5. Research activities

1. Main scientific areas

- Theory and methodology of teaching computer science;
- Digitalization of education;
- Robotics and mechatronics;
- STEM approaches in education;
- Information systems;
- Artificial intelligence and machine learning in education;
- Internet of Things (IoT) in educational environments;
- High technologies in education.

2. Research Projects (Ministry of Science and Higher Education of the Republic of Kazakhstan, Grants, Contract-Based Projects) Over the Past 3 Years

The faculty of the Department of Computer Science and Educational Informatization actively participates in research projects funded by the Ministry of Science and Higher Education of the Republic of Kazakhstan, as well as in grant programs aimed at developing the modern education system. The implemented projects are both fundamental and applied in nature and focus on solving current challenges related to digital transformation of the educational process, professional development of teaching staff, and the integration of IoT technologies, artificial intelligence, and robotics into education.

Over the past three years (2023–2025), five research projects funded by the Ministry have been implemented at the department.

List of Implemented Research Projects

1. “Improving the effectiveness of hybrid and distance learning formats based on the development of higher education infrastructure in the context of digital transformation,” 2023–2025. Project leader: B.S. Akhmetov, Doctor of Technical Sciences, Professor. Chief Researcher: N.T. Oshanova, PhD, Associate Professor

2. “Building a system of continuous professional development for teachers in the context of education for a complex world: paradigm, methodology, digital tools,” 2023–2025. Project leader: Doctor of Pedagogical Sciences, Professor Zh.K. Nurbekova Chief researcher: Doctor of Pedagogical Sciences, Professor A.E. Sagimbayeva Leading researchers: Doctor of Pedagogical Sciences, Professor E.Y. Bidaybekov; PhD, Associate Professor N.T. Oshanova; PhD, Professor Sh.T. Shekerbekova.

3. “Development of a mobile application for teaching robotics to Kazakh secondary school students,” 2023–2025. Project manager: PhD, Senior Lecturer M.I. Revshenova. Leading researcher: PhD, Senior Lecturer E.Kh. Zhabayev. Researchers: Master's degree, Senior Lecturer A.A. Amangeldi; 1st year doctoral students of OP “8D01507 Informatics”: Turashova Sh.P., Seyduali Q.S.

4. “Transformation of educational organizations based on IoT: design, implementation of smart classrooms, and training of IoT specialists for education,” 2024–2026. Project leader: Doctor of Pedagogical Sciences, Professor M.A. Kamalova G.B. Leading researchers: Doctor of Pedagogical Sciences, Professor Bidaybekov E.Y.; Candidate of Pedagogical Sciences, Professor Koneva S.N.; PhD, Associate Professor I.T. Salgozha. Researchers: Master's Degree Holder, Senior Lecturer A.A. Amangeldi; 1st-year doctoral students of the 8D01507 Informatics program: Sh.P. Turashova, Seiduali K.S., 1st year doctoral student of OP “8D06102 Information Systems”: Nauryzbayev D.B.

5. “Study of the impact of generative artificial intelligence technologies on methods for assessing university students' programming skills,” 2024–2026. Project leader: Doctor of Pedagogical Sciences, Professor Sagimbaeva A.E. Chief Researcher: Doctor of Pedagogical Sciences, Professor Nurbekova Zh.K. Leading Researcher: Doctor of Pedagogical Sciences, Professor Bidaybekov E.Y. Researchers: Candidate of Pedagogical Sciences, Professor Sh.T. Shekerbekova; Master's Degree, Senior Lecturer A.B. Zhamkeeva; Master's Degree, Lecturer N.E. Artykbaev; Master's Degree, Lecturer A.K. Nagmetov.

University grants

The department's lecturers also participate in scientific projects funded by university grants.

