. – 2024. – Vol. 14, № 10. – Article 1067. – P. 1–13.
7. Xolmatov P. Q. Ta’limni raqamlashtirish asosida bo’lajak o’qituvchilar kasbiy kompetensiyasini rivojlantirish imkoniyatlari // Academic Research in Educational Sciences. – 2022. – № 1(4). – P. 511–516.
8. Niyozov S. R. An’anaviy va raqamli ta’limda pedagogik dizayn va uning xavfsizligi // Academic Research in Educational Sciences. – 2023. – № 2(1). – P. 285–293.
9. Jurayev T. N. Interactive methods of assessment of knowledge on the basis of digital education on the subject “Information technology in education” // International Journal Paper Public Review. – 2020. – Vol. 1, № 2. – P. 71–77.



10. Oqnazarov T. T. Masofaviy ta'lim sharoitida o'qituvchilarning virtual texnologiyalar sohasidagi axborot kompetentligini rivojlantirish: DSc diss. ... ped. fan. – Samarqand: Sharof Rashidov nomidagi SamDU, 2023. – 190 p.
11. Djurayeva P. S. Raqamli savodxonlik – bugungi o'qituvchi kompetensiyasi // Ilmiy-amaliy anjuman materiallari. – Navoiy, 2023. – P. 3–7.

