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ENSURING THE QUALITY OF EDUCATION DURING MARTIAL LAW: THE ROLE OF DIGITAL TECHNOLOGIES

ЗАБЕЗПЕЧЕННЯ ЯКОСТІ ОСВІТИ ПІД ЧАС ВОЄННОГО СТАНУ: РОЛЬ ЦИФРОВИХ ТЕХНОЛОГІЙ

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Abstract. The paper highlights the importance and role of digital technologies in ensuring the quality of education in the context of martial law in Ukraine. It considers the challenges associated with the destruction of infrastructure, population displacement, limited access to face-to-face learning, and the difficulties in organising a continuous educational process. It highlights the need for an in-depth analysis of the education system and the introduction of new approaches to support the quality of education. It justifies the importance of digital transformation as a systematic, comprehensive process of integrating digital tools into all aspects of learning, including personalisation, flexibility, inclusiveness, security, and the application of the latest teaching methods. It is emphasised that digital technologies not only contribute to the survival of education during the war, but also become a platform for its innovative development. The advantages of distance, blended and mobile learning are analysed in comparison with the traditional model of education, in particular in terms of access to resources, activation of the learning process, the role of the teacher and assessment of knowledge. It is also noted that the digital transformation of education helps to overcome regional educational inequality and make learning more accessible even in crisis conditions.

Keywords: digital technologies, quality of education, martial law, digital transformation, distance learning, blended learning, educational technologies, inclusiveness, personalization of learning, educational inequality, digital pedagogy, online education, continuity of learning, innovation in education, knowledge assessment, digital educational platforms.

Introduction.

Relevance of the topic. The issue of the importance and role of digital technologies in ensuring the quality of education during martial law is extremely important and relevant due to the significant challenges that war poses to the education



system and the opportunities that digital tools offer for overcoming these crisis situations. Education under martial law is a serious challenge for the state and society, as the destruction of infrastructure, population displacement and the lack of conditions for face-to-face learning threaten the continuity and quality of the educational process.

Despite a significant number of studies [1,2,3,4] devoted to the development of education and its ability to adapt to changes in the external environment, there is still a need for a thorough analysis of current problems in educational activities in order to identify and develop a further strategy for the development of education in Ukraine. Under martial law, the education system faces a number of critical challenges: destruction of educational infrastructure, threats to the life and health of participants in the educational process, power outages, and unstable access to the Internet. Everything mentioned above significantly complicates the organisation of the educational process and creates additional barriers to the education system functioning. Thus, there is a need to regularly review and rethink existing educational models, develop new approaches, and search for effective mechanisms to overcome crisis situations. This, in turn, will ensure the continuity and progressive development of education in Ukraine even under extreme circumstances.

Main material.

The concept of “quality of education” has a broad scientific and regulatory interpretation. It covers a set of characteristics of the educational process and its results in accordance with established standards, the society’s needs, and the labour market. In scientific terms, the quality of education is defined as “... a set of characteristics of the educational process that determine the consistent and practically effective formation of competence and professional awareness. This is a certain level of knowledge and skills, mental, physical and moral development achieved by graduates of an educational institution in accordance with the planned goals of training and education” [5].

The regulatory and legal understanding of the quality of education in Ukraine is enshrined in the Law of Ukraine “On Education” (No. 2145-VIII of 5 September 2017), where “... the quality of education is the compliance of learning outcomes with the



requirements established by law, the relevant education standard and/or the contract for the provision of educational services;

the quality of educational activities is the level of organisation, provision and implementation of the educational process, which ensures that individuals receive a quality education and meets the requirements established by law and/or the contract for the provision of educational services” [6].

The Law of Ukraine “On Higher Education” offers the following interpretation: “...the quality of higher education is the compliance of the conditions for conducting educational activities and learning outcomes with the requirements of legislation and standards of higher education, professional and/or international standards (if any), as well as the needs of stakeholders and society, which is ensured through the implementation of internal and external quality assurance procedures...” [7].

Taking into account the society’s urgent needs and in order to ensure and implement the educational process, since the beginning of the coronavirus pandemic in Ukraine and around the world, there has been a process of deepening the formation of a digital society. Today, in the context of active warfare, this process is becoming even more evident and reaching a new level of development. Ukraine’s regulatory framework is currently taking into account the need to integrate digital technologies into the educational process during martial law. The Ministry of Education and Science of Ukraine, in cooperation with the Ministry of Digital Transformation, is implementing strategies for digitalisation and support for online education, as reflected in numerous documents and programmes, including state initiatives to support digital learning centres and international projects, particularly those funded by the EU and UNICEF [8, 9, 10].

