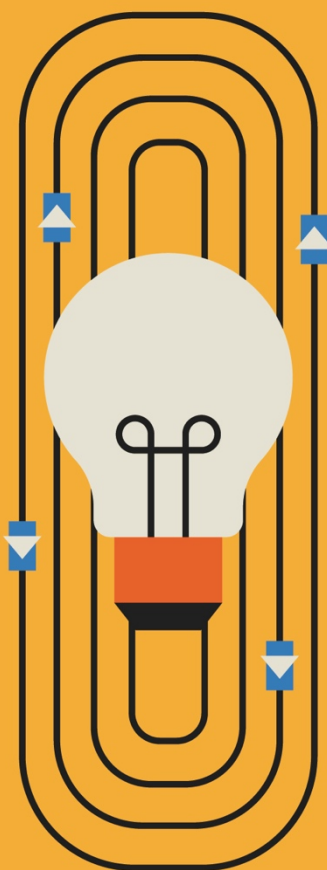# Analysis of Current Trends and Activities Related to the Integration of Artificial Intelligence into Higher Education

In Central Asia and Beyond

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Content

1. INTRODUCTION

One of the significant directions of digitalisation of higher education (HE) in the countries of the Commonwealth of Independent States (CIS) is the intensive use of artificial intelligence (AI) methods in educational processes. Although these countries reached independence more than 30 years ago, most Commonwealth countries maintain close ties in various fields of activity and desire to consolidate in the most relevant areas, particularly in education, science and economics. The intensification of large-scale work on the integration of AI into HE, the design of AI systems, their application in higher education, as well as research on the topic of distance learning (DL), have led to the need to take into account the specifics of teaching, studying and developing advanced information technologies to obtain and disseminate knowledge, teaching methods, as well as international cooperation to solve regional problems.

The countries for which the analysis of current trends and activities related to the integration of AI into HE can be divided into three groups: Russia and Belarus, Armenia and Georgia, and the Republics of Central Asia. The criteria for dividing into groups are the similarity of countries' development strategies, political decision-making on HE, and the use of state-of-the-art information technologies in the education system, as well as regional peculiarities related to national traditions, customs, etc.

Russia and Belarus

Undoubtedly, the most intensive development of AI, both in HE and in other fields of activity, is taking place in the Russian Federation and Belarus. This is because, historically and before the collapse of the Soviet Union, these countries tended to have decent potential in the field of information technology development, including AI. The similarity of cultures, traditions, close economic integration, and political orientation are reflected in the development of similar strategic aspects and activities in science and education.

Armenia and Georgia

Even before gaining independence, these republics had close scientific and educational relations. Currently, Georgia and Armenia, as neighbouring republics in the Transcaucasia region, have close cultural ties and share similar traditions. The development of advanced information technologies, including AI in HE, is one of the

foreground areas of government policy in these countries. According to experts [1], the digital future of this region depends on the human factor: investments, cooperation, joint agreements, legislation and common standards.

Republics of Central Asia

The republics of Central Asia (Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, and Uzbekistan) have similar historical roots, traditions, cultural heritage, and customs. This is reflected in the development of both the economy and the social sphere, as well as similar reforms in the fields of science and education.

Although the pace of development of HE and the use of advanced technologies in these countries have different levels, in general, these republics are trying to keep up with each other and follow global trends. They cooperate on some crucial issues and hold joint scientific and educational conferences and forums in order to improve the effectiveness of the educational process in the region.

The purpose of the report is to present the outcomes of the analysis of the state of reforms, current trends and measures on the integration of artificial intelligence into higher education in the CIS countries (Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Tajikistan, Uzbekistan).

2. GENERAL TRENDS AND POLICY DIALOGUES ON THE INTEGRATION OF AI INTO HIGHER EDUCATION

In the CIS republics, and throughout the civilised world, intensive work is underway on the digital transformation of the HE. Although the development of AI has generated new challenges, heads of state and universities are clearly aware that AI brings new opportunities both for the education system and for the development of the economy and production of countries as a whole. Therefore, reforms in HE are being intensively carried out, and there is an active debate on the forms and methods of implementing AI. Almost all CIS republics have adopted laws and presidential or government orders regulating the development and application of AI.

As studies of current trends and activities related to the integration of AI into HE in the CIS republics have shown, most countries face similar challenges:

• Shortage of specialists in AI and related fields, an insufficient number of highly qualified AI teachers;

• Weakness of the legislative framework on AI, a great demand to solve ethical problems, as well as improve the regulatory framework for the use of AI in HE;

• In many republics, the weak material and technical base of universities does not make it possible to create and develop scientific laboratories for the study of AI functions, to develop effectively applied developments and scientific projects;

• A great need to develop effective AI training programmes that meet modern requirements for highly qualified personnel training;

• Insufficient international integration with leading scientific and educational schools to increase the level of knowledge of teaching and scientific staff at universities.

To solve these problems, each country takes measures on its own or tries to combine efforts to improve the legislative framework and cooperate in the implementation of educational or scientific projects on AI. It is not uncommon for international conferences, summits, forums, and business meetings on AI issues in HE to provide significant assistance in solving these problems.

An important event in the field of AI in HE was the Global Summit 'Transformation of Higher Education in the Era of Artificial Intelligence' by the partners of the International Institute of Online Education (IIOE) at the end of 2023. The event is organised by the UNESCO Institute for Information Technologies in Education (UNESCO IITE), the International Centre for Innovation in Higher Education under the auspices of UNESCO (UNESCO-ICHEI), Southern University of Science and Technology (SUSTech) and the IIOE Rotating Presidency Unit University Putra Malaysia (UPM). The summit was held in December 2023 under the patronage of the Secretariat of the National Commission of the People's Republic of China for UNESCO Affairs in Shenzhen. The event was attended by about 200 people from 28 countries in Asia, Africa, Latin America, the Middle East, and Europe, including representatives of ministries of education, presidents and vice-rectors of universities, international experts and other senior leaders of higher education [2]. Representatives of Tashkent University of Information Technology (Uzbekistan) attended the event.

The logical continuation of this event was the holding of the High-level Regional Policy Dialogue in Central Asia themed 'Promoting the Transformation of Higher Education based on GenAI', held on June 24, 2024, in Tashkent, Uzbekistan. The event was organised by the International Centre for Innovation in Higher Education under the auspices of UNESCO (UNESCO-ICHEI) and the Tashkent University of Information Technologies (TUIT), which is now the National IIOE Centre in Uzbekistan [3]. The policy dialogue was structured in three thematic sessions: 'GenAI Policy and Governance in Higher Education at the Regional and National Levels', 'Institutional Approach to GenAI Policy, Governance and Practice' and 'Artificial Intelligence Literacy and Professional Development of Higher Education Workers'. These sessions contributed to an in-depth discussion of various topics, including the opportunities and challenges of GenAI in education, the ethical use of AI, education management, the formation of multi-stakeholder partnerships, and the use of the International Institute of Online Education (IIOE) micro-certification project for retraining and advanced training of HE staff.

The outcomes of the Policy Dialogue are essential for integrating AI into HE not only in the Central Asian region, but on a global scale as well. Informative reports and an exchange of views among leading scientists and experts in generative AI from different countries (Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan, Turkmenistan, Russia, Belarus, Georgia, Turkey, the United Arab Emirates, Germany, France, Pakistan and China) provided significant material on the development of national

policies and action plans for HE management, based on GenAI. UNESCO-ICHEI intends to expand cooperation with various stakeholders in the Central Asian region and beyond by implementing a micro-certification project to empower universities in developing their digital transformation strategies and to support the retraining and advanced training of HE employees, as well as the integration of AI into HE.

To work out uniform rules for regulating public relations related to the use of AI in the CIS countries, Belarus has proposed a draft Model Law 'On Artificial Intelligence Technologies.' The rules set out in the Law aimed to improve people's lives, ensure safety and contribute to the development of the economy and social sphere through the development, implementation and use of AI. The draft Law was approved by the Permanent Commission on Science and Education of the CIS Interparliamentary Assembly on April 18, 2024. Delegates of parliament and scientific and educational communities of Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan attended this event [4, 5].

According to representatives of the commission, the establishment of common concepts, definitions, terms and principles for the use of AI and model rules in the CIS will help create a common space for technology development as part of the innovative economic development of the Commonwealth countries, as well as reduce the economic and administrative costs of implementing common technological solutions in the field of AI.

2.1 ARMENIA

Digitalisation in many areas of activity of the Republic of Armenia is emerging quite intensively, the dynamics of which depend on the rapid development of innovative technologies. According to statistics, the number of ICT graduates in Armenia is 0.38 per 1,000 people (the global average is 0.32).