In 2025, Salgoja Indira Toishybekkyzy, PhD, Associate Professor (Associate Professor), became the head of a project that received a university grant for the implementation of integrative research projects in collaboration with research institutes of the Republic of Kazakhstan: “Development and implementation of a system of micro-qualifications in relevant IT areas for students of pedagogical universities based on an atlas of new professions.” The amount of funding is 7,000,000 tenge. The project aims to develop the digital skills required by students of pedagogical specialties and to adapt educational programs to the requirements of the labor market.

Participation in startup projects and competitions:

Teachers of the Department of Informatics and Informatization of Education have achieved significant results in the field of innovation and entrepreneurial activity.

As part of the “Zhas kəsipker Abai University” startup project competition, the department's teachers became prize winners:

1st place: Kozhan Akerke, teacher at the Department of Informatics and Informatization of Education, and Ersin Mukhtarhan, leading researcher at the STEM laboratory. Project: “Petamentor.” Prize fund - 1,000,000 tenge.

2nd place: Musirat Erzat, senior lecturer at the Department of Informatics and Informatization of Education. Project: “Birlik Sheberhanasy.” Prize fund - 500,000 tenge.

Participation and victories in startup competitions confirm the high level of innovative activity of the department's teachers and their contribution to the development of entrepreneurial thinking and practice-oriented education.

3. Scientific schools

Scientific research work (SRW) is carried out as part of a comprehensive approach to modernizing the education system. The main goal is to theoretically substantiate and practically implement models of education in the digital economy. Research covers the following key areas:

- Digitalization methodology: Transformation of the educational environment through the introduction of hybrid, distance, and blended learning formats.
- Technology stack in education: Research into the potential of artificial intelligence (AI), the Internet of Things (IoT), and educational robotics.
- STEAM-oriented learning: Development of methods for building algorithmic and digital competencies through project activities and mobile applications.
- Continuous development: Modernization of training and retraining programs, taking into account micro-qualifications and a competency-based approach.

4. Publication activity

In 2023, the department's teachers published a total of 74 articles, including:

- 9 articles in foreign and domestic journals;

- 19 articles in journals of the Committee for Science and Higher Education of the Republic of Kazakhstan;

- 13 articles in other journals of the Republic of Kazakhstan;

- 4 articles in conference proceedings from foreign and neighboring countries;

- 17 articles in international conferences held in the Republic of Kazakhstan;

- 10 articles in journals with impact factor;

In 2024, faculty members published 127 articles, including:

-28 articles in journals recommended by the Ministry of Education and Science of the Republic of Kazakhstan;

- 17 articles in other journals of the Republic of Kazakhstan;

- 15 articles in conference proceedings in countries near and far abroad;

- 48 articles in international conferences held in Kazakhstan;

- 18 articles in journals with impact factor;

In 2025, scientific productivity amounted to 124 articles, including:

- 33 articles in journals recommended by the Ministry of Education and Science of the Republic of Kazakhstan;

- 17 articles in other journals of the Republic of Kazakhstan;

- 17 articles in conference proceedings in foreign countries and neighboring countries;

- 41 articles in international conferences held in the Republic of Kazakhstan;

- 16 articles in journals with impact factor;

5. Monographs, textbooks, teaching materials

During the reporting period, the teaching staff published seven monographs reflecting current scientific research in the fields of pedagogy, digitalization of education, informatization of society, continuous professional development of teachers, and transformation of university infrastructure.

The monographs are devoted to:

- the theory and methodology of teacher training in the context of informatization;
- the impact of fourth industrial revolution technologies on teacher education;
- expertise in educational content and resources;
- systems of continuous pedagogical and professional development;
- digital transformation and optimization of online education.

Some of the monographs have been recommended by academic councils and republican scientific and practical centers, confirming their high scientific and practical value.

