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DIGITAL TRANSFORMATION OF EDUCATION: NEW PEDAGOGICAL APPROACHES

Abstract

The presented article explores innovative educational solutions in digital pedagogy. Since 2018, the Digital Kazakhstan program has been operating in the Republic of Kazakhstan, focusing on five main areas: digitalization of economic sectors, transition to a digital government, implementation of the Digital Silk Road initiative, development of human capital, and creation of an innovation ecosystem. Within the education system, the emphasis is placed on the priority area of human capital development.

The main purpose of this article is to present the results of pedagogical research on the topic: «Digital Pedagogy: Using Educational Resources». The primary materials for the study included scientific and theoretical information, university accounting documentation, and responses from survey participants, collected as part of socio-pedagogical diagnostics. The research methods employed include an analysis of psychological, pedagogical, socio-economic, and technical literature related to the research problem, as well as comparative and system-structural analysis. In addition, a sociological survey and questionnaire were conducted.

The results describe the transformational processes occurring within the higher education system, the terminological apparatus of modern didactics in the educational process using digital resources, and the results of a sociological survey conducted with participants in the pedagogical process at the Pedagogical Faculty of M. Utemisov West Kazakhstan University

Keywords: digital transformation, educational resources, higher education, didactics, transformational processes, IT-education.

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БІЛІМ БЕРУДІ ЦИФРЛЫҚ ТРАНСФОРМАЦИЯЛАУ: ЖАҢА ПЕДАГОГИКАЛЫҚ ТӘСІЛДЕР

Аңдатпа

Ұсынылған мақала сандық педагогикаға арналған инновациялық білім беру шешімдеріне арналады. Қазақстан Республикасында «Цифрлық Қазақстан» жүйесі 2018 жылдан бері жұмыс жасап келеді, оның бес негізгі бағыты бар: «Экономика салаларын цифрландыру», «Цифрлық мемлекетке көшу», «Цифрлық Жібек жолын іске асыру», «Адами капиталды дамыту», «Инновациялық экожүйені құру».

Мақаланы жазудағы негізгі мақсат: «Цифрлық педагогика: білім беру ресурстарын қолдану» тақырыбы бойынша педагогикалық зерттеу нәтижелерін көрсету. Зерттеуге арналған негізгі материалдар ғылыми-теориялық ақпараттар, университеттің есептік құжаттамасы, әлеуметтік-педагогикалық диагностика аясында респонденттердің жауаптарымен алынған бланкілер болды. Зерттеу әдістері: зерттеу мәселесі бойынша психологиялық-педагогикалық, әлеуметтік-экономикалық және техникалық әдебиеттерді талдау; салыстырмалы және жүйелік-құрылымдық талдау; социологиялық сұрау және сауалнама.

Нәтижелер жоғары білім беру жүйесінде болып жатқан сипатталған трансформациялық процестер, цифрлық трансформацияны ескере отырып, қазіргі білім беру үдерісі дидактикасының терминологиялық аппараты, М.Өтемісов атындағы Батыс Қазақстан университетінің педагогика факультеті студенттері мен оқытушылары арасында жүргізілген социологиялық сауалнама нәтижелері.

Түйін сөздер: цифрлық трансформация, білім беру ресурстары, жоғары білім, дидактика, трансформациялық процестер, IT-білім беру.

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ЦИФРОВАЯ ТРАНСФОРМАЦИЯ ОБРАЗОВАНИЯ: НОВЫЕ ПЕДАГОГИЧЕСКИЕ ПОДХОДЫ

Аннотация

Представленная статья раскрывает инновационные образовательные решения по цифровой педагогике. С 2018 года в Республике Казахстан действует система «Цифровой Казахстан», которая охватывает пять основных направлений: цифровизация отраслей экономики, переход на цифровое государство, реализация цифровой инициативы «Шелковый путь», развитие человеческого капитала и создание инновационной экосистемы. В системе образования приоритетным остается направление по Развитию человеческого капитала.