Although Armenia does not approve IT legislation, the country has original experience integrating AI into education. In this country, much attention is already paid to teaching AI methods and tools in the secondary education system. The 'Artificial Intelligence Generation' project has been operating here since 2023, which was initiated by the Ministry of High-Tech Industry of the Republic of Armenia (MVPRA) and the Foundation for Armenian Science and Technology (FAST) on the basis of a Memorandum of Cooperation aimed at promoting education in the field of AI. The main article of this agreement is the Generation AI project. [6, 7]

The originality of the programme of this Generation AI project lies in the fact that it is multidimensional and is carried out in several stages, starting from the school level. It is integrated into the public education system to ensure sustainability and support systematic change. Project Generation AI not only allows you to train AI personnel, but its programme is aimed at educating a new generation of AI researchers with the skills and knowledge that will be needed to apply them in almost all fields of activity. According to the programme, from 2023 to 2024, more than 350 students have already learned the skills and methods of working with AI methods.

Project activities in the field of AI in HE

AI projects are being developed with the support of the Foundation of Armenian for Science and Technology of Armenia (FAST). FAST's activities are focused on supporting major projects in science, technology and education, to generate an ecosystem that is favourable for the development of the republic. [1]. One of the promising AI projects in education is the 'Artificial Intelligence Program', implemented jointly by AVBS Silicon Valley, the Armenian Union of Employers of Information and Communication Technologies (UEICT), Synopsys Foundation, Synopsys Armenia (oversaw by the Education Department) and the Armenian Virtual College (AVC AVBS) [8]. The purpose of the Programme is to teach students of the republic, the basics of creating and using AI and skills when working with AI. This knowledge will allow students to continue their studies in AI or get a respectable job in this sphere. This project has become popular and attracts students from different universities. In the 2023-2024 academic year alone, more than 80 students from five educational institutions completed AI and machine learning courses through interactive multimedia lessons, combining the advantages of online and traditional teaching methods. The classes cover a wide range of topics, from the history of artificial intelligence to the technical nuances of the Python programme.

Challenges

An analysis of sources on the development and integration of AI in the higher education system of the Republic of Armenia has shown a number of challenges facing the education system:

• The lack of continuity of education leads to a significant shortage of specialists in the field of AI and related fields, which reduces the country's competitiveness in the global market;

• According to the Ministry of Education and Science, only five universities offer AI-related degrees to applicants (the share of AI programmes in the total number of programs is only 0.84%, and the share of AI-related programmes (including mathematics and computer science -about 9%);

• Specialised councils for the defence of PhD and DC dissertations in the field of AI have not yet been opened in universities and the National Academy of Sciences of the Republic of Armenia (NAS RA). Doctoral degrees are awarded in the field of AI based on programmes and advice only in related fields, which makes it somewhat difficult to train highly qualified scientists in areas specifically related to theoretical and applied aspects of AI;

• There is a weak publication activity among teachers, scientists and doctoral students in highly rated scientific journals. For example, between 1996 and 2021, only 76 publications were published on AI. Currently, Armenia ranks only 116th among 195 countries in this indicator [9];

• Digital transformation requires a qualitatively new education. Therefore, mechanisms for introducing a new information paradigm are in great demand. State policy in the field of education should not be limited only to strategies of a purely educational nature [10].

Solutions

• The FAST Foundation proposes to fill the shortage of AI specialists in Armenia by ensuring the continuity of education and the phased implementation of the Generation AI programme at all levels of education;

• The project is actively supported by the Ministry of Education, Science, Culture and Sports, the Ministry of High-Tech Industry of the Republic of Armenia and the Foundation for Armenian Science and Technology, which has been implemented in seven regions of Armenia since 2022.

The project programme will help to solve the urgent ıssue of training highly qualified personnel in the field of AI in Armenia. There is no doubt that the supported Generation AI project will accelerate the development of AI in the educational process [9].

One of the critical trends in the development of AI in Armenia is the growth of startups, which are increasingly attracting the most talented young people to develop

AI methods and software for solving applied problems. Successful startups are an important incentive for training highly qualified personnel in AI.

The fact that Armenia pays great attention to the integration of AI not only in higher education but also to the development and implementation of curricula in the secondary education system gives hope that there will be some progress on this issue in the republic soon.

2.2 GEORGIA

In Georgia, the law 'On Higher Education' (07/21/2010, No. 3528) is a main legislative document regulating the processes of educational and research activities of universities, the principles and procedures of management and financing, and other issues related to HE. Taking into account the problems in the educational process related to the COVID-19 pandemic, the parliament has amended the law. These changes are mainly concerned with the development of distance learning(DL) for higher education institutions, the development of instructions on how to use DL platforms, and familiarising students and staff of higher education institutions with them [11]. In September 2024, Georgia signed the document THE FRAMEWORK CONVENTION ON ARTIFICIAL INTELLIGENCE AND HUMAN RIGHTS, DEMOCRACY AND THE RULE OF LAW at a ministerial conference of the following countries: Andorra, Georgia, Iceland, Norway, the Republic of Moldova, San Marino, the United Kingdom, as well as Israel, the United States, and the EU [12]. For the educational sphere, the Convention states that 'the parties should develop digital literacy of all segments of the population in order to reduce potential risks from the use of AI systems', 'the parties should exchange information and cooperate with each other', including training in the areas of AI. A Conference of the Parties is being established to discuss current issues and provide reports. Undoubtedly, Georgia's higher education will benefit significantly through the exchange of information on AI, have more opportunities to train highly qualified personnel in developed member countries of the Convention, the implementation of joint projects, etc.

Georgia joined the Bologna Process in 2005 at the Bergen Summit. In addition, in 2014, the country signed an Association Agreement with Europe, which outlined the country's commitments to develop digital infrastructure. In connection with this Agreement for 2021-2027, the importance of stimulating the digital economy and innovation in the country, as well as enhancing the digital literacy of the general population, is emphasised. Consequently, reforms in the Georgian education sector

have been actively initiated, and the need for digital transformation, including the integration of AI into HE, using the support of EU countries, is on the agenda of the government [13].

An important aspect of the development of AI in HE is the project activities of universities in this field, which envolve the participation of commercial structures and start-ups. This provides an opportunity to acquire important skills for students, researchers and doctoral students in the application of AI in the educational process. Examples include the following [14, 15]:

• The Education Management Information System uses the Qlik Sense analytical system for data visualisation and reporting. It has the function of associative data analysis based on AI [16];

• The National Center for Education Quality Improvement applies Office 365 with an integrated DLP module based on AI. This system is designed to prevent data loss, which identifies confidential and personal data using machine learning, classifies them and performs automatic encryption when the risk of data loss is detected;

• The joint SDL Trados Studio project implemented with the British company SDL is used in the National Center for Education Quality Improvement. It uses AI to translate accreditation documents and permits prepared with the involvement of international experts from English into Georgian for higher education institutions.

Challenges

When integrating AI into HE, Georgia faces the following challenges:

• The absence of regulations governing AI issues and documents defining ethical standards in the target departments, as well as in the HE system;

• The insufficient number of AI teachers, as well as the relatively low salaries of teachers in the relevant field, complicate the training and opening of new departments and the preparation of curricula in universities;

• The weak financial and technical base of universities makes it difficult to create and develop scientific laboratories for studying the possibilities of AI and for developing effective scientific projects in universities.

Solutions

• According to experts, in addressing the issues of AI integration into HE, it is necessary to increase the role of the public sector, which should contribute to the formation of a national ecosystem for national startups and industries aimed at using AI, involving investors and donors, practice AI applications in various sectors and support training initiatives in this area;

• The Ministry of Education, Science, Culture and Sport of Georgia, as part of the education reform, implemented a project to integrate the Georgian language, and the Microsoft AI platform is being introduced, which will help improve the quality of education in HEIs and promote the broader adoption of modern technologies in the educational process [17];

• Georgia has signed the Council of Europe Framework Convention on AI and Human Rights, Democracy and the Rule of Law, which will solve a number of problems related to teacher training and training of AI researchers in the developed countries of the EU and the USA [12].

2.3 BELARUS

Traditionally, Belarus is one of the leaders among the CIS countries in training specialists in information technology (IT). So far, there is no legislation in the republic on regulatory activities of AI in the HE. Presidential Decree No. 196, dated June 28, 2023, 'On the Concept of Legal Policy of the Republic of Belarus' noted that the legal system has yet to resolve the issues of application of AI in various activities, including higher education. [18] Great hopes are pinned on the promising Law 'On Artificial Intelligence Technologies', the development of which has been entrusted to the Council of Ministers jointly with the National Academy of Sciences of Belarus, as well as the National Center of Legislation and Legal Information of the Republic of Belarus [4,5]. The law should include basic terms and definitions, goals and objectives of state policy of AI, the competence of the authorised public administration body in this area, principles of legal regulation of relations, measures to ensure state and public safety when using AI technologies, and ethical principles. The law will also address the issues of integrating AI with HE, indicating the level of competence of teachers and qualification requirements.