Scientific works by both Ukrainian and foreign researchers emphasise that digital technologies are becoming not only a means of survival for education in wartime, but also a platform for its innovative development [11, 12]. According to Ukrainian scientists, distance learning during wartime has specific features that require adaptive strategies and technical support with security in mind. Experts also emphasise the importance of inclusiveness and equal access provided by digital solutions, especially



in times of crisis [13].

The digital transformation of education is a profound and complex process of integrating digital technologies into all aspects of the educational environment, changing not only the means of teaching, but pedagogical approaches, management models, teachers' and students' roles, and the organisation of the educational process as well. It is more than just digitisation or the introduction of ICT – it is an alteration in the entire paradigm of education in the digital age. The key characteristics of the education digital transformation include:

1. Systematicity (the transformation covers not individual courses or technologies, but the entire infrastructure – from administration to pedagogy).
2. Personalisation (using data to tailor content to individual student needs).
3. Flexibility and mobility (access to educational resources anytime, anywhere via LMS, mobile apps, cloud technologies).
4. Interactivity and multimedia (application of video, AR/VR, simulations, interactive whiteboards, chatbots to engage students).
5. Digital pedagogy (use of new learning models – blended, distance, microlearning, project-based learning supported by digital tools).
6. Continuity of learning (digital technologies enable the implementation of the concept of lifelong learning).
7. Security and ethics (issues of personal data protection, cybersecurity, digital etiquette, academic integrity).

Analysing and discussing the characteristics of digital transformation in higher education institutions, it is important to note the transition from traditional lectures to hybrid or fully online learning; the use of AI/ML for assessment, content recommendations and student support; and the use of digital education ecosystems (e.g. Google Workspace, Moodle, Canvas). The development of digital competence among teachers and students, as well as the use of EdTech solutions for performance analytics, motivation and adaptation, are of great importance in the transformation process. It is quite obvious that in the current conditions of global transformations, including war, pandemic and technological breakthroughs, the education system is undergoing



significant changes. Universities, schools and other educational institutions are increasingly implementing digital tools that are changing approaches to learning, teaching, assessment and interaction among participants of the educational process.

Comparing the traditional model of education with digital transformation allows us to identify the key differences, advantages and challenges that accompany this process (See Table 1). Such an analysis is particularly relevant in the context of martial law, when it is necessary to ensure the continuity, quality and accessibility of education for all participants in the educational environment.

Table 1 – Traditional education vs digital transformation

Parameter	Traditional Education	Digital transformation
Form of education	Full-time	Blended, distance, mobile
Access to resources	Limited (libraries, paper textbooks)	Round-the-clock access to online resources, cloud databases
Pedagogy	Lecture-based, explanatory and illustrative	Active, digital, adaptive, gamified
Role of the teacher	Knowledge transmitter	Mentor, facilitator, digital process coordinator
Assessment	Written, final	Formative, automated, using AI
Feedback	Sporadic, mainly offline	Immediate, using digital tools
Personalisation of learning	Minimal	High – through learning analytics, adaptive platforms
Technological tools	Limited (projector, board)	LMS, video conferencing, AR/VR, interactive simulators

When considering forms of education, it becomes obvious that traditional education is mainly based on a face-to-face format, with the learning process taking place in a classroom under the guidance of a teacher. This format provides direct interaction but does not take into account the needs of those who have limited access to educational institutions (due to war, disability, etc.). Simultaneously, with digital transformation, blended, distance and mobile learning allow for flexible organisation of the educational process. Digital technologies reduce dependence on physical



presence, which is critically important in times of war, pandemics or other crises.

When analysing access to resources, it should be noted that in traditional education, learning materials are limited to libraries, paper textbooks or copies of lecture notes. Access is limited in terms of time and place. In contrast, online resources, electronic libraries, and cloud services provide 24/7 access to a wide range of up-to-date information. This promotes independent learning and deepens knowledge. Additionally, resolving regional educational disparities can be greatly aided by digital education. Access to trained instructors and educational resources is frequently restricted in rural and conflict-affected communities. Ukraine can lessen these differences and guarantee that all students, wherever they may be, receive high-quality education by utilizing online courses, interactive learning resources, and AI-driven tailored education models [14].

Traditional education is dominated by a lecture-illustrative teaching style. Students are passive listeners, and the learning process is focused on memorisation. Digital transformation is characterised by the use of active, student-centred methods: gamification, project-based learning, adaptive learning, and microlearning, which stimulate motivation and engagement. The role of the teacher in the educational process is also changing. Whereas previously the teacher acted as a source of knowledge, providing information in a ready-made form, today the role of the teacher is transforming into that of a mentor, facilitator, and digital navigator who accompanies students on their individual trajectories.