Главной целью написания статьи является представление результатов педагогического исследования по теме: «Цифровая педагогика: использования образовательных ресурсов». Основными материалами для проведения исследования были научно-теоретическая информация, отчетная документация университета, полученные бланки с ответами респондентов в рамках социально-педагогической диагностики. Методы исследования: анализ психолого-педагогической, социально-экономической и технической литературы по проблеме исследования; сравнительно-сопоставительный и системно-структурный анализ; социологический опрос и анкетирование.

Результатами являются описанные трансформационные процессы, происходящие в системе высшего образования, терминологический словарь, включающий концепты, связанные с цифровой педагогикой; результаты социологического опроса студентов и преподавателей педагогического факультета Западно-Казахстанского университета им.М.Утемисова.

Ключевые слова: цифровая трансформация, образовательные ресурсы, высшая школа, дидактика, трансформационные процессы, IT – образование.

Introduction. In light of recent global changes, significant attention is being paid to the digital economy, which is increasingly becoming a central component of the global landscape.

Humanity now views information as a key resource – the driving force behind competitiveness and the successful development of society. The scientific community is conducting extensive research to explore the specific capabilities of the virtual environment as a carrier of vast amounts of information, as well as the techniques for processing and applying this information in real-life situations. Today, digital technologies are becoming a key auxiliary resource that determines the dynamics of change in modern society. Their rapid development and social significance are transforming the usual models of business, economics, services and public life.

This dynamic transformation has led to the emergence of new educational paradigms that prioritize digital literacy, critical thinking, and the ability to navigate complex technological environments. In the sphere of education, digital technologies are not merely supplementary tools but have become foundational elements that reshape teaching methodologies, learning processes, and communication between all participants in the educational ecosystem. Institutions are increasingly integrating artificial intelligence, data analytics, and cloud-based platforms to personalize learning experiences and enhance accessibility. Thus, the professional role of teachers is constantly being transformed, which involves acquiring advanced competencies and critically rethinking pedagogical paradigms. Such changes are necessary for constructive interaction with the digital generation and the formation of intellectual and practical skills in students that are in demand in a knowledge-oriented economy.

Basic provisions. The article defines key terms in digital pedagogy, including concepts such as "digital pedagogy," "information competence," "digital teacher," and "digital student." It discusses notions like adaptive learning, mobile learning, massive open online courses (MOOCs), virtual reality, and gamification. Special attention is given to the term "digital inequality," which reflects disparities in access to educational technologies among different social groups.

Digital pedagogy is a key component of the modern educational environment, aimed at integrating digital technologies to improve the quality and effectiveness of learning; modern approaches to its implementation are based on the use of interactive platforms, online courses and adaptive educational systems; while digital pedagogy has a number of advantages, such as personalization of learning, accessibility of educational resources and increased student engagement, but is also associated with

challenges, including the need to develop digital competence of teachers and overcome technical barriers; successful examples of the implementation of digital technologies confirm their potential for transforming education, and development prospects are associated with the expanded use of artificial intelligence, virtual and augmented reality.

Materials and Methods. In our study, we employed a comprehensive set of methodological approaches to explore digital pedagogy within the context of digital transformation in education. First and foremost, the author conducted an in-depth analysis of psychological-pedagogical, socio-economic, and technical literature, which made it possible to trace the evolution of concepts and structures of digital education. Comparative and system-structural analyses allowed for the comparison of traditional and digital teaching methods, the examination of digital tools and platforms, and the consideration of digital pedagogy as a holistic system encompassing technologies, content, learning participants, and teaching methodology.

In addition, the article presents an empirical component based on the results of a sociological study conducted among students and faculty members of the pedagogical faculty. Altogether, the survey encompassed 51 students and 7 teachers, with the primary objective of investigating attitudes toward digitalization and determining the degree of digital competence. Three groups of teachers were identified based on their ICT proficiency: those who use technology sporadically, those who use it out of necessity, and innovative educators. These methods enabled the author to obtain an objective picture of how digital changes are perceived in the higher education system and to justify the need for further development of digital competencies among all participants in the educational process [1].