Belarus has taken the initiative to create legislation on AI for CIS countries. Deputies of the parliaments of Azerbaijan, Armenia, Belarus, Kazakhstan,

Kyrgyzstan, Russia, Tajikistan and Uzbekistan, and representatives of scientific and expert communities approved the draft Model Law 'On Artificial Intelligence Technologies'. [5] The document's main purpose is to implement uniform rules in CIS countries to regulate public relations related to the use of AI. The articles of the law aim not only to ensure the security, economic and social development of the Commonwealth countries, but also to train highly qualified personnel through the effective integration of AI into HE.

According to statistics [19], approximately 100,000 people are employed in IT within the country, and the number of employees with higher education is about 76%, of which 57% are under the 30 and 12% of those employed in the IT industry are students. The Belarusian State University of Informatics and Radioelectronics (BSUIR) was one of the first in CIS countries to found the Department of Intelligent Information Technologies in 1995 and to begin training students in artificial intelligence. Today, three universities in the republic already teach highly qualified specialists in AI. According to a student survey at leading universities in the republic, most already use AI capabilities (94.3%), and 5.7% of them turn to paid neural networks. The following AI systems are the most popular: ChatGPT (56.7% use it), MidJourney (18.2%), Character.ai (11.3%), Stable Diffusion (3.0%), QuillBot (2.8%), Google Bard (1.9%), Bing (1.9%) and other services (4.2%). [19]

Project Activities in the Field of AI in HE

The training of highly qualified AI personnel had an impact on the development of applied research and start-ups. The growth in the number of start-ups in finance, industry, medicine, construction, transport, agriculture, tourism and other sectors has been particularly noticeable over the past 5-7 years. The Fabby neural network application, developed by the Belarusian company AIMatter, has already gained recognition on the global market. Google found this company. Exadel develops both its own AI software products and custom software for Fortune 500 clients, including Deloitte and McKesson. OxyTech, AI Sapiens (a start-up), and others are also well-known in the foreign IT market. Work is actively underway to introduce GenAI into the instrumental distance learning system DL.GSU.BY [20]. Based on the above data, Belarusian projects have received recognition and funding from major international companies around the world, and there are more and more such products, despite the fact that they are quite difficult to innovate.

Challenges

Today, the AI labour market in Belarus is showing positive trends, although it has faced certain challenges:

• In resupply, the demand for AI specialists increases every year. For example, in 2023, the number of vacancies in the field of AI increased by 25% compared to 2022. Specialists in the following areas are most in demand: machine learning, natural language processing, and data analysis. However, the level of education in these specialities still does not fully meet the requirements of the market due to the high dynamics of the development of this field [21];

• So far, the use of AI in HE is causing distrust. Ethical issues related to AI are of considerable concern. The risks of using AI in HE include the replacement of students' original texts with texts made by AI, an increase in plagiarism in student papers, a decrease in grades, technological bias; increased social inequality; the dying away of the need for HE for future generations;

• A number of leading AI specialists and companies are hired for foreign organisations. This is due to the relatively low salary in the republic, which leads to a staff drain. Productivity and living standards in developed countries are significantly higher, which makes their markets more attractive to Belarusian specialists;

• There are no uniform terms and definitions, or regulatory rules in AI yet, which makes it difficult to develop unified curricula and solve personnel training tasks in general [22];

• One of the main problems with training ICT specialists, especially in AI, is retaining and replenishing the teaching staff. This is due to the fact that highly qualified AI specialists receive significantly higher salaries than trainers.

Solutions

• Popular opinion in Belarus is that the most effective way to solve personnel issues is retraining and advanced training in AI. 73% of respondents consider it advisable to invest in training specialists to work with AI [23];

• It is necessary to create a stable system of moral and material incentives for teachers involved in training personnel for the AI industry [24].

• To support and stimulate the self-education of teachers and students, the following options are offered: internships for teachers (1-3 months) in specialised commercial companies; collaborations and exchange of experience in the field of AI with foreign universities; creation of laboratories and open spaces for specialists from different organisations; inviting specialised personnel from the industry to conduct additional courses;

• In the republic, a survey of more than 530 organisations showed that the vast majority of respondents, 86%, believe that discussions about AI, including its integration into HE, should take place at the international level. Only 14% believe that it is better to solve organisational, legal issues, AI development and its application in various industries within the country[24];

• The country's authorities are confident that it is necessary to develop international standards (at least within the CIS countries), including the basic requirements and norms for the development and application of AI, to ensure its effective and safe use [23]. This stimulated the development of a Model law regulating AI for CIS countries.

2.4 RUSSIA

Of particular interest are the Decrees of the President of the Russian Federation (RF) No. 490 dated 10.10.2019 (as amended on 02/15/2024), "On the development of artificial ntelligence in the Russian Federation" and "National Strategy for the Development of Artificial Intelligence for the period up to 2030". [25] . The documents defined the goals and main objectives of AI development in the RF, as well as measures aimed at using it to safeguard national interests and implement strategic national priorities, particularly in ield of scientific and technological development. The regulatory framework for the digitalisation of higher education in the RF also includes the Government's Decree "On the state information system ' Modern Educational Environment'". Although this document does not specifically address the use of AI in education, at the same time, Russian universities are also facing the challenge of to integrating AI into the educational process in order to remain competitive, making the integration of AI into higher education a particularly pressing issue [26].

The most significant achievements of Russia in the development and application of AI in the field of education are:

• By the start of 2024, more than 100 educational programmes in the field of AI had been developed   by higher education institutions in the Russian Federation;

• More than 30,000 teaching staff have improved their qualifications in this field;

• In 2022-2023 alone, more than 40,000 students participated in the project-based AI education programmes for pupils. More than 30,000 people participated in competitions for solving   theoretical and applied AI problems;

• Currently, more than 50 Russian universities have been launched since 2017. Specialised AI courses have been designed and included in educational programmes [27, 28]. Six research centers in the field of AI have been established on the basis of key Russian HEIs support and scientific organizations;

•The number of graduates who have completed AI educational programs in 2030 is expected to grow to at least 15,500 people per year, compared with 3,048 graduates in 2022;

• In order to assist Russian universities in applying AI for educational and scientific purposes, the Higher School of Economics (HSE) and Yandex Education have prepared a joint report on Artificial Intelligence in Education. [29]. An important outcome of the joint work is an analytical report   on the students' experience of using AI in higher education. The focal point is on measures to assist students in the legal use of AI tools in educational processes. These developments are available on the https://education.yandex.ru/aihighreporthttps://education website.yandex.ru/aihighrepot. A database of cases documentingthe experience of using AI in higher education is being developed on this information resource, allowing users to explore and also "draw" possible scenarios for its application in an educational environment;

• In 2024, the Russian Alliance in the Field of Artificial Intelligence Association was established, uniting leading technology companies to develop AI in the country, with education being one of its key focus areas. The Alliance has developed a methodology for rating the effectiveness of the modern Russian education system in training AI specialists. "The purpose of the rating is to create a system for evaluating universities' capacity for developing AI tools to improve the quality of training specialists, and to provide objective information about universities to applicants and the state" [27].

Challenges

In addition to these achievements, Russia has significant advances in integrating AI into HE. However, the following challenges are noted:

• Significant risks associated with a lack of research in this area have beenobserved. Of particular concern is the use of generative AI in HE, which can lead to a decrease in creative activity among students and doctoral students;

• There is a lack of in-depth research, methodological development, and analysis of the possibilities and potential of AI in HE;

• At the federal level, there is a weak legislative framework for AI, along with a need to address ethical challenges and enhance regulations for its use in higher education. Moreover, the regulatory documents being created should primarily encourage universities to use and develop AI tools, and only secondarily focus on regulation [30];

• There is a pressing need to develop and test didactic and subject-methodical products based on suitableAI models, with the aim of implementing them in university practice;

• The introduction of generative AI in universities of the humanities, which have their own specificities with regards to teaching and examination (assessment of critical thinking skills, academic writing, creative processing of texts, etc.) has created the need to develop new approaches to learning.

Solutions

The most promising areas for the development of AI in the field of education are:

• Supporting scientific research and development in order to ensure the advanced development of AI, with plans to increase the attractiveness of a scientific career in this field for students of higher education programmes and young scientists, including through the payment of scholarships from the President of the RF;

• Enhancing citizens' awareness and competenceis of AI technologies, with plans to introduce a comprehensive training system for qualified personnel in the field of AI technology development and use in higher education institutions;

• Developing university graduates' skills in using AI technologies , with strategies of including AI modules included in all educational programmes (taking into account the specificities related to industry affiliation and training areas);

• The comprehensive system for training qualified personnel in the development and use of AI technologies will involve the formation and periodical update of a set of competencies gained through higher education in various AI-related specialties. The educational process, the development and updating of curricula, and the establishment of dedicated AI departments will also involve the organizations active in the AI sector;

• In furthering international cooperation in AI technologies, plans include developing educational programs in AI and multilingual online platforms in collaboration with foreign partners, as well as professional development and retraining programs, including for government civil servants in partner countries. Additionally, there will be efforts to train foreign AI specialists in the Russian Federation.

• Currently, only 17% of Russian companies utilise AI, so the government plans to provide financial and organisational assistance to organisations involved in the development and implementation of AI in education, business, and manufacturing.

