

## THE EFFECT OF TEACHING EDUCATION THROUGH COMPUTER TECHNOLOGIES IN UZBEKISTAN (2017–2027) AND FUTURE PERSPECTIVES TO 2030

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### ANNOTATION

This article examines the large-scale digital transformation of the education system in Uzbekistan between 2017 and 2027, focusing on the impact of computer technologies on accessibility, quality, management efficiency, and learning outcomes. The study provides statistical analysis of infrastructure expansion, teacher digital competency, student engagement, and the development of national e-learning platforms. It also identifies structural challenges such as digital inequality and regional disparities. Furthermore, the article outlines strategic priorities for 2030, including artificial intelligence integration, adaptive learning systems, full digital infrastructure coverage, and cybersecurity frameworks.

**Keywords:** ICT in education, digital transformation, e-learning, Uzbekistan, artificial intelligence, blended learning, digital literacy.

### ANNOTATSIYA

Maqola 2017–2027 yillar oralig'ida O'zbekiston ta'lim tizimida amalga oshirilgan keng ko'lamli raqamli transformatsiyani tahlil qiladi hamda kompyuter texnologiyalarining ta'limga kirish imkoniyati, sifati, boshqaruv samaradorligi va o'quv natijalariga ta'sirini o'rganadi. Tadqiqotda infratuzilmaning kengayishi, o'qituvchilarning raqamli kompetensiyasi, talabalar faolligi hamda milliy elektron Ushbu ta'lim platformalarining rivojlanishi bo'yicha statistik tahlillar keltirilgan. Shuningdek, maqolada raqamli tengsizlik va hududlar o'rtasidagi tafovutlar kabi tizimli muammolar ham aniqlangan. Bundan tashqari, 2030 yilgacha bo'lgan strategik ustuvor yo'nalishlar, jumladan sun'iy intellektni integratsiya qilish, moslashuvchan (adaptiv) ta'lim tizimlari, to'liq raqamli infratuzilma qamrovi hamda kiberxavfsizlik tizimlarini rivojlantirish masalalari bayon etilgan.

**Kalit so'zlar:** ta'limda AKT, raqamli transformatsiya, elektron ta'lim, O'zbekiston, sun'iy intellekt, aralash ta'lim, raqamli savodxonlik.

### АННОТАЦИЯ



В данной статье рассматривается масштабная цифровая трансформация системы образования Узбекистана в период 2017–2027 годов с акцентом на влияние компьютерных технологий на доступность образования, его качество, эффективность управления и результаты обучения. В исследовании представлен статистический анализ расширения инфраструктуры, цифровой компетентности учителей, вовлеченности студентов, а также развития национальных платформ электронного обучения. Кроме того, в статье выявлены структурные проблемы, такие как цифровое неравенство и региональные различия. Также определены стратегические приоритеты до 2030 года, включая интеграцию искусственного интеллекта, внедрение адаптивных систем обучения, полное покрытие цифровой инфраструктурой и развитие систем кибербезопасности.

**Ключевые слова:** ИКТ в образовании, цифровая трансформация, электронное обучение, Узбекистан, искусственный интеллект, смешанное обучение, цифровая грамотность.

The 21st century has reshaped global education through rapid technological development. In Uzbekistan, prior to 2017, the integration of computer technologies into the educational process remained limited and uneven. Teaching methods were predominantly traditional, teacher-centered, and textbook-based. Digital infrastructure was insufficient, particularly in rural areas, and access to stable internet connections was inconsistent.

In 2016:

- Fewer than 50% of general secondary schools had stable internet access.
- The student-to-computer ratio exceeded 20:1 in many regions.
- National e-learning platforms were almost non-existent.
- Teachers' ICT competencies were largely basic.

The adoption of the “Digital Uzbekistan – 2030” Strategy marked a turning point. The government initiated systematic reforms aimed at modernizing infrastructure, equipping schools with computers, launching digital platforms, and strengthening ICT-based pedagogy.