An analysis of scientific and theoretical literature made it possible to identify the characterological essence of the concept of «digital pedagogy». V.I.Toktarova and A.E.Shpak identified synonyms for this concept: «electronic pedagogy», «virtual pedagogy» and «technopedagogy» [2]. The authors systematized a number of conceptual foundations that characterize digital pedagogy as a scientific and pedagogical concept (Table 1).

Table 1. Systematization of the concept of «digital pedagogy»

Authors	*Definition*
(E.Yu. Ilaltdinova, T.K.Belyaeva, I.V.Lebedeva)	a field of pedagogical science that includes the analysis of the essential characteristics, principles and laws of digital education. [3];
(E.Kazakova)	a field of pedagogical science that studies the theoretical and practical foundations of the active use of digital technologies, tools and products in the educational process in order to increase its efficiency, accessibility and interactivity [4];
(B.Croxall)	represents the meaningful use of digital tools and resources that can transform and support the educational process [5];
(M.Milton)	organization of the learning process, which involves constructing an educational trajectory through solving educational problems based on digital technologies [6].

N.Yu.Ignatova notes that education is one of the basic spheres of human existence. Professional development plays a vital role in the development of personality and in the process of social integration. In addition, skills in digital transformation of professional activities and readiness for rapid adaptation in the context of global changes are becoming a significant requirement from employers [7]. Therefore, innovative solutions of digital pedagogy in the educational system deserve special attention.

1. Digital advantage - development of knowledge and competence capital. The main criteria include: high information competence necessary for the implementation of future professional activities; a developed professional terminological vocabulary; as well as readiness for continuous professional and personal self-improvement throughout life.

The system of training professional skills, self-development and professional improvement is being implemented in a new way. The coronavirus pandemic has accelerated digital transformation, with massive open network platforms stepping up to help educators improve their skills. Currently, the most common platforms are Coursera, Khan Academy, Udemy, edX, FutureLearn, and other similar online courses.

2. Current challenges in IT education. Digital pedagogical transformation offers vast opportunities for improving the quality of education, yet its implementation is often challenging. Among the key issues are the growing risk of computer addiction among schoolchildren, who increasingly replace traditional play with mobile devices, leading to negative effects on their mental activity. Equally significant is the problem of teachers' information competence, which requires not only the ability to structure educational content effectively but also to design modern presentations, digital assignments, and mobile applications. As Professor M. M. Kovalev emphasizes, the introduction of innovative IT-based professional development programs for teachers is essential to address these challenges [8].

3. Impact of the pandemic on the digital transformation of education. The rapid spread of COVID-19 brought global changes to education, forcing 1.6 billion students in nearly 200 countries to switch to home-based and remote learning, with the most severe impact felt in low-income countries where 86% of children missed primary schooling compared to 20% in high-HDI states. By April 2020, 94% of learners worldwide—from preschoolers to university students—were engaged in online education, largely through platforms such as Zoom, while universities adopted distance and blended models. Educators expanded digital practices by developing personal educational spaces that included presentations, e-textbooks, YouTube channels, simulators, and social media communities. However, attitudes toward digital learning remained mixed: a Times Higher Education survey of 200 experts from 45 countries (2018) showed that while 63% believed online education would dominate by 2030, only 24% viewed MOOCs as more effective than traditional courses, and 19% expected classical formats to be fully replaced by internet-based alternatives [9,10].

4. Cluster-based approaches to the development of education. Digitalization of the educational space has triggered transformations in social technologies, actualizing the importance of cluster principles that enable the organization and coordination of pedagogical activity, continuous professional development, and effective management. This article aims to explore digital pedagogy as an innovative educational technology by defining its key concepts and theoretical foundations, examining modern approaches to implementing digital tools in education, outlining their benefits and challenges, and analyzing successful practices to determine future prospects. The study is based on scientific and theoretical literature, university reports, and survey data from socio-pedagogical diagnostics, while the applied methods include psychological, pedagogical, socio-economic, and technical analysis, comparative and system-structural approaches, as well as sociological surveys and questionnaires.