Russia is a leader amongst the list of CIS countries and members of the Eurasian Economic Union in terms of reforms and decisions on the development of AI for both education and other industries. The Russian government is motivated to step up the integration of AI into higher education by a number of factors: the sanctions imposed by the EU and the United States in industrial and scientific sectors, the need to survive in a fiercely competitive environment, and global trends in the development of AI across higher education and civilian activities.

2.5 KAZAKHSTAN

An important document on AI regulation in the Republic is Resolution No. 592 of the Government of the Republic of Kazakhstan, dated July 24, 2024, "On the approval of the Concept of Artificial Intelligence development for 2024-2029" [31]. The Concept describes in some detail the analysis and assessment of the current state of the industry, scientific research in the field of AI, regulation of legal relations in the field of AI, the basic principles and approaches of development in terms of the introduction of AI, problems and prospects for its development, including in the educational sphere of Kazakhstan.

According to the Government's AI Readiness Index for 2023 conducted by Oxford Insights, Kazakhstan ranks 72nd of 193 countries. In Kazakhstan, 24 institutions of higher education and research centres are engaged in research and

development in the field of AI. Due to the acceleration of technological transformation and digitalisation, the demand for IT specialists and talents   in the IT sector remains high and exceeds their supply.

The Institute of Smart Systems and Artificial Intelligence (ISSAI) at Nazarbayev University made an important contribution to the development of AI in higher education and other fields in the Republic.   ISSAI conducts scientific research and applies advancements in the field of AI. One of the important tasks of the Institute is to assist with the training of highly qualified specialists in the field of AI. The Model ISSAI KAZ-LLM with AI developed by the Institute is not only a scientific project, but also an important contribution to the development of qualified specialists in the field of generative AI. The project covers the entire process, from data preparation and model training to its implementation, providing local talents with practical experience in developing and improving AI tools. Nazarbayev University, al-Farabi Kazakh National University, the National Scientific and Practical Center "Til-Kazyna" named after Shaysultan Shayakhmetov, and others participated in the development[32].

In 2024, the Ministry of Science and Higher Education launched the AI-Sana pilot programme in the Republic, which provides training for 100,000 students in AI, programming, and startup acceleration[33]. The Astana Hub Technopark has opened courses for university teachers in AI, where it is planned to train more than 700 teachers from 47 universities in Kazakhstan. The Interuniversity AI Standard has been adopted in the field of AI, and universities have developed 20 new educational programmes on AI.

Challenges

As the analysis shows, there are a number of challenges that hinder the development of AI in HE of the Republic:

• The lack of a strategic vision for the development of AI in higher educationand other areas, as well as regulatory documents, starting with the exact concept of "Artificial Intelligence", regulating the ethical standards of AI application, the competence of government agencies, as well as the rights, duties and responsibilities of subjects in the field of AI;

• The lack of technical regulations and national standards for AI products and technologies complicates the development and implementation of domestic (national) AI systems in research units and laboratories of universities;

• The absence of large private technology companies for the development and implementation of AI, which could affect the training of personnel in this area;

• Low venture capital and insufficient expenditures on research and development (R&D) on AI also make it difficult to develop AI research in higher education. Government funding in this area is lower compared to developed countries - the planned cost level does not exceed 1% of GDP. Accordingly, "the development of scientific research in the field of AI requires financial support and increased interaction between education, science, production and business";

• According to Oxford Insights, in 2023 Kazakhstan had a shortage of specialists with higher education in the field of IT, insufficient level of digital skills, and insufficient number of effective educational programmes in the field of AI;

• As stated in the AI Development Concept, "today, systemic problems remain open related to a shortage of personnel, lack of necessary knowledge, high competition for AI talents, insufficient number of educational programs, lack of practical training in the field of AI, and therefore it is necessary to continue training teachers, advancing professional development of industry specialists, and actively expanding implementation of AI in higher education.

Solutions

• Since 2023, AI research has been included in the list of priority fields of science, and grants have been allocated for the commercialization of research outputsand retraining programmes in the field of commercialisation, which will stimulate the development of AI in HE and science[34];

• The development of AI in HE will be facilitated by the emergence of new AI laboratories and even research institutes at universities. It is necessary to pay more attention to the development of domestic AI systems. One of the most striking examples is the Institute of Smart Systems and Artificial Intelligence at Nazarbayev University. The ISSAI KAZ-LLM Model information system developed by using generative AI serves as an example of the integration of science with education.;

• The "Guidelines on the Use of Artificial Intelligence (AI) in Academic Activities" developed by the International School of Economics, the Higher School of Humanities, and the Higher School of Law were created "with the aim of establishing clear and fair norms and principles governing the use of AI across all types of academic activities in higher education institutions in Kazakhstan" [33]. This important document should be supplemented, developed and disseminated to all universities, and taking into account the analysis of best practices and insights from reputable sources. This will help create an environment in the Republic in which AI is used to improve the effectiveness of education, promote innovative research and optimise administrative processes within the framework of ethical and responsible use of AI.

In general, there is an intensification of AI development in Kazakhstan, and its basis is the integration of AI into higher education. In this acceleration process, the role of public administration is noteworthy, which is trying to optimise regulatory actions and provide more opportunities for the development of scientific and human resources in the tasks of implementing AI both in the higher education system and other fields of activity.

2.6 KYRGYZSTAN

The main regulatory document in the field of education is the "Law on Education" of the Republic of Kyrgyzstan dated August 11, 2023 No. 179 [35]. It establishes the basic principles of state policy in the field of education, as well as the legal, socio-economic, and organisational foundations of educational activities in the Kyrgyz Republic (KR). Although the Law was adopted during a period of rapid AI development in education, there are no points in the document regulating the use of AI in the education system. The Decree of the President of the Kyrgyz Republic "On measures to increase the potential and competitiveness of educational institutions of higher professional education in the Kyrgyz Republic" [36] gave great opportunities to five key universities in the country "to implement educational programs of higher professional and postgraduate professional education based on independently established educational standards and requirements." This made it possible to quickly develop and include new advanced subjects and educational programs on AI in higher education institutions.

In recent years, the Ministry of Education and Science along with other government agencies and universities in the Republic have begun to pay more and more attention to the issues and integration of AI in higher education. In every educational conference, Cabinet meetings, and other important government events, the topic of AI has been a priority.   Back in 2020, the Ministry of Education and Science and the Kyrgyz Academy of Education prepared an Information Bulletin on Artificial Intelligence Issue No. 4., [37]. This document analyses the best practices of leading countries in reforming and applying AI in the educational process and the experience of leading universities in Europe, the USA, Russia, China, and etc. in integrating AI into higher education and scientific activities. The document has been distributed to all educational institutions and is publicly available in order to facilitate AI in higher education, take measures to develop curricula, and train relevant personnel.

Leading AI researchers and experts are given invitations to universities both to teach and to design infrastructures for the development of AI as a tool for solving applied problems. For example, in addition to the IT Academy, the American IT school DevX IT-SCHOOL1 has been operating at Osh State University since the end of 2022.   Teachers who were invited are leading US specialists working in companies such as Apple, Meta, and Microsoft. Specialists are trained both in traditional IT technologies and in AI for higher education, economics, and etc. [38].

Challenges

The most important challenges in the Kyrgyz Republic regarding the integration of AI into higher education are as follows:

• There is no government regulation of issues related to AI in various spheres, including education;

• The technical infrastructure and provision of the necessary equipment for universities and research centers to conduct either scientific research or applied developments in AI are insufficiently developed;

• The most pressing problem remains the shortage of AI teachers at universities, and necessary curriculum updates are absent;

• There are no specialised scientific or educational laboratories for raising the capabilities of AI and adapting its functional modules to solve practical problems or train AI systems.

Solutions

According to the leading researchers and teachers of the Republic of Kazakhstan, who are actively engaged in the tasks of introducing AI into educational processes [38] to accelerate the integration of AI into the higher education system of the Republic:

• It is necessary to develop a regulatory framework for AI for various fields of activity, including higher education, taking into account the specifics of the country's development and national characteristics. There is a need to develop effective strategies and standards to ensure data privacy, overcome prejudice, and ensure equal access to education in the context of AI in higher education;

• It is important to establish horizontal ties with universities in Kyrgyzstan by carrying out joint megaprojects to study pedagogical aspects in the formation of professional skills, as well as the tools of modern AI, in order to increase the level of knowledge of future teachers in various fields related to AI in a higher education context;

• It is advisable for Kyrgyzstan to use the potential of the Republic's leading physics and mathematics schools, developers, and IT companies. To use talents not only to solve the problems of education, science, and production in the country using AI tools, but also to create competitive software products to enter the foreign market;

• It would be advisable to prioritise AI research in the scientific programs of the relevant ministries of the Kyrgyz Republic, promote the massive "rapid implementation" of Deep Learning and AI based on open source software, and support university initiatives to develop   these technologies among undergraduates and young scientists;

• Solving the tasks of personnel training through leading universities, research centers, and institutes, while updating technical and software infrastructure for developing opportunities to conduct training sessions, scientific research, and applied AI developments.

