

THE CONCEPT OF EDUCATION QUALITY IN A DIGITAL EDUCATIONAL ENVIRONMENT

Salikhova Alfira Askhatovna

Student of the faculty of Educational Management
Tashkent International University of Education.

E-mail: u25099@tiue.uz

DOI: 10.61587/mmit.tiue.uz.v1i1.364

Abstract. The quality of education in an academic environment depends on the integration of pedagogical technologies, digital platforms, and artificial intelligence tools. This article analyzes the concept of school education quality within the context of the systemic digital transformation occurring in Uzbekistan, with a particular focus on platforms such as emaktab.uz. The study examines the impact of the digital environment on students' cognitive abilities, including its positive aspects (problem-solving and the development of metacognitive skills) and its risks (digital distraction and increased cognitive load). Furthermore, it considers the role of artificial intelligence in personalizing education and automating tasks, as well as significant challenges like algorithmic bias, data privacy concerns, and the digital divide. Drawing on an analysis of recent scientific literature, reports from the Organisation for Economic Co-operation and Development (OECD) and UNESCO, and systematic reviews, the article emphasizes the central role of teacher competencies in realizing the potential of digitalization. A balanced, human-centered approach is proposed to ensure that digital technologies and artificial intelligence enhance the quality of education without undermining equity, critical thinking, and student autonomy.

Keywords: *education quality, digital educational environment, digitalization, online learning, meta-subject skills, pedagogical technologies.*

Introduction

Education is one of the most important part of human life, as it forms an individual's personality and enables them to adapt quickly to societal changes. By using pedagogical technologies in the educational process, it is possible to create conveniences that make learning more flexible, accessible from anywhere and at any time. To improve the quality of education, it is essential to develop and implement new and effective teaching methods. A modern teacher is a well-rounded specialist who, in addition to a thorough knowledge of their subject, possesses sufficient expertise in psychology, a creative approach, and information technology. Online platforms are considered assistants to teachers, as they monitor academic performance and support independent study.

The novelty of the work lies in considering the quality of education in the digital environment as a result of developing meta-subject skills and the effective use of modern educational platforms, such as Maktab.uz.

Literature Review

The term "education" is considered a lifelong process of personality formation. Education is a process of acquiring knowledge and skills. It fosters personal development. The philosophical foundations of knowledge transfer are revealed in the work of Ivanov [1], who refers to Pythagoras's ideas and notes that knowledge can be transmitted without losing its content.

Research by authors [2] emphasizes that the introduction of digital technologies contributes to increasing the accessibility of education. The author refers to the fact that education quality is a set of learning outcomes and is supported by innovative pedagogical technologies [3].

Modern research, including that of the OECD [4], confirms that digital tools are capable of improving student engagement and personalizing learning, but their effectiveness is not automatic and largely depends on how they are strategically implemented in the classroom. In particular, teachers play a central role in activating the potential of digital solutions, while at the same time, risks such as digital distraction and inequality issues must be carefully managed [5].

Results and discussions

Before studying the concept of education quality in the modern digital world, it is necessary to clarify the content of the term "education." This is a long-term process that shapes a person throughout their entire life. It includes the development of intelligence and the ability to think critically, as well as the application of accumulated knowledge in practice.

Learning develops skills that will be useful and practical both in the sphere of human activity and in life. By developing skills through practice, the individual accumulates experience. The accumulated experience of not a single individual, but an entire society, develops culture [6]. Pythagoras noted that knowledge can be transmitted without losing it to oneself, as he believed that awareness is not exhausted during transmission [1].

The entire education system is divided into the following stages: preschool, general secondary (primary, basic, secondary), secondary specialized, vocational, and higher education. During the preschool period, children are prepared for future school. Then at school, instruction is structured in multiple stages: primary, middle, and high school, where students choose fields of study that align with their future professions.

The quality of education is the thorough mastery of specific knowledge—that is, the level of assimilation of educational material and a person's ability to apply it practically in their professional activities. This term reflects the outcome of training and the level of its alignment with the goals and needs of the individual and society. In the modern world, the rapid development of information technologies affects all spheres of life, including education [2].

Digital technologies can significantly improve the quality of education by personalizing the learning process and ensuring convenient access to resources [3]. Electronic materials, such as videos, presentations, and e-books, allow for a deeper understanding of a topic through repeated review. Currently, online platforms for school and higher education are developing rapidly in Uzbekistan:

eMaktab.uz is a state portal designed for schoolchildren that contains educational materials, class schedules, and assignments. It facilitates access to educational resources, supports distance learning, and increases students' interest in subjects. By 2026, this platform is expected to be fully implemented in all of the country's more than 10,000 schools, which will enable Uzbekistan to completely transition to bureaucracy-free administration [7]. The system allows for digital tracking of lessons, attendance, and grades, and has led to an 88 percent increase in student class participation [7].