Results. One of the pressing problems of modern society is digital inequality. According to PISA-2018, only 9% of 600 thousand 15-year-old schoolchildren do not have a specially equipped place for study, and this is most acute in Indonesia, the Philippines and Thailand. At the same time, in countries with a high level of prosperity, such as Austria, Denmark, Iceland, Lithuania, the Netherlands, Norway, Poland, Slovenia and Switzerland, 95% of students have a workplace and a personal computer. In the United States and Mexico, social stratification is observed: teenagers from well-off families are provided with digital devices for study, while a significant part of their peers from disadvantaged families are deprived of such opportunities [11].

According to B.V.Sorvirova and A.M.Baranov, such a cluster includes both manufacturing organizations. This group also includes service and technical companies, educational institutions, financial organizations and other structures. The educational cluster provides conditions for the integration of educational, research, practical and production organizations. Digital transformation, in turn, provides broad prospects for the development of educational institutions, especially in the field of higher education.

Teachers at M.Utemisov West Kazakhstan University adhere to the following technological trends aimed at the digitalization of the educational process (Table 2)

Table 2. Current technological trends in the field of education

№	Trend name	Content
1	Cloud technologies	Deep and voluminous storage of information, which can be accessed via the Internet
2	Massive Open Online Courses	online courses for advanced training and self-education; intended for mass use
3	Mobile-based education	a form of learning that uses mobile devices and applications to provide access to educational resources anytime and anywhere
4	Personalized learning	an educational approach that tailors instruction, content, and pace to the individual needs, interests, and abilities of each learner
5	Digital immersive environment	a computer-generated space that creates interactive, 3D experiences, used in education to simulate real-world scenarios and enhance learning engagement
6	Gamification	adding computer game elements to the educational process, related to the completion of specific tasks

The experimental part of our study was conducted at M.Utemisov West Kazakhstan University, where 51 second- and third-year students from the specialties «6B01301 Pedagogy and Methodology of Primary Education» and «6B01303 Primary Education» participated. Seven teachers were involved in the study.

1. Questionnaire «Social aspects of digitalization». Objective: to identify respondents' attitudes towards the digitalization of society, the level of digital competence and the frequency of use of digital technologies.

Main sections of the questionnaire:

- General information (age, occupation).
- Use of digital technologies (how often do they use the Internet, mobile applications, educational platforms).
- Attitude to digitalization (positive / negative impact on education, work, everyday life).
- Level of digital competence (self-assessment of skills: basic, intermediate, advanced).
- Problems and barriers (lack of technical means, low Internet speed, lack of digital skills). (Figure 1).

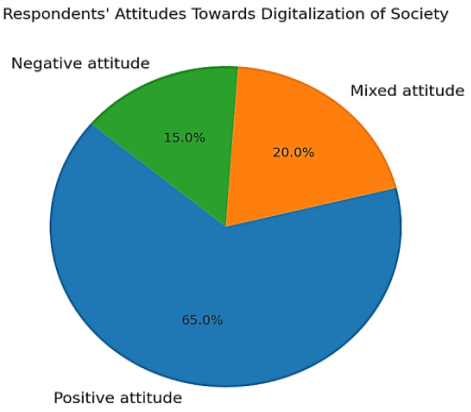

Figure 1. Results of the survey «Social aspects of digitalization»

The majority (65%) perceive it positively, some (20%) note its dual nature, and 15% express concern about the negative consequences.