List of published monographs, chapters in monographs in ranked publications in 2023-2025

№	Full name, academic title, position	Title of monograph	Publication details: Journal, city, year, page numbers
1	Oshanova Nurzhamal Turashovna, Revshenova Makhbat Izbasarovna, Kurmangalieva Nurgul	Theory and methodology of training teachers to communicate with students in the context of the informatization of society and education	Monograph. -Almaty: Abai KazNPU, 2023.-145 p.
2	Zhabayev Ermakhan Khuryshovich, PhD, Associate Professor	The Impact of Fourth Industrial Revolution Technologies on the Training of Students at Pedagogical Universities	Monograph.-Almaty:Abay KazNPU, 2023.-166 p.
3	Nurbekova Zhanat Kunapianovna, Doctor of	International and domestic experience in evaluating educational content and resources	Monograph - Astana: CAEC, 2023- 242 p.

	Pedagogical Sciences, Professor		Recommended by the Academic Council of the Republican Scientific and Practical Center for Expertise in Educational Content (Minutes No. 4 of October 6, 2023)
4	Sagymbaeva Ainur Esengazyevna, Ph.D., Professor	The system of continuous pedagogical education in the context of integrating formal and informal learning	-Aktobe: NAO "K. Zhubanov Aktobe Regional University." 2024. -191 p.
5	Salgoja Indira Toishibekkyzy, PhD, Associate Professor	Forming Students' Information Competence in Informatics Extracurricular Activities	Recommended for publication by the Scientific Council of the Abay Kazakh National Pedagogical University. (Minutes No. 8, March 27, 2025), Almaty, 2025. - 120 pages.
6	Oshanova Nurzhamal Turashovna, Ph.D., Associate Professor (Associate Professor) Akhmetov Bakhytzhan Srazhatdinovich Ph.D., Professor	Optimization of online education through the development of university infrastructure in the context of digital transformation	Almaty: KazNPU named after Abai, 2025. - 225 p. Ill. 107. Tables. 11. Bibliography. - 116 titles.
7	Nurbekova Zhanat Kunapianovna PhD, Professor	System of continuing professional development for teachers in Kazakhstan: from paradigm to monitoring and digital problem-solving.	JSC «NCPD «Orleu», 2025. – 192 p.

In 2023–2025, the teaching staff prepared and published **five textbooks and teaching aids** for general education schools in the Republic of Kazakhstan.

Main areas of focus:

- digital literacy for primary school pupils;
- programming in Python;
- educational robotics;
- methodological support for computer science teachers.

A number of textbooks and manuals have been recommended by the Ministry of Education of the Republic of Kazakhstan and educational associations, which confirms their compliance with state educational standards.

List of textbooks and teaching aids for schools in the Republic of Kazakhstan published in 2023-2025

№	Full name, academic title, position	Title and status of publication	Publication details: Journal, city, year, page numbers	Body that recommended the textbook for publication
1	Sagimbayeva Aynur Esengazyevna, D.Sc., Professor	1. Digital Literacy. Textbook for 1st grade of general education schools (in Russian) 2. Digital Literacy. Methodological guide for teachers 'Digital Literacy' for 1st grade of general education schools (in Russian)	1. Almaty: -Almaty kitab – 2023. CU (Bidaybekov E.Y., Ermaganbetova M.) 2. Almaty: -Almaty kitab – 2023. –on CD (Ermaganbetova M.)	ҚР ОАМ
2	Anuarbekova Gulzat Zhaparkhanovna,	The Python Programming Language	Textbook. – Almaty, 2024. – 302 pages.	Methodological Association in the Field of Education

	PhD, Senior Lecturer		ISBN 978-601-08-3797-3	'Pedagogical Sciences' of the R&D Centre for Pedagogical Sciences at Abay Kazakh National Pedagogical University
		Building robots with the LEGO Education WeDo set	Methodological guide. – Almaty, 2024. – 137 pages. ISBN 978-601-08-3797-3	Department of Informatics and Information Technologies, Faculty of Mathematics, Physics and Informatics, Kazakh National University named after Abai
3	Amangeldin Aibek Amangeldyuly, Master's Degree Holder, Senior Lecturer	'Fundamentals of Robotics' Textbook	Almaty, 'ONON' Printing House, 2025. - 92 pp. ISBN 978-601-311-221-3	Abai Kazakh National University

During the reporting period, 12 educational and teaching aids were published for higher education institutions.