The analysis allows us to conclude that although there is no regulatory framework on AI in the Kyrgyz Republic yet, positive developments in integrating AI into higher

education are observed. Evidently, when developing the legislative framework for regulating AI, the government of the Kyrgyz Republic will rely on the Model Law on AI proposed by Belarus in 2024. This will allow the Kyrgyz Republic not only to determine the conceptual aspects of AI, terminology, and its strategic aspects, but also to establish close international relations with other CIS republics for implementing joint educational and scientific projects in this field.

2.7 TADJIKISTAN

Digitalisation in education, training, and human potential strengthening systems in the Republic of Tajikistan, implemented in accordance with the "Medium-term Program for the Development of the Digital Economy in the Republic of Tajikistan for 2021-2025", is aimed at solving promising tasks of introducing key elements of AI in HE and other sectors of the country. [39].

In Tajikistan, the development of AI is regulated by the document "Strategy for the Development of Artificial Intelligence in the Republic of Tajikistan for the period up to 2040". This is the Resolution of the Government of the Republic of Tajikistan No. 483, signed on September 30, 2022 [40]. The main purpose of this document is to promote the implementation of the "fourth strategic goal – accelerated industrialisation of the country." It defines further goals, priorities, and tasks for the development of AI in the country, as an important phenomenon of great importance for education and other areas of socio-economic development. There is a desire in the Republic to "introduce a digital system of industry activities, making extensive use of AI technologies to facilitate labour and save time, as well as increase the efficiency of industries," including the education system. [40]

The Strategy provides an in-depth analysis of the state and trends of AI development in advanced countries, which strive for the comprehensive development of AI by attracting investments, training highly qualified staff, and creating favorable conditions for introducing new technologies.

The fact that the first AI laboratory in Central Asia was established in Dushanbe in 2019 with the support of the Islamic Development Bank indicates that Tajikistan pays serious attention to the development of this important area. This laboratory conducts not only scientific research and development of AI software packages, but it

also serves as a training centre for young people to study the application of AI capabilities for various fields of activity. More than 100 young professionals have already been trained and are active in various industries.

Currently, 5 universities in the country are training specialists in the field of AI. The Technological University of Tajikistan and the Polytechnic Institute of the Tajik Technical University, a branch of the Technological University of Tajikistan, and the Kulob Institute of Management and Innovative Technologies have AI faculties and laboratories, where bachelor's and master's degrees in Artificial Intelligence are provided.

Challenges

When solving the tasks of AI development in education, the Republic faces a number of challenges:

• There is a great need to develop new and effective AI training programmes at universities and training centres. There is also a lack of scientific and educational literature on AI in local language;

• Educational institutions have a low level of technical and technological infrastructure, with universities lacking sufficient equipment for studying and developing advanced AI software systems;

• Lack of teaching staff in the field of AI;

• Weak international cooperation in the development and implementation of joint educational and scientific projects related to AI;

• There is a need to develop regulatory documents to regulate AI in higher education and other fields of activity.

Solutions

In the near future, Tajikistan plans to solve the following tasks related to the integration of AI into HE:

• Development and improvement of regulatory legal acts, such as the draft Law of the Republic of Tajikistan "On Artificial Intelligence", which defines the foundations of state regulation in this area;

• Amendments and additions to laws and codes related to the legal protection of AI and related relationships. Development of national rules and standards for assessing the value of AI in facilitating for commercialization and management;

• Training of highly qualified AI specialists, including data analysts and machine learning engineers at the level of professional education institutions in the country. By 2040, 5,000 highly qualified AI specialists, including data analysts and machine learning engineers, will be trained at universities and training centres in the country. The number of universities where AI personnel are trained will rise to 7 (now there are 5) by 2026[40];

• Creation of AI laboratories with the involvement of international organisations for the study and use of AI technologies. By 2026, three full-fledged laboratories will operate in the country, where they will not only teach practical skills in working with AI, but will also develop AI software. Currently, the Republic of Tajikistan has two AI laboratories in the cities of Dushanbe and Khujand, funded by the private sector. These laboratories are engaged in the study and development of artificial intelligence algorithms in the financial and telecommunications sectors and other sectors of the economy;

• Pilot AI clubs are planned to be established in five cities of Tajikistan (Dushanbe, Khujand, Bokhtar, Kulyab and Khorog), where additional education centres have been established.;

• It is planned to introduce a new subject "Fundamentals of Artificial Intelligence" in advanced training centres (courses) and an AI module as part of the Information Technology courses in high school and in secondary educational institutions.A professional training program for AI specialists will also be developed;

• It is planned to introduce AI training in the Republic, with the first year launched through the organisation of summer internships. Private IT companies and laboratories of research centers will be involved in these events;

• Training of young scientists in the field of artificial intelligence in cooperation with international organisations at the master's and postgraduate levels in educational institutions of developed countries;

• Development of rules for the use of AI in both HE and other fields, definition of mechanisms for the use of AI in the activities of government agencies, mechanisms for the use of information sources, dispute resolution, its legal protection and other aspects.

2.8 TURKMENISTAN

The Law of Turkmenistan on Education [41] is the basic law that regulates the legal basis of relations and defines the principles of state policy in the field of education, as well as the goals, objectives, and functions of the education system as well as the organisational basis for managing its activities. As for the digital transformation in higher education, in 2017, the "Concept for the development of the digital education system in Turkmenistan" was adopted, as well as a plan for its implementation. The main goal of the Concept is to "radically improve the work of educational institutions, provide high–quality electronic information at all levels of education, as well as the widespread use of digital resources and improve the content of education in educational institutions and its quality compliance with international standards." Although there are no special points in the Concept and there is no mention of the use of AI in higher education, they are provided for in articles related to the introduction of advanced digital technologies in the educational process [42].

The increasing efforts on the creation of AI regulation methods, effective use of AI, analysis of trends in the developed countries of the EU, USA, China, and CIS countries, as well as the presence of threats to the information security of countries, encourage authorities to pay more attention not only to the tasks of AI training, but also to the development and use of AI systems for various fields of activity. Perhaps the Republic will adhere to the recommendations on forming a system of legal regulation of public relations and the basic components of the "Model Law on Artificial Intelligence" proposed by Belarus for the CIS countries.

The introduction of AI in the Republic is at an early stage. The Republic's leadership understands the potential and limitations of introducing AI, especially in the education and training of highly qualified personnel. The Academy of Public Administration under the President of Turkmenistan is interested in and oversees the training of specialists in the field of digitalisation, including the use of AI, both in the education system and in other fields of activity. The Academy, with the support of the

United Nations Development Program, as well as a project of the European Union and the Academy of Management under the President of the Republic of Belarus, is working on the development of master's degree programmess such as Digital Governance, Constitutional Law and Public Administration, which provide training for highly qualified specialists for government authorities in the field of information and communication technologies and management. The listed tasks are specified in the "Concept for the Development of the Digital Economy in Turkmenistan in 2019-2025". These programmes are guided by the global experience of leading universities in Europe, Asia, and CIS countries.

In general, it can be noted that the Academy of Public Administration under the President of Turkmenistan, the Technology Center of the Academy of Sciences of Turkmenistan and the Innovation Information Center of the Ministry of Education of Turkmenistan play the most important roles in the development of new technologies for the education system, including the intensification of the use of AI. These organizations most actively assist universities and other educational institutions and research centres in the implementation of projects in the field of e-education, in the development of textbooks, video and audio materials, e-books, software packages based on advanced IT technologies [43].

Currently, the Ministry of Education of Turkmenistan and ULearning (Huawei's partner) are discussing important cooperation projects on the development and adaptation of the Smartclass system to explore the possibilities of effective use of AI in the Republic. To test the system under educational conditions 200 users will be granted access to universities in the Republic. Users will be able to evaluate the effectiveness of using AI in higher education, the system's capabilities for conducting training sessions, and receiving recommendations for improving the organisation of lessons using AI tools. Also, university teachers in Turkmenistan will gain skills in using AI in preparing materials for classes, planning them, writing tests, evaluating and analyzing student performance [44,45].

On November 9, 2023, the "Roadmap for IT cooperation in education for 2024-2025" was approved between the Ministry of Education of Turkmenistan and the UNESCO Institute of Information Technologies in Education. Within the framework of this agreement, activities are carried out in various areas of activity, mainly related to the digitalisation of education and the use of AI in HE[44]. As part of the implementation of the tasks defined by the Roadmap for this Cooperation for 2024-2025, a scientific and practical conference "Artificial Intelligence in the education system of Turkmenistan" was held in December 2024. It was organized on the

initiative of the Ministry of Education of the Republic. The participants discussed the development of information systems for education management, improving the digital competencies of teachers, as well as the introduction of advanced technologies in teaching, taking into account the needs and peculiarities of Turkmenistan. The main topics of discussion at the conference were: implementation and improvement of the use of AI in the educational system; competencies necessary for teachers and students in the field of AI; preparation of young people to solve production tasks using AI; draft Strategy for the development of artificial intelligence in education in Turkmenistan; and development of international cooperation on the use of advanced educational platforms on AI.