LMS (Learning Management System) is an educational platform designed for monitoring academic performance and sharing learning materials, which has facilitated interaction between teachers and students. It is now difficult to find a university without some type of LMS platform. Universities have their own LMS based on their requirements and specifications, and the most widely used LMS in the world is Moodle (moodle.org).

Euromed is the internal digital platform of the Euromed International Private Medical School in Tashkent and serves as a comprehensive alternative to the eMaktab.uz platform. This digital platform integrates the core functions of education management, replacing traditional bureaucratic tasks with an automated system. It includes an interactive electronic journal and grade book for real-time grading and attendance tracking, as well as a convenient homework

module that allows teachers to upload educational materials and students to submit completed work for review. Additionally, the system features a function for conducting online tests in specialized subjects and languages, with results being instantly and automatically evaluated. All collected data is aggregated in the academic performance analysis module, which generates visual graphs and charts for detailed tracking of each student's individual progress.

The platforms are designed to improve the quality of education. Asynchronization (recorded lectures, video lessons), along with the synchronized ability to learn remotely using video conferences (Zoom, Google Meet), i.e., real-time learning, are key components of effective education [3].

According to some studies [4], when teachers with sufficient technical and pedagogical skills use interactive digital platforms, learning outcomes have been observed to improve by 15–25%. Conversely, if IT literacy is low, the effectiveness of implementing such platforms can decrease significantly. This suggests that technology alone does not guarantee educational success; rather, the effectiveness of digitalization also depends on the teacher's skill level.

The Impact of the Digital Environment on Learners' Cognitive Abilities

The digital environment has a significant and comprehensive impact on students' cognitive development. On the one hand, systematic reviews confirm that the use of digital technology-based interactive learning media has a positive impact on cognitive learning outcomes [8]. Significant improvements are observed particularly in problem-solving and spatial reasoning skills, especially when technologies incorporate constructivist principles, interactive engagement strategies, adaptive feedback mechanisms, and collaborative learning opportunities.

On the other hand, there are risks associated with digital distraction. A meta-analysis of 27 randomized controlled experiments found that mobile phone distraction during learning activities causes a moderate negative effect on immediate recall, with an even stronger negative effect on lecture recall [9]. The distraction arises when students multitask, switching attention between learning (e.g., attending lectures) and off-task activities (e.g., texting), which increases cognitive load and reduces academic performance. In the context of digital learning environments, media multitasking has been associated with reduced cognitive control and weaker academic performance, especially when content is designed for rapid scrolling rather than deep engagement [10].

However, the impact of digitalization is not one-sided. Research has shown that web-based learning environments can foster metacognitive development in children as young as preschool age, helping them become more intentional, reflective learners and better at monitoring their own learning [11]. The development of metacognitive processes and the ability to self-regulate one's learning activities are critical skills that the digital environment can both challenge and cultivate, depending on the design of instruction and the degree of teacher support. The overall finding from recent research is that digital technology is neither inherently beneficial nor harmful; rather, its cognitive effect depends on how it is used and the instructional design implemented by the educator [4].

A particularly important dimension in this context is the development of meta-subject skills. Studies have shown that meta-subject tasks, when implemented in a digital environment, can effectively develop all types of universal learning actions. The digital environment significantly improves this process and enriches the content of meta-subject skills by providing additional actions and opportunities for interdisciplinary integration [12].

How AI is transforming Education

Artificial intelligence is a computational system that enables machines to perform complex tasks that traditionally require human intellectual labor. To enhance educational

effectiveness through the integration of AI into educational systems, it is necessary to create a learning experience based on an individualized approach [13]. Although the individualized educational process is intended to meet the specific needs of an individual in acquiring knowledge, it faces several obstacles. The accurate measurement of educational indicators remains a serious challenge. While artificial intelligence can analyze student behavior and educational data, correctly interpreting complex human factors such as cognitive load, engagement, prior knowledge, and motivation remains problematic [14]. Nevertheless, artificial intelligence can assist in important aspects of the education sector. AI can automate many repetitive administrative tasks, such as creating schedules and grading assignments. This allows teachers to focus their attention on mentoring students and working directly with them [15].

