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**INFORMATION AND COMMUNICATION TECHNOLOGIES, MEDIA SPACE,  
AND SPIRITUAL SECURITY**

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**Abstract**

This scientific article analyzes innovative processes in the education system, digital transformation, the development of modern pedagogical technologies, and their impact on the effectiveness of education. It also highlights the advantages and disadvantages of an ICT-based educational environment and addresses the issue of digital competencies.

**Keywords:** STEM, communication, globalization, education, transformation, pedagogical skills.

**Introduction**

In the context of today's globalization and digital transformation, innovative approaches in education are becoming increasingly important. The digitalization of the educational process, the renewal of pedagogical technologies, and the use of interactive methods tailored to students' needs have become an integral part of modern education. On February 28, 2022, in Resolution PQ–118, the development of the digital economy and the widespread application of ICT in all sectors, particularly in education, was emphasized. This has created a legal and institutional framework for improving the quality of education in Uzbekistan through modern technologies[1]. First, we examine the ideas of the great scholar Abu Rayhan Beruni from the Eastern Renaissance period regarding "the relationship between teacher and student." He emphasized that "the teacher must serve as an example both in conduct and in imparting knowledge," a principle that remains a cornerstone of pedagogical ethics today. According to Beruni, the main task of education is not only to increase students' knowledge but also to ensure their moral and spiritual development. He asserted that education is a means of leading a person from darkness to enlightenment. Therefore, Beruni advocated teaching knowledge in a way that develops the individual, expands critical thinking, and is based on practical life experience. He stressed that education should focus not only on theoretical knowledge but also on forming practical skills.

For example:

- Mathematics should not be limited to memorizing numbers but should teach their real-life application.
- Geography and history should prepare individuals to live in harmony with the environment and society.
- Medicine and natural sciences should help solve practical problems effectively.

Moreover, Abu Rayhan Beruni encouraged young people to assess their knowledge, think critically, and make independent decisions. This approach aligns fully with contemporary pedagogical principles. Beruni authored over 150 works, and his scientific

legacy and pedagogical views remain relevant and widely applied in today's modern education system[2]. In modern education, digital resources, online platforms, and artificial intelligence-based educational systems enhance teaching quality, increase student motivation, and allow for a more flexible learning process. Digital transformation refers to the modernization of the teaching process through the use of digital technologies, electronic platforms, and ICT (Information and Communication Technology) tools. According to Sharipova's research, the digitalization of the education system is closely linked to infrastructure, ICT tools, and the potential to increase student engagement[3]. Pedagogical innovations involve new methods that are more effective than traditional teaching forms, including interactive, modular, student-centered, and competency-based approaches. Dela Fuente emphasizes the importance of innovative methods in fostering students' independent thinking in the learning process[4].

Regarding digital education infrastructure and learning environments, digital education infrastructure consists of the following components:

- Smart classrooms;
- Distance learning platforms (e.g., Moodle, Google Classroom);
- E-textbooks and digital libraries;
- Online dictionaries, simulations, and virtual laboratories.

According to the European International Journal of Pedagogics, the integration of ICT makes education more flexible, open, and interactive, significantly increasing student engagement. In recent years, AI-based learning systems have been developing rapidly. They allow the assignment of tasks tailored to students' knowledge levels, identify strengths and weaknesses, and form individualized learning paths. Research also highlights that teachers' readiness to implement digital innovations is a key factor in ensuring educational quality.

Even in primary education, several innovations are emerging. Digital innovations—such as robotics, basic coding, interactive programs, and virtual laboratories—help develop students' creative thinking and problem-solving skills[5].

STEM education:

- S – Science
- T – Technology
- E – Engineering
- M – Mathematics

Thus, STEM is an educational approach that integrates science, technology, engineering, and mathematics. Using STEM models from an early age helps develop scientific and technical thinking[6]. In today's traditional education system, this approach contributes to:

- Analytical thinking, problem-solving, and conducting experiments;
- Robotics, coding, and modeling;
- Developing scientific-technical thinking and practical skills.

Moreover, meta-analyses show that STEM education significantly improves students' learning outcomes. For instance, one analysis of 66 experimental and quasi-

experimental studies revealed that students educated using STEM methods outperform academically. Another meta-analysis indicates that combining STEM with mastery learning, evidence-based, or blended teaching methods produces highly effective results. Implementing STEM approaches and digital innovations from primary education enables children not only to acquire theoretical knowledge but also to develop problem-solving, creative thinking, and technological literacy skills. Research indicates that STEM education increases students' scientific literacy, interest in natural sciences and mathematics, and prepares them for technical and scientific fields. Through STEM, students gain modern skills—analytical thinking, problem-solving, creativity, and technological literacy—which, in turn, provides advantages in personal development and future careers. Many scientific studies and meta-analyses have proven the effectiveness of STEM education—not only in theoretical knowledge but also in practical skills—showing that it is more effective compared to traditional educational models. Early exposure to STEM and digital pedagogical technologies lays the foundation for the development of scientific, technical, and innovative fields in society, helps identify talented youth, and enhances the country's future competitiveness. Innovations in education and the processes of digital transformation contribute to improving the quality of education, organizing the educational process according to modern requirements, and applying methods tailored to students' needs. The effective implementation of pedagogical technologies depends on teachers' digital competencies, high-quality infrastructure, and the scientific organization of the teaching process.

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