Challenges

To stimulate the process of digital transformation of AI in Turkmenistan, it is necessary to pay attention to the following challenges:

• There are no regulatory laws, documents, rules for regulating AI in the republic yet;

• There is a shortage of highly qualified teaching and research staff in the field of AI;

• Insufficient international integration with leading scientific and educational schools to increase the level of knowledge of teaching and scientific staff at the universities;

• There are problems in the technical equipment of universities focused on training specialists in the field of AI. There is a great need for specialized scientific and educational laboratories to develop skills in applying AI capabilities in practice.

Solutions

To solve the above challenges, a number of measures should be taken:

• Development of a regulatory framework on AI, addressing issues in education, ethics of use, and strengthening scientific potential, etc.

• Expansion of cooperation with leading foreign countries and companies. The first steps have already been taken in the Republic and there are practical results. These include cooperation with Huawei, joint projects with UNESCO, and addressing regulatory issues and human resource development with the CIS countries, etc. Other notable collaborations also include expanding the joint detail of the Ministry of

Education of Turkmenistan with UNESCO Institute for Information Technologies in Education (IITE) in accordance with the developed Roadmap for Cooperation for 2024-2025, contributing to the digital transformation of higher education in Turkmenistan;

• The most important task is to increase the knowledge and skills of both teachers and those who work on the development of digital technologies, the application and creation of AI systems;

• Stepping up the implementation of measures to consistently improve the digital culture of the population, aimed at the gradual adaptation of people to new digital realities and the use of AI methods and tools;

• Strengthening the material and technical base and developing a modern technical infrastructure that meets the requirements not only for the use of ready-made AI systems in the educational process, but also for developing national software applications.

2.9 UZBEKISTAN

In accordance with the Decree of the President of the Republic of Uzbekistan No. PP-358 DATED 10/14/2024, "The Strategy for the development of artificial Intelligence technologies through 2030" has been approved. The goal of the Strategy is to create favourable conditions for the introduction of AI technologies in the social sphere and economic sectors, and to elevate the country into the ranks of the world's leading nations in AI technologies. In accordance with the Strategy, the Republic has set a goal to rank among the top 50 states in the Government AI Readiness Index [46]. In addition to the Strategy, the integration of AI into higher education is based on two important resolutions aimed to facilitate the rapid development of AI technologies: Resolutions of the President of the Republic of Uzbekistan "On measures to create conditions for the accelerated introduction of artificial intelligence technologies" No. PP-4996 dated February 17, 2021 and "On measures to introduce a special regime for the use of artificial intelligence technologies" No. PP-5234 dated August 26, 2021. These documents identify the most prioritised areas for the development of artificial intelligence technologies [47,48]. A special legal regime has been created in the Republic, providing tailored conditions for the experimental introduction of artificial

intelligence technologies, which are regulated by current legislation for 12 priority areas, including higher education, finance, healthcare, energy, and others.

Currently, AI courses and disciplines have been introduced in 15 local universities. Starting from the 2023/2024 academic year, 572 students have been accepted in 12 higher educational institutions for training in "Artificial Intelligence". There is a need for 600 specialists in big data processing and language models. The undisputed leader in AI among universities is the Tashkent University of Information Technology (TUIT). A bachelor's degree programme in AI has been introduced at the joint Faculty of Information Technology of TUIT and the Belarusian State University of Informatics and Radioelectronics. Currently, 200 students are studying in this specialty in the areas of Artificial Intelligence, Mechatronics, and Robotics. The students are also preparing for   masters in the fields of Artificial Intelligence; Internet of Things; Computer systems in medicine; Intelligent information and communication systems. TUIT has opened a separate doctoral program in Digital Technologies and Artificial Intelligence. Since 2022, 5 quotas for doctoral studies and a dedicated quota for independent researchers have been allocated in the field of artificial intelligence. The Department of Artificial Intelligence at the National University of Uzbekistan has laboratories for Artificial Intelligence, IoT Technologies and Embedded Systems.It plans to also create laboratories for robotics and Cloud Computing. Bachelor's degree programmes have been significantly updated, considering the experience of leading foreign universities.

The Department of Artificial Intelligence at the National University of Uzbekistan was established in 2022 at the Faculty of Applied Mathematics and Intelligent Technologies. The main scientific directions of the department are the development of methods in data mining and in artificial neural networks. The Department has a scientific seminar "Intellectual analysis in solving applied problems". The seminar discusses the reports of staff and doctoral students of the Department as well as the results of scientific competitions from various organizations of the Republic of Uzbekistan.

The Department of Digital Technologies and Artificial Intelligence at the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers was established in 2023. Although the university specialises in training qualified personnel in the field of engineering and technology in agriculture and water management, thanks to the efforts of this department, the university is gaining momentum in teaching AI methods in information systems and technologies aimed at the agricultural sector.

Samarkand State University has opened a Department of Artificial Intelligence and Information Systems, which trains specialists in using AI in data analysis, automation of socio-economic and educational processes, and design and development of software complexes for various industries.

In order to form a scientific ecosystem in the field of AI, the Republic has launched a Research Institute for the Development of AI (Research Institute for the Development of Digital Technologies and Artificial Intelligence) under the Ministry of Digital Technologies of the Republic of Uzbekistan. The main objectives of the Research Institute are to organise scientific research aimed at the full implementation of the Digital Uzbekistan 2030 Strategy and the introduction of AI technologies into the economy, social sphere, and public administration. The Research Institute not only actively conducts fundamental and applied scientific research, but also develops innovative products for managing and automating production processes based on AI technologies. In addition, there is a Council for the defense of doctoral dissertations in the field of AI, which makes it possible to increase the scientific and pedagogical potential in the field of AI in HE.

In recent years, international and national conferences on AI have been increasingly held to enhance the integration of AI into higher education. The tasks of training personnel in AI occupy a special place in these conferences. As mentioned above, Uzbekistan hosted a High-level Regional Policy Dialogue in Central Asia in 2024 on the theme "Promoting the transformation of Higher Education based on GenAI", organised on the initiative of the International Centre for Higher Education Innovation under the auspices of UNESCO (UNESCO-ICHEI) and TUIT. The results of this forum cannot be overestimated. The participation of heads of universities and ministries, leading scientists and teachers from Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan, Turkmenistan, Russia, Belarus, Georgia, Turkey, the United Arab Emirates, Germany, France, Pakistan, and China marked the beginning of a new cooperation between the countries to jointly address the current challenges of GenAI in HE.[49]   The Ministry of Higher Education, Science, and Innovation of the Republic of Uzbekistan, together with the Department of Artificial Intelligence at Tashkent State University of Economics (TSUE), held the first International conference "Digital Transformation and Artificial Intelligence: Problems, Innovations and Trends" in September 2024. The conference was attended by representatives from different countries (Russia, Kazakhstan, Iran, etc.), universities, and research centres. The tasks of applying AI in various fields of activity were considered. The main attention was paid to the practical applicaitons of AI in higher education. TSUE

publishes its own scientific journal, "Digital Transformation and Artificial Intelligence".

On December 20, 2024, the annual International Conference of the National Team of Erasmus+ Experts in the field of higher education reform, "Prospects for the development of higher education in the Republic of Uzbekistan" was held. The conference was dedicated to the 30th anniversary of cooperation between the EU and Uzbekistan in the field of higher education under the Tempus (1994-2014) and Erasmus+ (2014-2024) programs. The initiator is the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan, and the National Office of Erasmus+ with the active participation of HE leaders from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The purpose of the conference is to increase the effectiveness of higher education development through the exchange of experience, analysis, and information on best practices, achievements, trends and challenges, while also promoting regional cooperation.

Challenges

Although Uzbekistan has achieved some success in facilitating the introduction of AI in various fields of activity, including HE, there are still a number of challenges.:

• So far, there is no government regulation related to the regulation of issues related to the integration of AI into HE, especially those related to GenAI. There is a need to address legal and ethical issues, especially in the use of GenAI in universities;

• There is a shortage of scientists and highly qualified AI teachers, and there is a great need for internships and training courses at leading scientific and educational centres from   leading foreign countries;

• Although there are several IT companies in the Republic and new technology parks are opening, there is still no close cooperation between universities and relevant departments with organisations specialising in the development and implementation of AI;

• There are no specialised scientific laboratories and centres for conducting scientific research on AI or developing and applying AI methods in education and solving other applied problems.