Furthermore, to improve the quality of education, Japan's Fujitsu Laboratories has created an artificial intelligence model that measures a person's level of concentration with over 85% accuracy by analyzing facial muscle movements with a video camera. This AI system can track micro-expressions such as pursed lips or staring at a single point. This new model, machine-trained on diverse data from the United States, China, and Japan, reduces cross-cultural misunderstanding. This system is also capable of functioning successfully on an international scale. It can determine whether students are focused, distracted, or losing concentration during a lesson. As a result, teachers can adapt their teaching methods to student needs, explain complex concepts more clearly, and provide additional support when necessary. Such systems help educators identify students who need extra support, preventing a significant decline in academic performance. Thus, while Benjamin Bloom's research shows the reason for the effectiveness of individualized education, artificial intelligence, in turn, creates new opportunities for providing individual support and feedback to an even greater number of students [14].

An AI system is able to improve the learning process, allowing for adaptive learning opportunities: the algorithm detects a student's struggle, the software automatically drops the difficulty level, and adapts to the student's learning pace [16].

A prominent example of hardware-driven adaptive learning can be seen in China, where schools rolled out high-tech headbands that read brainwaves to measure each student's level of concentration in real-time. The information is directly transmitted to the teacher's computer. However, experts warn that the technology is prone to errors, thereby placing a psychological burden on learners who face poor engagement metrics [17]. This stands in obvious contrast to the fact that adaptive software is designed to reduce pressure by tailoring the difficulty to the student's pace.

Advantages, Risks, and Ethical Challenges of AI in Education

The integration of artificial intelligence into education creates broad opportunities while simultaneously introducing significant risks that require serious attention. A systematic analysis was conducted on 53 peer-reviewed articles published between 2020 and 2025 [18]. The analysis showed that while generative artificial intelligence can provide students with individualized feedback, automate instruction, and increase the accessibility of education, it also poses risks such as a loss of cognitive independence in students, institutional misuse of student data, and a lack of regulatory oversight [18].

A comprehensive analysis of the scientific literature reveals several key issues related to artificial intelligence in education. These include risks of data privacy leakage (reported in 56% of cases), algorithmic bias (52%), depersonalization of learning (48%), digital divide issues (48%), and gaps in transparency and accountability (36%) [18]. Algorithmic bias is a particular concern, as it is likely that artificial intelligence systems trained on biased data could amplify existing social and educational inequalities, leading to the unintentional discrimination of certain student groups.

According to UNESCO's report, "Artificial Intelligence and Education: Protecting Students' Rights" [17], as of 2024, nearly one-third of the world's population—almost 2.6 billion people—still lacks internet access. This situation will further deepen the digital divide and may create a new form of inequality: the AI divide. The most affected may be relatively vulnerable groups, including girls, residents of remote rural areas, persons with disabilities, and socially excluded communities (low-income families). The report highlights the need for a human-centered and rights-based approach, emphasizing that digital technologies must expand educational opportunities for all, leaving no one behind.

Additional concerns have been noted in Russian-language studies. A survey conducted among teachers identified the main risks of implementing artificial intelligence as the diminishment of the teacher's role (38.5%), threats to privacy (75% of female respondents), and a slowdown in the learning process due to excessive automation (33.7%) [19]. Researchers also point to the risk of diminishing critical thinking, increasing dependency on technology, and the potential for academic dishonesty, as well as the dehumanization of learning [12].

At the same time, many scholars are emphasizing the need for a balanced and well-considered approach to the integration of artificial intelligence. The development of a comprehensive legal and regulatory framework, the organization of digital literacy training for teachers and students, and the design of inclusive educational systems are seen as crucial steps toward the responsible and sustainable use of artificial intelligence in schools [17, 5].

Teacher Competencies in the Digital Age

New and effective teaching methods have a significant impact on the quality of education. A modern educator must possess profound knowledge and competencies, be proficient in computer literacy, and act as a facilitator of the educational process by developing students' interdisciplinary skills. The main approaches can include the following: the process-oriented approach, which focuses on the organization and management of the educational process and the consistent acquisition of knowledge; and the program-targeted approach, which is based on defining specific outcomes, such as developing critical thinking, independent learning activities, and the ability to apply knowledge in practice [3].

In a digital environment, critical thinking—the ability to distinguish real information from false and to find reliable materials for one's work—is a crucial skill. The ability to access resources through various gadgets creates opportunities to download materials from anywhere and study them later. Digitization simplifies file sharing and rapid information retrieval. The use of feedback by the teacher is crucial for improving the quality of education, as it helps assess the extent to which students have mastered the material and identify gaps to increase effectiveness [12].

Modern research shows that a teacher's digital competence includes not only technical skills but also pedagogical integration, effective communication, and the ability to engage students through digital tools [5]. Ensuring the systematic professional development of teachers is a key factor in the effective, safe, and ethical use of digital technologies and artificial intelligence tools in the classroom.

Conclusion

The integration of digital technologies and pedagogical innovations in Uzbekistan is not only enabling individualized and adaptive learning and the tracking of results, but it is also enhancing the quality of education. An effective digitalization process facilitates skilled facilitators with modern platforms like eMaktab.uz, which aids in skill development and the creation of an inclusive, high-standard educational environment.

