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From Strategy To Practice: Development Of Artificial Intelligence Technologies And The Transformation Of Education In The Republic Of Uzbekistan

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Abstract: This article examines the current state of development and implementation of artificial intelligence technologies in the Republic of Uzbekistan, with a focus on education. It analyzes state strategic and regulatory documents, as well as key areas of digital transformation in the education system. Considerable attention is given to international experience in applying artificial intelligence in teaching and the results of a comparative analysis of data from an international survey of foreign language teachers, reflecting current trends in the use of AI tools in teaching. Based on this analysis, the key conditions, barriers, and prospects for the effective integration of artificial intelligence technologies into the national education system are identified.

Keywords: Artificial intelligence, digitalization of education, educational technologies, AI strategy, teacher competencies, Uzbekistan.

Introduction: Creating favorable conditions for the implementation of artificial intelligence technologies in the social sphere and key economic sectors is a priority area for the development of the Republic of Uzbekistan. The country's desire to become a leader in the application of AI is driven by the need to improve the efficiency of public administration, the quality of education, the level of healthcare services, and the overall competitiveness of the economy.

Global experience shows that artificial intelligence technologies have already become an integral part of the development of countries such as China, the United States, Japan, the Republic of Korea, and several European Union countries, where AI is actively used in education, medicine, industry, security, and management. In recent years, the Republic of Uzbekistan has also implemented systemic reform in this area, aimed at creating a sustainable ecosystem for the development of artificial intelligence.

Regulatory framework and state strategy for AI development: A key stage in the institutionalization of artificial intelligence policy was the adoption of the "Strategy for the Development of Artificial Intelligence Technologies until 2030," which provides for the creation of conditions for the accelerated implementation and widespread use of AI, as well as the formation of a comprehensive regulatory framework [1–6]. The strategy defines the goals, objectives, and priority areas for AI development, taking into account the current level of digitalization and best international practices. As part of its implementation, 86 projects have been formed in the republic, covering such areas as healthcare, education, energy, transport, ecology, and finance. A supercomputer cluster is being created to support the computing needs of AI implementation, and in the area of public administration, results have already been achieved in optimizing management processes and personnel numbers.

Artificial Intelligence in Education: Theoretical Approaches: Despite the widespread use of AI technologies, the scientific literature still lacks a unified, universal approach to defining the concept of "artificial intelligence." Modern interpretations include the following approaches:

- the ability of intelligent systems to reproduce human creative functions [12];
- the science and technology of creating smart machines and programs [14];
- a set of algorithms capable of performing individual functions of human intelligence [16];
- modeling of human mental and cognitive processes [7, 8];
- computer modeling of speech, cognitive, and learning processes, including machine vision and speech recognition [15];
- a tool for supporting decision-making and improving educational practices [9-13];
- a set of technological solutions that imitate human knowledge and skills, including self-learning and solution search [1].

The most comprehensive definition of artificial intelligence is presented in the national AI development strategy until 2030, where AI is considered a systemic factor in the digital transformation of all spheres of society, including education.

International experience with AI in teaching: The empirical data for the study were obtained based on a survey of 1,348 English teachers from 118 countries and regions, ensuring a high level of international representativeness of the sample (Figure 1) [17]. The survey collected information on the professional experience of teachers, teaching formats, types of educational institutions, and age groups of students.

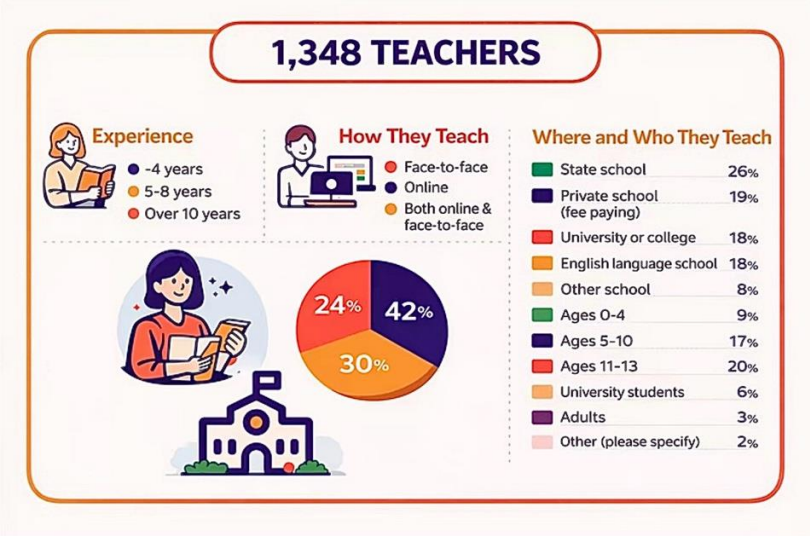

Figure 1. Demographic characteristics of respondents to the international pedagogical study.