Solutions

Most of these problems related to the integration of AI into HE will be solved by implementing the tasks set out in the Strategy for the Development of Artificial Intelligence Technologies through 2030[46]:

• First of all, it is planned to create a regulatory framework "including legislative acts regulating relations in the field of artificial intelligence, international and local standards, as well as the mechanisms of their implementation";

• Highly qualified specialists in the field of AI will be trained at universities in Uzbekistan. As of 2024, there are 572 graduates, with projections of 650 in 2026, 800 in 2028, and 1,000 by 2030;

• It is expected that the number of professors with academic degrees (PhD, DSc) in the field of AI in the universities of the republic will increase to 40 people by 2030;

• The government plans to allocate targeted grants for the creation of laboratories (equipped with modern technology) for the application and study of Internet of Things technologies, robotics, and AI at universities;

• A separate point was noted for the establishment of free online courses in the field of AI in higher education with the involvement of leading faculty professors and highly qualified specialists from foreign countries;

• In order to accelerate the integration of AI both in the higher education institutions and in the professional development systems for employees of various departments, specialised AI training programmes will be developed in the nearest future. A process for organising training processes for employees of private enterprises specialising in IT, as well as for government agencies, business associations, and local authorities will be established;

• The organisation "El-yurt umidi" ("Hope of the Motherland") has been founded in Uzbekistan to foster close cooperation with researchers, specialists, and talented youth living and working overseas, through training and professional development opportunities of citizens of the Republic. In 2024, 30 young scientists working on AI will be sent to study at leading foreign universities , funded by the foundation. In the nearest future, it is planned to send 3,000 specialists for advanced training in AI to manufacturing companies and universities in Germany, Japan, South Korea, China, Turkey, the United States, Russia, India, and the United Kingdom.

Of particular interest are developments on the use of AI methods for higher education to intellectualise the search for scientific and educational information carried out at the Tashkent University of Information Technology (TUIT).   Great expectations are placed on the "Center for Digitalization of Higher Education" (SMART CLASS) at TUIT, which is being created with the support of a UNESCO ICHEI grant. ICT teaching staff from all universities of Uzbekistan and, possibly, neighbouring countries of Central Asia will study here in important subjects such as the creation of applications and resources for micro-certification and the application of new ICT achievements (including AI) in the educational process. Priority will be given to teaching teachers and doctoral students the use of AI in teaching, access to valuable information resources, self-learning, and design of AI systems and knowledge bases[3].

3. CONCLUSION

This section of the Report summarises the analysis on the integration of AI into HE and provides recommendations based on the best practices of the CIS countries and the discussion outcomes of the event "The High-Level Regional Policy Dialogue in Central Asia: Facilitating GenAI-driven Higher Education Transformation", held in June 2024 in Tashkent. With analysis of the key stakeholder presentations and discussions, the conclusions serve to offer recommendations to higher education stakeholders for the more effective integration of AI into the higher education system. The recommendations are output from the context of the policy dialogue.

1. All CIS republics demand for and should develop or update the legislative and governance framework for the AI integration into HE. The Model Law "On Artificial Intelligence Technologies" [4, 5] proposed by Belarus can be a good example for consideration. Undoubtedly, the establishment of common principles and model rules in the CIS for the creation and use of AI in HE will help create a unified space for the development of the educational and scientific environment. Although the draft Law was approved by the Permanent Commission on Science and Education of the CIS Interparliamentary Assembly in 2024, each country should take into account its specific development and further develop its own guidelines and methodological

framework. There is a need to update laws and other guidance materials on the digital transformation of HE, taking into account the prospects for integrating AI into educational and research processes;

2. In order to increase the effectiveness of AI integration into HE institutions and organizations in Central Asia, as well as other CIS countries, it is recommended that institutions join an open ecosystem that facilitates knowledge exchange and "peer learning". Taking an example of the   IIOE network, establishing cooperative efforts in the IIOE micro-certification project aimed at meeting the urgent need for advanced training and retraining of HE personnel in the GenAI era. (the proposal of Prof. JIN Li, Director of UNESCO-ICHEI and Vice President of Southern University of Science and Technology, China) . Given the rich experience of UNESCO-ICHEI in the field of retraining and advanced training programs for higher education personnel in the field of AI, as well as multilateral cooperation in the development of educational resources and capacity building, such collaboration with UNESCO-ICHEI will significantly advance the transformation of AI in HE;   (based on the proposal of Prof. JIN Li, Director of UNESCO-ICHEI, and Vice President of Southern University of Science and Technology, China).

3. Given the growing influence of AI on HE, it is necessary to develop and support international rules and regulations that promote the recognition of qualifications and academic mobility, thereby stimulating innovation and preparing students for the future labour market. In this regard, the role of the Global Convention on the Recognition of Qualifications Concerning Higher Education is very important in ensuring equality in education, inclusivity and lifelong learning. (based on the proposal of Mr. Borhene Chakroun, Director of Policies and Lifelong Learning Systems Division, UNESCO HQs);

4. Strategic partnership, collaborative efforts of universities of the Central Asia republics and other CIS countries in the field of AI should be focused on the synergy of science, education, innovation, and management, which will reflect the key role of cooperation between universities and industry in the development of AI talents and ensuring future employment;

5. Taking into account the experience of the leading countries of the world, the CIS countries need to allocate sustainable investments to ensure the continuous development of competencies in the field of AI, including not only support for the educational process, but also the material and technical base and research activities. Examples include the FAST Foundation to support the   Generation AI project in Armenia, the Hope of the MotherlandState Foundation in Uzbekistan, the allocation

of targeted grants for the commercialisation of research results and retraining programs in the field of AI commercialization, and the creation of laboratories in Kazakhstan and Uzbekistan;

6. To expand the impact of UNESCO-ICHEI cooperation on developing and operationalising Smart Classrooms, where training courses on AI, digital scientific and educational databases, as well as scientific research and talent development are organized. Intelligent AI-enabled educational solutions, including Smart Classrooms, scientific research, and talent development, will help accelerate the digital transformation of higher education throughout the region;

7. Each country has experience in involving commercial companies in joint projects on the development and implementation of AI software systems in various spheres (the experience of Russia, Kazakhstan, Belarus).   It is recommended to use and expand the potential for integrating the efforts of private companies and the public sector in creating AI systems for higher education.

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4. Appendix

THE RESULTS OF A SURVEY ON GENERATIVE ARTIFICIAL INTELLIGENCE (GENAI)IN HIGHER EDUCATION

Within the framework of the International Conference "Prospects for the development of higher education in the Republic of Uzbekistan". With the participation of HE leaders from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. 20.12.2024

The purpose of the questionnaire is to analyse the state and prospects of using GenAI in higher education, as well as to formulate recommendations on the effective use of GenAI systems in universities in Uzbekistan. The survey was participated in mainly by teachers and doctoral students from the leading universities of the republic, 125 people in total.

To the question "Which GenAI tool do you use?" (Fig.1), the survey results were as follows: the majority (88 people) use ChatGPT as the most popular system, but more and more teachers and doctoral students are starting to use GENT AI UZ, which uses databases in Uzbek. 19% of respondents prefer other GenAI software packages.
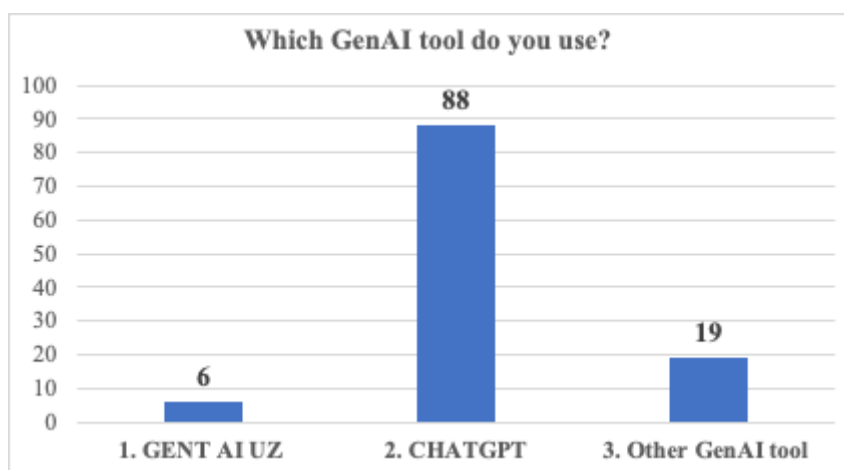