The topics covered by the manuals include:

- programming and digital didactics;
- computer technologies and operating systems;
- information systems and information security;
- higher mathematics and mathematical methods in economics;
- immersive and virtual educational technologies;
- designing smart classrooms;
- information and communication technologies.

The textbooks are recommended by republican educational and methodological councils, academic councils of higher education institutions, and relevant scientific organisations.

List of textbooks for universities published in 2023-2025

№	Full name, academic title, position	Title of educational resource	Publication details: Journal, city, year, page numbers	Body that recommended the textbook for publication
1	Sagimbayeva Aynur Esengazyevna, D.Sc., Professor	Python Programming Language, A Textbook. -Adal Kitap. -Almaty. -2023. -147 pp.	-Adal Kitap. -Almaty. -2023. -147 pp.	ROAB, Protocol No. 3, 17.01.2023
2	Omarova Sandugash Abierovna, PhD, Acting Associate Professor	1. Computer Technologies: Textbook 2. Operating Systems: Textbook 3. Fundamentals of Information Systems and Information Security: Textbook	1. Baspa Uyí Almanac Almaty, 2023, -144b 2. Baspa Uyí Almanac Almaty, 2023, -156b 3. Baspa Uyii 'Almanac' Almaty, 2023, -220b 4. Baspa Uyii 'Almanac' Almaty, 2023, -120 b	Published by the Scientific Council of the Kazakh National Pedagogical University named after Abai. Issue No. 9. 29 May 2021

		4. Theory of Languages and Automata: Textbook		
3	Nurbekova Zhanat Kunapianovna, Doctor of Pedagogical Sciences, Professor	1) Digital Didactics. 2) Digital Didactics.	1) Oku Quraly – Almaty: ADAL KITAP, 2023. –114 p. 2) Textbook – Almaty: ADAL KITAP, 2022. –107 p.	ROAK No. 3, 17 January 2023
4	Avdarsol Saylughul, PhD, Senior Lecturer	Mathematical Methods in Economics	Textbook. – Almaty, 2024. – 192 pp.	Evero Publishing House, Almaty Humanities and Economics University
		Higher Mathematics. Volume 1.	Textbook. – Almaty, 2024. – 236 pp.	Evero Publishing House, Almaty Humanities and Economics University
5	Nurbekova Zhanat Kunanapovna, PhD, Professor	Collaborative Learning in Immersive Virtual Reality Mukashyeva M. U., Taibolotov Q. M., Smanova G. K.	Methodological Guide. – Astana: I. Y. Altynsarin National University, 2024. – 102 pp.	Altynsarin National Scientific-Methodological Centre
6	Salgoja Indira Toishybekkyzy, PhD, Associate Professor (Assistant Professor)	Fundamentals of Building a Smart Classroom System.	Textbook. Almaty: Ush Kiyan LLP, 2025. – 360 p. ISBN 978-601-311-201-5	Abai Kazakh National Pedagogical University
7	Kulira Zamanbekovna Khalikova, PhD, Associate Professor	Information and Communication Technologies	Textbook, Ministry of Education and Science of the Republic of Kazakhstan RROE ‘Pedagogical Sciences’ at Abay Kazakh National Pedagogical University – Almaty, JSC ‘Lantar Trade’: 2025. – 279 pp.	Republic of Kazakhstan Ministry of Education RROK ‘Pedagogical Sciences’ at Abay Kazakh National Pedagogical University, Almaty University of Humanities and Economics

6. Participation in conferences

Teachers, master's and doctoral students of the department actively participate in scientific conferences both in the Republic of Kazakhstan and abroad. In 2023–2025, research results were presented at:

- International conferences abroad, including neighbouring and distant countries;
- International conferences held in Kazakhstan;
- Domestic scientific conferences and events organised by universities and scientific organisations.