An analysis of respondents' professional experience shows that the majority are experienced teachers. Sixty-four percent of teachers have more than ten years of teaching experience in English, while another 21% have five to ten years. Only 16% of respondents reported less than five years of teaching experience, indicating that the sample is dominated by specialists with substantial professional experience.

In terms of teaching formats, 53% of survey respondents teach exclusively in-person, while 42% combine both in-person and online teaching. Only 6% of respondents teach exclusively online, indicating the continued predominance of traditional in-person instruction in foreign language teaching.

An analysis of educational institution types shows that the most common place of employment for respondents is public schools (33%), followed by private (fee-paying) schools (23%) and higher education institutions (22%). A smaller proportion of teachers work in specialized language schools (18%), while 15% of respondents selected the "other" category, including private tutors, corporate training instructors, volunteers, and employees of non-governmental and international organizations.

The age range of students with whom respondents work is characterized by significant diversity. Teachers most often teach students aged 14-18 (47%), followed by students aged 11-13 (36%). Comparable shares of respondents work with university students (30%) and adult learners (28%). Less common is teaching children aged 5-10 (20%) and children under four (3%).

AI tools used and their purposes: The survey results indicate that language learning apps are the most widely used in teachers' educational practices, used by 48% of respondents. A significant proportion of study participants also use language generation systems (37%), as well as chatbots (31%). Less widespread use is made of automated assessment tools (22%), speech recognition software (21%), and text-to-speech technologies (19%). Teachers are significantly less likely to use educational data analytics (12%) and virtual and augmented reality technologies (7%). Moreover, almost a quarter of respondents (24%) indicated that they do not use any of the listed AI tools, indicating the presence of institutional, technological, or competency-based barriers to the implementation of artificial intelligence in educational practice (Figure 2).

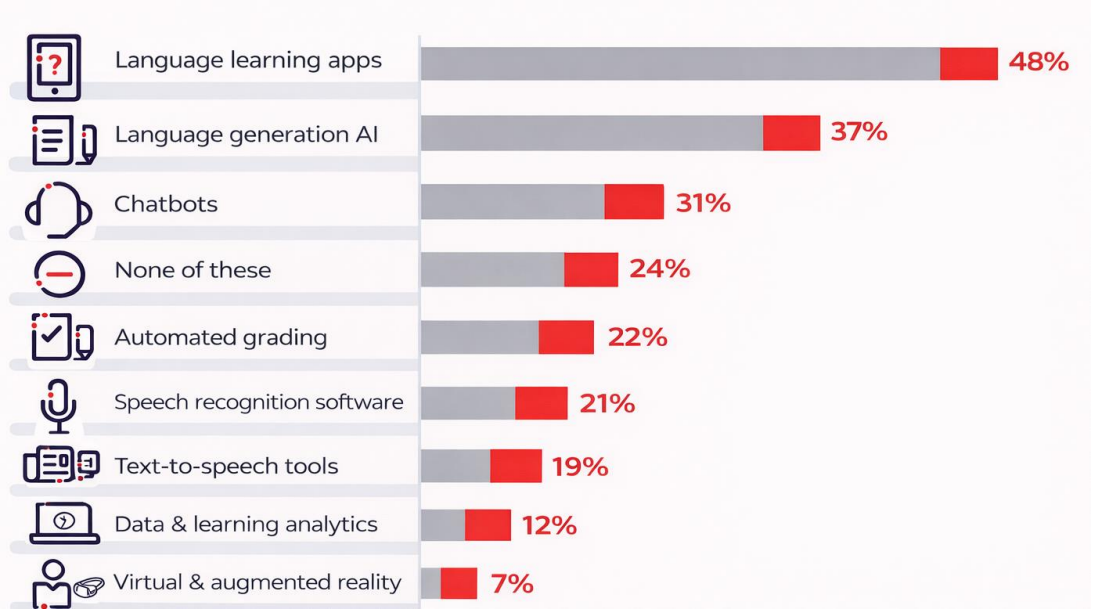

Figure 2. Structure of AI tool use in teaching practice.