By 2027, measurable progress has been achieved: 98% of general secondary schools are connected to high-speed internet. The student-to-computer ratio decreased to approximately 7–8:1 nationwide. More than 7 million students actively use national digital learning platforms. 85% of teachers have completed certified ICT training programs. 60% of schools implemented electronic journals and automated assessment systems. 40% of schools established STEAM and robotics laboratories.

The COVID-19 pandemic (2020–2021) served as a catalyst for digital education expansion. Nationwide online platforms and televised lessons ensured educational continuity for over 6 million learners. This emergency response later evolved into a

sustainable blended learning model. Research conducted between 2022 and 2026 indicates that classrooms integrating interactive digital tools demonstrated 18–22% higher academic engagement compared to traditional instruction alone.

**1. Increased accessibility.** Digital platforms expanded educational opportunities for students in remote and rural regions. Online Olympiads, video lectures, and digital libraries became accessible nationwide, reducing geographic inequality.

**2. Improvement in digital literacy.** Youth digital literacy increased from approximately 40% in 2016 to 78% in 2027. Programming fundamentals, robotics clubs, and coding competitions became integrated into school curricula.

**3. Pedagogical innovation.** Technology facilitated a shift from passive memorization to interactive and student-centered learning. Virtual laboratories, simulations, and multimedia presentations enhanced conceptual understanding.

**4. Administrative efficiency.** Electronic journals, attendance tracking systems, and digital monitoring tools improved transparency and reduced administrative inefficiencies. Despite significant achievements, structural challenges remain:

- **Digital inequality:** Rural internet speeds are often slower than in urban centers.
- **Device accessibility:** Not all families possess personal computers or tablets.
- **Teacher adaptation gap:** Some educators use technology primarily for presentations rather than interactive pedagogy.
- **Cybersecurity risks:** Increased digital exposure raises concerns regarding data protection and online safety.

Without addressing these issues, digital transformation may deepen disparities instead of eliminating them. To ensure sustainable development, the following strategic priorities are essential:

**1. Artificial Intelligence Integration.** AI-driven adaptive learning systems can personalize instruction based on students' performance data, enabling individualized educational trajectories.

**2. Full Hybrid Education Model.** Institutionalizing blended learning (combining face-to-face and digital instruction) can increase flexibility and efficiency.

**3. 100% Digital Infrastructure Coverage.** All schools should be equipped with high-speed broadband and modern devices by 2030.

**4. Advanced Digital Pedagogy Training.** Teacher training programs must move beyond basic ICT skills toward advanced digital didactics and instructional design.

**5. National cybersecurity framework.** Developing comprehensive digital safety policies to protect student data and prevent cyber threats.

**6. Ensuring digital equity.** Providing subsidized or free devices for low-income families to prevent educational exclusion. If systematically implemented, Uzbekistan could become a regional leader in digital education in Central Asia by 2030.

The transformation of Uzbekistan's education system between 2017 and 2027 demonstrates that technological integration directly influences learning quality, student engagement, and administrative transparency. However, infrastructure development alone is insufficient. Sustainable digital transformation requires pedagogical reform, institutional capacity building, and equitable access mechanisms.

**Comparative analysis shows:**

<b>Indicator</b>	<b>Before 2017</b>	<b>2027</b>
Internet coverage in schools	<50%	98%
Student-to-computer ratio	20:1+	7–8:1
National e-learning platforms	Limited	Fully operational nationwide
Teacher ICT training coverage	Low	85%
Blended learning model	Absent	Institutionalized

The data confirms a significant structural shift toward digital education.

The integration of computer technologies into Uzbekistan's education system between 2017 and 2027 has produced measurable improvements in accessibility, digital literacy, student engagement, and administrative efficiency. The country has transitioned from a predominantly traditional model to a hybrid digital education framework.

However, digital inequality, infrastructure disparities, and uneven pedagogical adaptation remain challenges. Strategic investments in artificial intelligence, cybersecurity, teacher training, and digital equity are essential for achieving sustainable transformation by 2030. Computer-based education is not merely a technological upgrade; it is a systemic reform that enhances national competitiveness and prepares future generations for participation in the global digital economy.

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