In total, during the period under review, the department presented more than 150 reports and articles at conferences, which contributes to the expansion of scientific ties, the exchange of experience and the enhancement of the department's international scientific image.

7. Patents and copyright certificates

Between 2023 and 2025, the teaching staff obtained more than 40 patents and copyright certificates for intellectual property, including computer programs, electronic educational resources, educational platforms, teaching methods, and technical inventions.

Over the three years, there has been a steady positive trend in the growth of scientific and innovative activity among faculty members. While in 2023, isolated developments of an applied and educational nature prevailed, in 2024–2025, the range of areas expanded significantly, the

number of collective projects increased, and the level of technological complexity of developments rose.

The key areas for the reporting period were:

- digitalisation and transformation of the educational process;
- development of software products and cloud platforms;
- introduction of artificial intelligence and automated assessment systems;
- creation of electronic teaching aids and interactive educational resources;
- research in the field of information security and engineering technologies.

The results obtained are of high practical significance, are used in the educational process, scientific research and project activities, and also contribute to improving the scientific rating and competitiveness of the educational organisation.

List of teaching staff who obtained patents and copyright certificates in 2023.

№	Full name, academic title, position	Name of copyright object (patent, copyright certificate)	№ Patent/copyright certificate number	Date of issue of patent/copyright certificate
1	Khalikova Gulira Zamanbekovna, Ph.D., Associate Professor	Glossary of IT terms in the Kazakh sign language (in co-authorship)	№37968	17.07.2023 г.
2	Shekerbekova Shirinkiz Тлеубергenovna, Ph.D., Acting Professor	Mobile application for conducting customer diaries in enterprises (In co-authorship)	№36097	24.05.2023 г.
3	Kemelbek Maira Narimanovna, Master's Degree, Lecturer	Programme for assessing the investment attractiveness of start-ups and IT projects	№ 34535	11.04.2023 г.

List of teaching staff who obtained patents and copyright certificates in 2024.

№	Full name, academic title, position	Name of copyright object (patent, copyright certificate)	№ Patent/copyright certificate number	Date of issue of patent/copyright certificate
1.	Oshanova Nurzhamal Turshanovna, Ph.D., Associate Professor	Decision Support System Module - Software for scaling the University's cloud learning platform	№ 51248	08.11.2024
		Python programming language	№ 50450	15.10.2024
2.	Ahmetov Bakhtzhan Srazhatdinovich, D.Sc., Professor	Decision Support System Module - Software for Scaling the University's Cloud Learning Platform	№ 51248	08.11.2024
3.	Sagymbaeva Aynur Esengazyevna, D.Sc., Professor	SSMART BALA PLATFORM Software for a Computer	№ 45981	17.05.2024
4.	Nurbekova Zhanat Kunapianovna, Doctor of Pedagogical Sciences, Professor	Цифрлық фасилитатор Цифровой фасилитатор Digital facilitator	No 9761	08.11.2024
		"Facilitation as an effective form of ongoing professional development	№48733	30.07.2024

		for teachers" educational programme for teacher training courses		
5.	Iskakova Kulpash Amanovna, Ph.D., Professor	Plasma method for obtaining GaAs/Si heterostructures.	№ 202391464, Int. Cl. H01L 21/20 (2006.01)	29.11.2024
6.	Gulira Zamanbekovna Khalikova, PhD, University Professor	Bolashak Informatics Mugali Min Virtual Laboratory	№ 51532	15.11.2024
		Digital technologies in education	№ 51599	19.11.2024
7.	Anuarbekova Gulzat Japarhanovna, PhD, Senior Lecturer	Python Programming Language	№ 50450	15.10.2024
8.	Amangeldin Aibek Amangelduly, Master's Degree, Senior Lecturer	Digital Tools in Professional Teaching. Practical Workshop	№ 51393	12.11.2024
9.	Bereke Madina Berekeқызы, Master's Degree Holder, Senior Lecturer	Decision Support System Module - Software for Scaling the University's Cloud Learning Platform	№ 51248	08.11.2024
10.	Ibraimkulov Aibek Erkamanuly, Master's Degree Holder, Senior Lecturer	Virtual Laboratory for Future Informatics Teachers	№ 51532	15.11.2024
11.	Seisenbekova Perizat Bekbolatkyzy, Master's Degree Holder, Lecturer	Digital Technologies in Education	№ 51599	19.11.2024

List of teaching staff who obtained patents and copyright certificates in 2025.