In the digital world, the demands on teaching quality are shifting from the mere transmission of knowledge to a role of guidance and mentorship. The success of modern

education is becoming directly dependent on a teacher's ability to integrate subject-matter competencies with digital skills and to foster critical thinking in students.

The integration of artificial intelligence and automated monitoring systems represents the next significant breakthrough in the field of education. Advanced tools, such as the attention-tracking models developed by Fujitsu Laboratories, eliminate the shortcomings of the human factor by providing objective, evidence-based insights into student engagement and attention. Benjamin Bloom's research illustrates the principles of personal tutoring; "smart" systems analyze data on student activity levels to reduce cognitive load and instantly adapt the learning experience [14].

The implementation of advanced devices, such as the high-tech concentration monitoring systems used in China, is a significant achievement in ensuring accountability and transparency in the educational process. While adaptive software optimizes the complexity of the curriculum, the real-time transmission of precise student attention metrics to teachers and parents transforms passive classrooms into highly transparent learning environments. Rather than creating undue stress, this automated data allows for timely and proactive interventions during natural fluctuations in student attention. As a result, this strengthens classroom discipline, develops students' self-regulation skills, and fosters the systematic, evidence-based learning environment necessary for rapid skill acquisition [10].

A balanced approach—one that considers both the cognitive benefits of digital tools, such as improved problem-solving and metacognitive skills, and the associated risks, like digital distraction, algorithmic bias, privacy concerns, and the digital divide—is crucial for building an effective, equitable, and sustainable education system for the future.

References

1. I. I. Ivanov, **Philosophy of Antiquity**. Moscow: Nauka, 2023.
2. G. Abdullahanova and N. Alimatova, "Digitalization of the education system in Uzbekistan," **World Science**, vol. 1, no. 46, 2020.
3. R. I. Zinurova, G. R. Khamidullina, and G. R. Gatina, **Innovative approaches to quality management in the education system**. Kazan: KNITU Publishing House, 2015.
4. OECD, "The impact of digital technologies on students' learning," OECD Publishing, Paris, 2025a.
5. OECD, "Key findings and integration strategies on the impact of digital technologies on students' learning," OECD Publishing, Paris, 2025b.
6. Wikipedia, "Education," 2025. [Online]. Available: <https://ru.wikipedia.org/wiki/Education>. Accessed: May 22, 2026.
7. eMaktab, "Официально: eMaktab представила обновления, упрощающие работу учителей," 2025. [Online]. Available: <https://emaktab.uz>. Accessed: May 22, 2026.
8. "Smart learning from a young age: A systematic review of digital technology integration for cognitive development," **DOAJ**, 2025.
9. "Mobile multitasking in learning: A meta-analysis of effects of mobile phone distraction on young adults' immediate recall," **Computers in Human Behavior**, vol. 159, 108345, 2024.
10. K. R. Schlichting, "Balancing Innovation and Attention: A Review of Digital Distraction, Self-Regulation, and Technology Policy in Modern Classrooms," Master's thesis, Bethel University, 2025.
11. "Children's cognitive abilities in the context of the digital transformation of basic education," **Interactive Learning Environments**, vol. 32, no. 1, pp. 115-127, 2024.
12. I. O. Petrishchev, "Creating a digital environment is the path to improving education quality," **Yaroslavl Pedagogical Bulletin**, vol. 6, no. 117, pp. 8-13, 2020.

13. World Economic Forum, "Shaping the Future of Learning: The Role of AI in Education 4.0," Geneva, 2024.
15. H. K. Dharam Singh and S. K. Mohamad, "Decoupling personalised and adaptive learning in AI-enhanced education: A narrative review and conceptual clarification," **Innovative Teaching and Learning Journal**, vol. 9, no. 2, pp. 470-483, 2025.
16. SPH, "5 key benefits of AI in education: How technology is transforming learning," **Sekolah Pelita Harapan**, 2024. [Online]. Available: <https://sph.edu/blog/benefits-of-ai-in-education>. Accessed: May 22, 2026.
17. G. Di Pietro and S. Muñoz, "A meta-analysis on the effect of technology on the achievement of less advantaged students," **Computers & Education**, vol. 226, 105197, 2025.
18. UNESCO, **AI and education: Protecting the rights of learners**. Paris: UNESCO Publishing, 2025.
19. "Ethical and regulatory challenges of generative AI in education: A systematic review," **Frontiers in Education**, vol. 10, 1565938, 2025.
20. Z. S. Zhirkova, **Management of Education Quality**. Saint Petersburg, 2021.