Diagnostics "Level of digital competence of teachers and students". Main diagnostic criteria:

- Frequency of using digital technologies (daily, several times a week, rarely).
- Skills in working with educational platforms (Zoom, Google Classroom, Moodle, etc.).
- Use of digital tools in professional/educational activities (presentations, online tests, mobile applications).
- Self-assessment of digital competence (low, medium, high).
- Attitude to the digitalization of education (positive, neutral, negative).

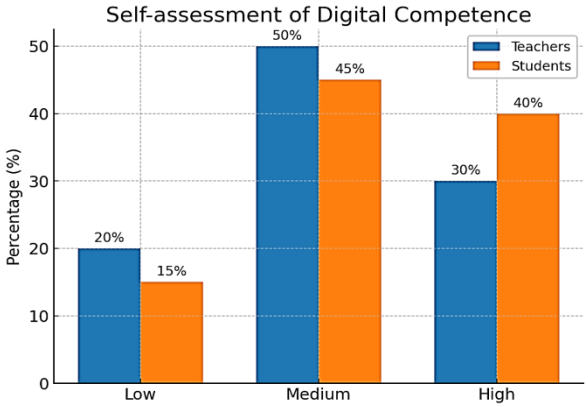

Figure 2. Results of a Self-assessment of Digital Competence

Students: the results show that the majority of students (90%) use digital technologies on a daily basis, while only 10% turn to them several times a week. In terms of self-assessment of digital competence, 40% of students rate their level as high, 45% as medium, and 15% as low. Their general attitude toward digitalization is predominantly positive (75%), with 20% expressing a mixed perception and only 5% demonstrating a negative stance.

Teachers: among teachers, 71% report daily use of digital technologies, whereas 29% use them several times per week. Regarding digital competence, 30% consider their level high, half of the respondents (50%) assess it as medium, and 20% admit to having a low level. In terms of perception, 65% of teachers hold a positive view of digitalization, 25% have a mixed perspective, and 10% maintain a negative attitude.

Based on the data obtained, it can be concluded that modern society as a whole has integrated digital technologies, and they play a particularly significant role in the higher education system. In this context, concepts such as “digital teacher” and “digital student” are increasingly used, which opens up a new direction for pedagogical research.

Discussion. The conducted study highlights the multifaceted nature of digital transformation in education, emphasizing both its potential and the accompanying challenges. Empirical data collected from students and teachers confirm that digital technologies have become an integral part of the modern educational environment, offering opportunities for personalized learning, expanded access to resources, and increased engagement through interactive tools. However, the transition to digital pedagogy is accompanied by a number of issues. The results show that a significant portion of teachers use digital tools out of necessity rather than as a conscious pedagogical strategy, indicating the urgent need for a systematic enhancement of digital competencies among educators.

In addition, the discussion raises the important issue of digital inequality, as not all students and educational institutions have equal access to digital infrastructure and resources. This not only affects academic performance but also impacts the social inclusion of students within the digital environment. The study confirms that digitalization expands educational opportunities, yet its successful implementation requires institutional reforms, infrastructure investments, and the creation of adaptive learning environments. In this context, the role of digital pedagogy goes beyond being a supportive tool and becomes a strategic foundation shaping the future of education through the integration of technology and didactic principles. The author emphasizes the need for further exploration of the long-term effects of digital transformation and the importance of collaboration among policymakers, educators, and technologists to build an inclusive and effective digital educational environment.

Conclusion. Global events of recent years have led to profound changes in the life of society, with the process of digitalization of key areas acquiring particular importance. Education, as one of the leading social institutions, needs technological and digital strengthening, which makes the development of scientific and theoretical foundations of digital pedagogy, its cultural and didactic content one of the

priority tasks. Today, all participants in the educational process are forming their own professional and digital spaces, which are generally transforming the system of higher education. At the same time, digital transformation requires skillful integration of modern pedagogical technologies, such as group work, research projects, brainstorming, complex assignments, educational research and the use of educational video materials. A harmonious combination of digital tools with traditional teaching methods allows us to improve its quality, form new formats of the educational process and develop info+rmation literacy of students.

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