Fig.1. GenAI tools used in the educational process

It was interesting to find out the extent to which GenAI is used in daily work, and how much users know about GenAI (Fig.2). The majority (49 people) indicated that they have only general ideas about GenAI, 39 people use it for their scientific research, and 4 are teachers who have included GenAI in their curricula to teach students how to use these systems. It was also interesting to learn that 4 people are actively involved in the development of GenAI systems, and in the formation of a database and knowledge bases for their own use.
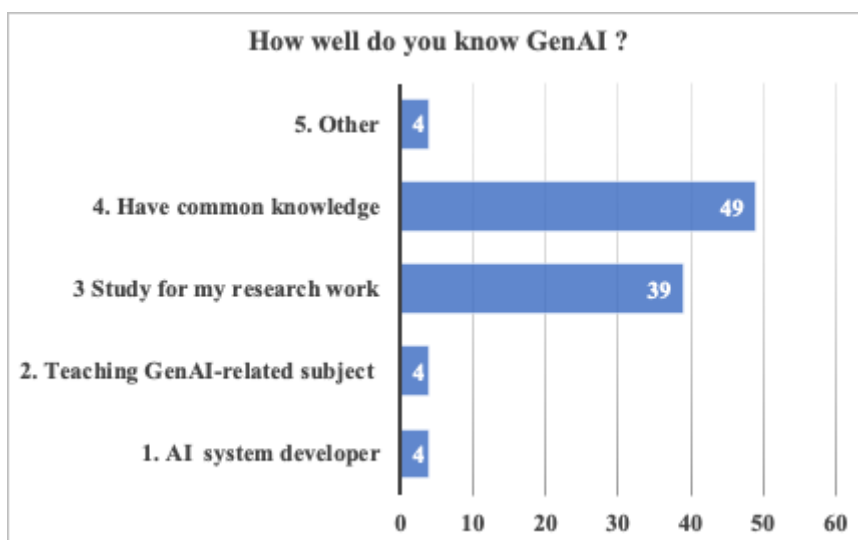
Fig.2. Knowledge level(skills) on GenAI

The next question was related to the purposes of using GenAI (Fig.3). 55 respondents still consider GenAI a fun software package and are more interested in its functionality rather than active application, and 24 use it for entertainment in their spare time. But 32 people are already actively applying the system to write up research papers, and 21 use it for their dissertations.
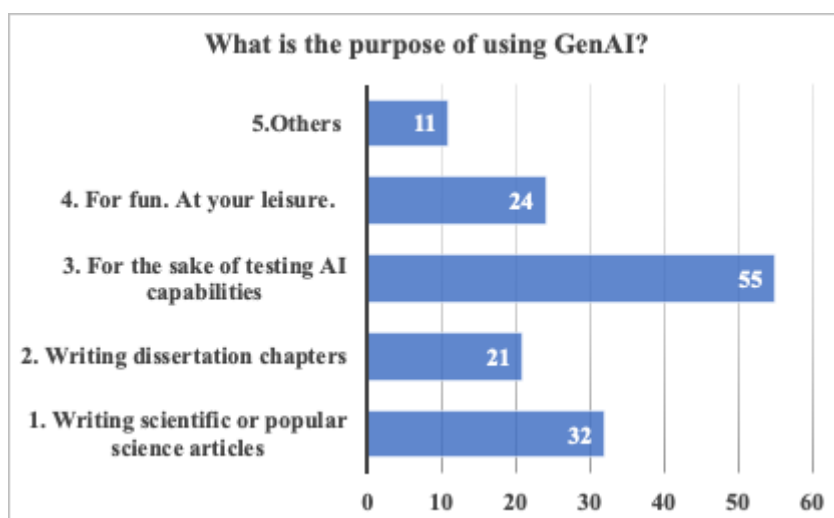

Fig. 3. The purpose of using GenAI

The next question was about the relationship to GenAI (Fig.4) Do they consider it a useful tool in improving the effectiveness of the educational process, or does it harm the creative process? The majority (39) believe that the system is a useful tool for speeding up scientific work and is a promising direction for improving the efficiency and quality of higher education (37). GenAI will help in writing scientific articles and dissertations, and improve their quality (32). 20 respondents believe that GenAI harms the quality by reducing the creative potential of students and doctoral students.

They believe that most students and researchers will assign all creative work to GenAI systems, which will generate new scientific solutions and thereby reduce the development of creative skills.   Only 6 respondents noted the futility of using GenAI in the educational process.
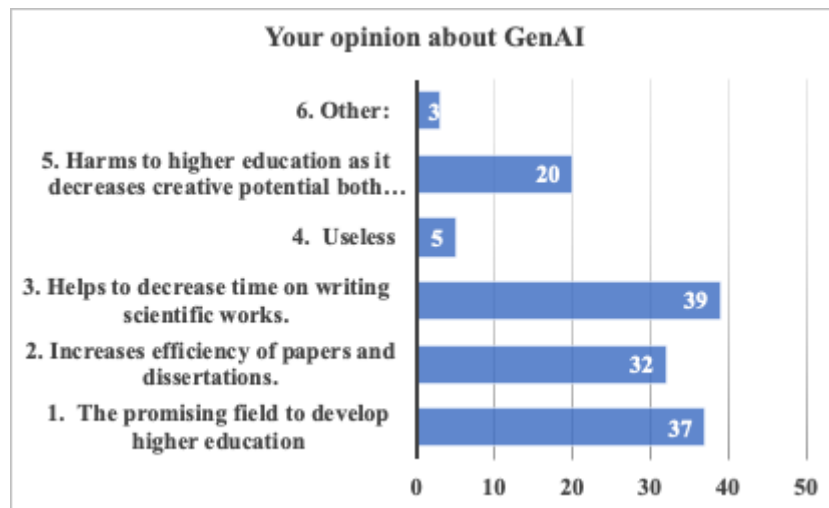

Fig.4 Opinion to GenAI

The most important was to find out the opinion of the respondents about the need for special government decisions and administrative regulation of the use of GenAI in higher education (Fig.5). The majority (35 people) are convinced that it will be enough to develop recommendations on the use of GenAI and send them to all universities. 33 respondents believe that universities should be given more independence to make decisions on regulating the use of GenAI at their universities. Not a small number, 29, believe that government decisions are necessary to regulate the use of GenAI. However, 19 people expressed the opinion: "there is no need for special reforms on the use of GenAI" and that more freedom should be given to the use of such systems in higher education.

**Any State decrees on managing GenAI usage
in Higher education?**
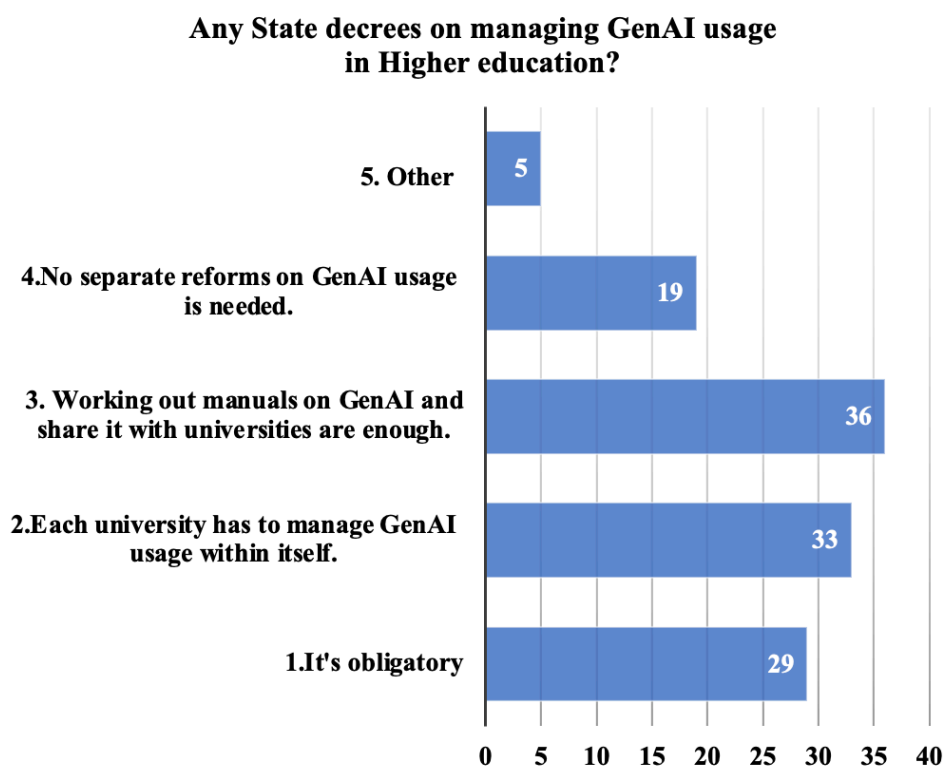
Pic. 5.   The need to regulate the use of GenAI in higher education

Conclusion

The questionnaire showed that the use of GenAI in Uzbekistan HE is at an early stage. Currently, there are more than 50 GenAI systems in the world, but no more than 3-4 systems are used in Uzbekistan, and ChatGPT is the most popular of them.   So far, university teachers do not often use AI in the educational process, because there is a distrust of such systems and most educators lack the technical proficiency. However, at the same time, the majority of respondents are optimistic about using AI in higher education to improve the effectiveness of teaching, writing scientific articles and dissertations. Although the respondents believe that universities themselves should manage the process of using AI, there is still a need for government regulation and development of the legislative framework for the use of GenAI in higher education. The survey was conducted mainly among the conference participants from Uzbekistan. Nevertheless, the survey results reflect the general state of GenAI usage in the Central Asian republics. The analysis presented in the Report showed that the problems and achievements in the development and use of AI in higher education across the region are of a similar nature.