As for the assessment concerned, traditional education mainly used summative assessment in the form of written exams. It was often subjective and unsystematic. Digital transformation brings formative, ongoing assessment using digital tests, e-portfolios and artificial intelligence. It is characterised by high objectivity, automation and analysis of results. Feedback in traditional education is limited, usually during classes or after exams. It is often delayed, which reduces the effectiveness of correction. Digital transformation allows you to engage and use interactive platforms (LMS, chats, forums, automated systems) to provide instant feedback.









When talking about personalised learning, it should be noted that traditional



education is geared towards an “average student”, with the same tasks and pace for all learners. Digital transformation introduces individualised learning paths based on data about performance and interests (Learning Analytics). Moreover, digital transformation paves the way and enables the use of a wide range of tools: LMS, Zoom, Teams, AR/VR, interactive models, simulations. Traditional technological tools, such as projectors, whiteboards, and handouts, with minimal interactivity, are becoming a thing of the past.

Therefore, the digital transformation of education is not simply a modernisation of technical resources. It creates new opportunities for flexibility, accessibility, inclusiveness, and quality of learning, which is particularly relevant in times of war, crisis, or global challenges. The obvious advantages of digital transformation are clearly shown in Table 2.

Table 2 – Benefits of digital transformation

Parameter		Digital transformation
Form of education		Accessibility and inclusiveness of learning regardless of location.
Access to resources		Continuous, instant access to updated learning content.
Pedagogy		Active student participation, development of critical thinking and autonomy.
Role of the teacher		More attention to support, motivation, and feedback.
Assessment		Flexibility, efficiency, and a personalised approach to assessment.
Feedback		Improved interaction, motivation, and effective learning.
Personalisation of learning		Increased learning efficiency through adaptation to student needs.
Technological tools		Visualisation, modelling of real-life situations, and student engagement.

Let us note the possibility of ensuring the accessibility and inclusiveness of education regardless of location by exploring the parameters of digital transformation.



This is especially important during restrictions caused by pandemics, war, or other crises. Modern digital tools provide constant and instant access to up-to-date educational content, ensuring timely knowledge updates and improving the quality of learning.

The use of digital technologies stimulates active student participation, promotes critical thinking, and fosters autonomy in learning, which is consistent with the competency-based approach. The role of the teacher is also changing. The teacher becomes not only a source of information, but also a mentor, moderator and motivator, whose main task is to support students and provide effective feedback. Digital tools also make the assessment process more flexible and personalised. The use of electronic platforms allows for quick testing of knowledge and consideration of students' individual characteristics. Digital tools improve communication and provide fast and regular feedback, which has a positive effect on motivation and learning effectiveness. Adaptive technologies allow the learning process to be tailored to the level of preparation, a particular student style and pace of learning, which significantly increases the effectiveness of knowledge acquisition. The use of innovative tools (visualisation, modelling of real situations, interactive simulations) makes learning more practice-oriented and helps to engage students.

According to data presented at the forum “Digital Learning Centres: Experience, Challenges, Prospects”, more than two million children in Ukraine have lost safe and stable access to education since the start of the war due to the destruction of schools, lack of shelters, and problems with electricity supply [8]. In such conditions, the state and society must adapt quickly to ensure education, which is fundamental to the development of the younger generation and the preservation of national potential. The forum was held in Kyiv by the Finnish international non-governmental organisation Finn Church Aid as part of the Multi-Year Resilience Programme (MYRP) with financial support from the “Education Cannot Wait” fund. It provided a platform for discussing the role of Digital Learning Centres (DLCs) in ensuring continuous education for children during the war and the prospects for their development.

Digital technologies are a key tool for ensuring continuous access to knowledge.



They enable the creation of distance learning platforms and digital learning centres, as well as the use of multimedia resources, making education accessible regardless of the location of students and teachers. Distance learning, based on the principles of open access, has become a safe and reasonable format in wartime, although it has specific challenges, such as internet outages, air raid sirens, and the need for shelter during classes [11]. Digital tools also provide flexibility in learning, which is extremely important in situations of forced displacement.