An analysis of the purposes of AI application shows that teachers primarily use these technologies to support teaching and learning activities. For example, 57% of respondents use AI to create educational materials, and 53% use it to help students practice English. Developing lesson plans using AI is characteristic of 43% of teachers, while 33% of study participants use AI to correct students' language errors. A significantly smaller proportion of respondents use AI for assessment and knowledge monitoring (23%) and administrative tasks (19%). However, 18% of teachers indicated that they do not use AI for any of these purposes (Figure 3).

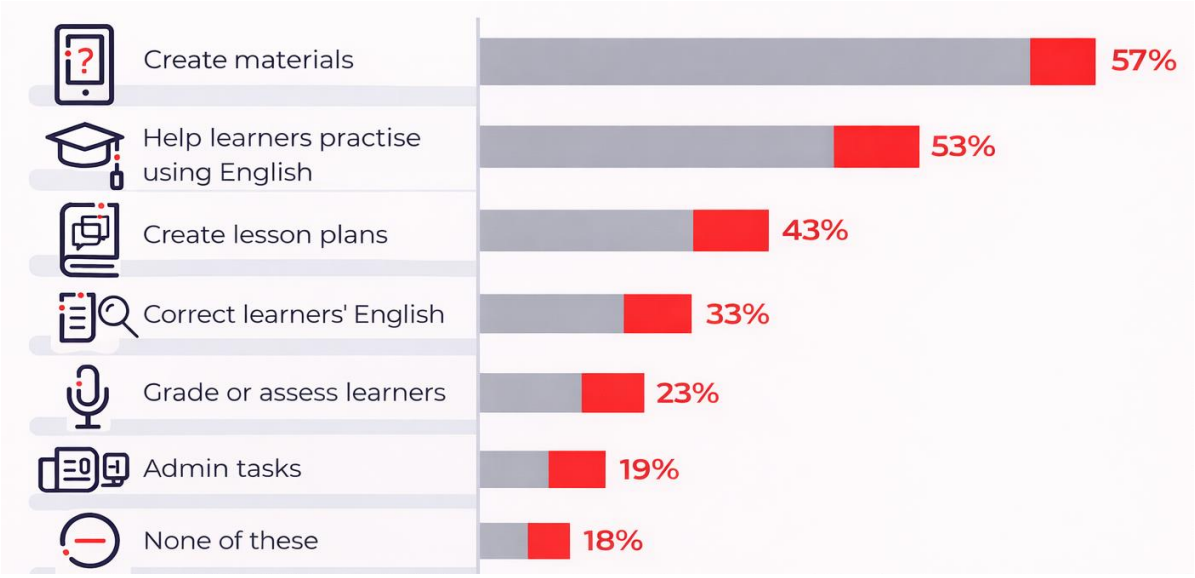

Figure 3. Main areas of AI tool use in the educational process.

The respondents' socio-professional profiles demonstrate a high level of teaching experience. Sixty-four percent of teachers have more than ten years of experience, and another 21% have five to ten years. In terms of teaching format, more than half of respondents (53%) teach exclusively in person, while 42% combine both in-person and online learning. The geographic distribution of the respondents shows the highest representation from Asian and European countries (27% each), followed by the Middle East and North Africa (23%), ensuring representativeness of the data for international comparative analysis.

Prospects for the application of AI in the education system of Uzbekistan: Given the current state of digital transformation in the country, achieving the strategic goals of AI development in education requires the following:

- monitoring attendance and ensuring student security using personal identification technologies;
- analyzing the quality of the educational process and identifying deficiencies across subjects, topics, and levels of learning;
- automating knowledge assessment and analysis of educational data;
- expanding opportunities for learning programming languages and artificial intelligence;
- integrating AI disciplines into high school, secondary vocational, and vocational education;
- creating a technical infrastructure for the practical application of AI in universities and teacher training programs.

Implementing these conditions will improve the quality of education, build sustainable intellectual capital, and ensure the training of personnel who meet the requirements of the digital economy.

CONCLUSION

Currently, the implementation of artificial intelligence technologies in the education system of the Republic of Uzbekistan is in its infancy. The main limiting factor remains the shortage of qualified personnel and the insufficient readiness of teachers to use AI tools. This necessitates revising curricula, developing retraining and professional development programs, and developing digital and AI competencies among all participants in the educational process. Comprehensive implementation of the state strategy for the development of AI until 2030 creates the preconditions for the sustainable development of education and increasing the country's competitiveness on the international stage.

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