№	Full name, academic title, position	Name of copyright object (patent, copyright certificate)	№ Patent/copyright certificate number	Date of issue of patent/copyright certificate
1	Sagymbaeva Aynur Esengazyevna, D.Sc., Professor	. A computer programme entitled ‘Creation of a System for Assessing Students' Coding Skills in Programming Using Generative Artificial Intelligence and an Investigation of Its Effectiveness’. Copyright certificate	17.04.2025	№ 56910
		Roadmap for assessing the effectiveness of the educational space and the professional outcomes and academic achievements of its stakeholders. Copyright certificate.	01.07.2025	№60400
		Roadmap for assessing the effectiveness of educational initiatives for the continuous professional development of educators. Copyright certificate.	03.06.2025	№ 59119

		EduGrade automated assessment system. Computer programme. Copyright certificate.	12.03.2025	№ 55668
		AI-tutor bot. Computer programme. Copyright certificate.	28.03.2025	№56152
		Methodology for assessing students' knowledge in Informatics using a mind map. Computer program. Copyright certificate.	03.06.2025	№59169
2	Bukanova Asel Kairatovna, PhD, Senior Lecturer	‘History of Informatics’ Electronic Learning Tools	23.06.2025	№ 60094
		Computer Program "Creating a Mobile Application for Teaching he History of Informatics Based on Augmented Reality"	28.05.2025	№58818
3	Tekesbaeva Nazym Aitmoldaevna, Master's degree, Senior Lecturer	Adaptive learning platform for the Python programming language	05.06.2025	№ 59284
4	Amangeldin Aibek Amangeldyuly, Master's degree, teacher	Mobile application called RoboBil	13.05.2025	№57864
		IMPROVING AND DIGITAL LITERACY OF STUDENTS electronic learning	19.05.2025	№58205
5	Urazimbetov Mukhit Serikbaevich, Master's degree, lecturer	Automated system for checking written exams using artificial intelligence	11.12.2025	№65227
6	Kozhan Akerke Yerzhanqyzy, Master's degree, lecturer	‘Electronic resources for teaching infographics using the “Information and Information Systems” section of the Mektep Informatics course’	23.04.2025	№57124
7	Bakhyt Makenuly Babakhan, MSc, Lecturer	Programming IoT Devices in C++ and Code Verification with AI: an electronic teaching aid	17.06.2025	№59885
8	Gaziz Gulnur Gazizkyzy, PhD, Senior Lecturer	The Effectiveness of Teaching Operating Systems to Future Informatics Teachers Based on the Use of Virtual Models	21.08.2025	№61573
9	Ахметов Бахытжан Сражатдинович д.т.н., профессор	Software package for scaling the university's cloud-based learning environment	10.11.2025	№64014
		Computer program imagescaling.exe software for behavioural analysis as part of research into insider threats in cloud services of critical computer systems	11.12.2025	№65235
		SZIforRVS.exe automated selection of the optimal set of information security tools for university RVS	15.12.2025	№65343
10	Nurbekova Zhanat Kunanapovna Doctor of Philosophy, Professor	‘Web-system “Professional Network of Facilitators for NPCR”’ Computer Programm	30.10.2025	№63596
		A computer programme entitled ‘Creation of a System for Assessing Students' Coding Skills in Programming Using Generative Artificial Intelligence and a Study of its Effectiveness’. Copyright certificate	17.04.2025	№56910