The growing role of EdTech solutions during the crisis has become particularly noticeable. Support from international organisations and initiatives such as the Device Coalition, which supply digital devices to Ukrainian schools and students in combat zones, helps to maintain not only access to education but also the quality of education as a whole [9]. In addition, UNICEF is helping students who are unable to attend classes in person to access distance learning through formal and informal courses funded by the European Union. Since 2023, they have received more than 18,000 devices for learning: 7,000 from the EU's External Action Service and 11,170 from the European Commission's Directorate-General for Civil Protection and Humanitarian Aid. This allows children living in the areas most affected by the war to continue their education [10].

Distance learning is becoming increasingly popular globally, but the quality of education varies. THE Online Learning Rankings 2024, created by the Times Higher Education platform, is the first attempt to evaluate and measure online learning around the world [15]. In this pilot edition, THE used 17 indicators that comprised four main components:

1. Resources – technical, financial and human resources dedicated to online learning;
2. Engagement – student engagement, interaction on platforms;
3. Outcomes – learning outcomes, course completion, employment;
4. Environment – digital infrastructure, accessibility, environment that tracks the level of inclusiveness, diversity and support.

The best Ukrainian universities were the National Technical University “Kharkiv



Polytechnic Institute”, Sumy State University and V. N. Karazin Kharkiv National University. In addition to the universities included in the Times Higher Education platform ranking, other higher education institutions in Ukraine, in particular the Vadym Hetman Kyiv National Economic University, can also boast practical results of digitalisation. Digital solutions began to be implemented here long before it became common practice (See Table 3).

Table 3 – Ukrainian universities in the ranking

Name of the institution	Tier	Resources	Engagement	Outcomes	Environment
Sumy State University	Silver	44.6	45.7	84.4	49.4
National Technical University “Kharkiv Polytechnic Institute”	Silver	44.8	53.3	61.9	42.6
V. N. Karazin Kharkiv National University	Bronze	21.3	50.7	29.3	29.0

Source: Table based on [15]

Conclusions and future perspectives

The digital transformation of education is not merely a transition to new forms of learning, but a profound rethinking of the entire education system, including fundamental changes in models, processes and modes of interaction. It contributes to increasing the accessibility of education, especially for those who face geographical, social or physical barriers, by opening up opportunities for distance, individualised and continuous learning. Thanks to the integration of innovative technologies such as ICT, artificial intelligence, data analytics, cloud services and EdTech platforms, the educational process is becoming more effective, motivating and tailored to students’ individual needs.

Digital transformation is changing the role of teachers from mere transmitters of knowledge to learning coordinators who use intelligent tools to create interactive, multimedia content and assess individual student progress. For example, artificial



intelligence helps personalise learning and visualise complex concepts through augmented or virtual reality, while EdTech platforms remove time and geographical barriers, expanding access to quality education anytime, anywhere.

At the state level, digital transformation is a strategic priority aimed at increasing the innovation and competitiveness of the education system by preparing students for the modern digital labour market. Meanwhile, it requires comprehensive work – modernisation of infrastructure, improvement of teachers’ qualifications, and attention to ethical aspects such as personal data protection and digital security. Thus, the digital transformation of education is a complex process that combines technological innovation with changes in pedagogy and management, creating new opportunities and improving the quality of education for all participants in the learning process.

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Анотація. У статті висвітлюється значення та роль цифрових технологій у забезпеченні якості освіти в умовах воєнного стану в Україні. Розглядаються виклики, пов'язані з руйнуванням інфраструктури, переміщенням населення, обмеженим доступом до очного навчання та складнощами організації безперервного освітнього процесу. Виокремлюється необхідність глибокого аналізу освітньої системи та впровадження новітніх підходів для підтримки якості освіти. Обґрунтовується важливість цифрової трансформації як системного, комплексного процесу інтеграції цифрових інструментів у всі аспекти навчання, що включає персоналізацію, гнучкість, інклюзивність, безпеку та застосування новітніх педагогічних методик. Підкреслюється, що цифрові технології не лише сприяють виживанню освіти під час війни, а й стають платформою для її інноваційного розвитку. Аналізуються переваги дистанційного, змішаного і мобільного навчання у порівнянні з традиційною моделлю освіти, зокрема у питаннях доступу до ресурсів, активізації навчального процесу, ролі викладача та оцінювання знань. Зазначається, що цифрова трансформація освіти допомагає подолати регіональну освітню нерівність і зробити навчання більш доступним навіть у кризових умовах.

Ключові слова: цифрові технології, якість освіти, воєнний стан, цифрова трансформація, дистанційне навчання, змішане навчання, освітні технології, інклюзивність, персоналізація навчання, освітня нерівність, цифрова педагогіка, онлайн-освіта, безперервність навчання, інновації в освіті, оцінювання знань, цифрові освітні платформи.

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