
БІЛІМ БЕРУДІҢ ТЕОРИЯСЫ МЕН ПРАКТИКАСЫ ТЕОРИЯ И ПРАКТИКА ОБРАЗОВАНИЯ THEORY AND PRACTICE OF EDUCATION

<https://doi.org/10.31489/2024Ped3/6-14>

UDC: 378.1

Received: 15.02.2024 | Accepted: 20.06.2024

D.A. Kazimova¹, K.L. Polupan², R.P. Bukh^{1*}, Ye.A. Spirina¹, G.O. Tazhigulova¹

¹Karaganda Buketov University, Karaganda, Kazakhstan;

²Immanuel Kant Baltic Federal University, Kaliningrad, Russian Federation

(*Corresponding author's e-mail: rosa.bukh@gmail.com)

ORCID ID: 0000-0001-7169-7931, 0000-0002-2141-8444,

0000-0001-7071-9633, 0000-0001-7026-3947, 0000-0001-7446-4869

Conditions for training future computer science teachers based on a systems approach

In the article the issues of training future teachers of computer science at the Buketov Karaganda University were considered. The requirements for Hard-skills, Soft-skills of future teachers of computer science as specialists who own modern pedagogical and information technologies in accordance with the requirements of innovative socially-oriented development of Kazakhstan were highlighted. The content of educational programs, the catalogue of elective bachelor's degree courses "6B01505-Computer Science", "6B01506-Computer Science, ICT and Robotics" developed on the basis of a system and competency-based approaches in collaboration with employers were analysed. The purposeful work on preparing future informatics teachers for professional activities, owning digital technologies was described, which contributes to their active life and professional adaptation, further personal and professional self-realization. Some aspects of the introduction of innovative approaches to the training of teaching staff were highlighted with an emphasis on improving the education content, the formation of a high level of information culture among future informatics teachers. The authors concluded that the logic of the disciplines' sequence studied, the optimization of the content of educational programs in collaboration with teachers of schools, will lead to the formation of professional Hard-skills and personal Soft-skills competencies of future computer science teachers.

Keywords: training of future teachers of computer science, system approach, Hard-skills, Soft-skills of informatics teachers, educational program.

Introduction

The training of highly qualified teachers, competitively capable scientific and pedagogical personnel in demand in the labour market with systematized knowledge in the field of pedagogical science, key and special competencies aimed at developing a high level of professionalism, social and civic responsibility, social and personal values in the context of scientific thinking and worldview is one of the primary tasks in the field of education.

In the Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan "Kazakhstan in a new reality: time for action", it is noted that it is necessary to receive a quality education regardless of the place of residence and the language of instruction; to develop systematic measures to ensure equality of opportunities for children; to create a single online educational platform with a set of all functions necessary for a full-fledged educational process in the organization of distance learning (Tokayev, 2020) [1].

The 21st century's beginning is associated by many scientists with the advent of the era of innovation, with radical transformations in the field of education, changing our ideas about its role in modern society. Modernization of Kazakhstan's education involves the implementation of such an educational policy that

contributes to the development of a modern system of continuing professional education, improving the quality of education and ensuring its accessibility, increasing the investment attractiveness of the education sector. The implementation of these tasks will ensure the country's full-fledged entry into the digital society, will serve to strengthen Kazakhstan's position in the global world.

The systematic approach in education as one of the important directions of modern pedagogy is considered by such authors as Trushnikova T.G., Burova I.V. [2, 3] Putivtseva N.P. speaks about the application of a systematic approach in the context of competence and automation [4]. About the organization of education at a university with the use of ICT and consistency, the authors Bećirović S., Simak R.S., Levkin G.G., Vitsinets T.V. are interesting. [5, 6, 7].

The education system should become a platform on which future economic, political and socio-cultural prosperity will be based. The improvement of the education system plays an important role in achieving this goal. In turn, the improvement of the education system is impossible without its provision with highly qualified personnel.

The main purpose of the training of teaching staff can be defined as the training of a qualified specialist of the appropriate level and profile, competent, competitive, responsible, proficient in modern pedagogical and information technologies, capable of continuous professional growth, social and professional mobility.

In recent years, in industrially developed countries, including Kazakhstan, there has been a significant transformation of views on the role and place of the future specialist in an innovatively developing society. Today we need a fundamentally new type of specialist who has professional and social mobility, has in-depth knowledge of a number of related professions, is capable of self-development and self-determination and is ready to work with various forms of work organization.

Materials and methods

In modern realities, it is impossible to work without knowledge and skills in the field of IT technologies. At the level of higher education, the priority areas of modernization are improving the quality of training of future specialists, providing new areas of training, innovative development, integration with intensive research activities, close connection of university research with the needs of society based on the improvement of educational and information technologies.

The need to train specialists of a new formation means that they have broad fundamental knowledge, initiative, adaptability to the requirements of the labour market, and the ability to work in a team. Changing the technology of organizing the educational process, subordinating it to the interests of students, creating competition between teachers, improving and applying various forms and methods of teaching is provided as measures to improve the quality of educational services provided.

All this should be applied in the form of a system. In our work, we considered and used the university's specialty programs "6B01505-Computer Science", "6B01506-Computer Science, ICT and Robotics". When writing the article, such methods of scientific research were used as: observation, information collection, processing of scientific literature, secondary data analysis based on the information received.

Results and discussion

In Karaganda Buketov University, educational programs "6B01505-Computer Science", "6B01506-Computer Science, ICT and Robotics" are being implemented to improve the professional training of future computer science teachers, taking into account the mission of the university and the faculty related to the training of professionals in the field of education for the development of human capital.

The purpose of educational programs is to prepare a future teacher with pedagogical, fundamental and applied knowledge in the field of computer science, skills to carry out scientific and pedagogical activities in the conditions of updated content of education.

The systemic nature of the ongoing transformations requires a fairly accurate definition of the educational results of the organizations of higher pedagogical education, both at the level of general requirements for the professional competence of the graduate and at the level of specialization requirements (Gorbunova, 2019: 56) [8].

The requirements for a graduate of the system of higher professional pedagogical education based on a systems approach can be specified as the results of professional pedagogical education — Hard and Soft skills.

The sphere of professional activity of the bachelor «6B01505-Computer Science», «6B01506-Computer Science, ICT and robotics» are educational institutions (schools, pedagogical colleges, institutes of advanced training and retraining of teaching staff, departments of education).

The objects of professional activity of graduates are: educational institutions of state and non-state financing, preschool educational organizations, schools, lyceums, gymnasiums, colleges, educational institutions of technical and vocational education.

The types of professional activities of graduates are shown in Figure 1.

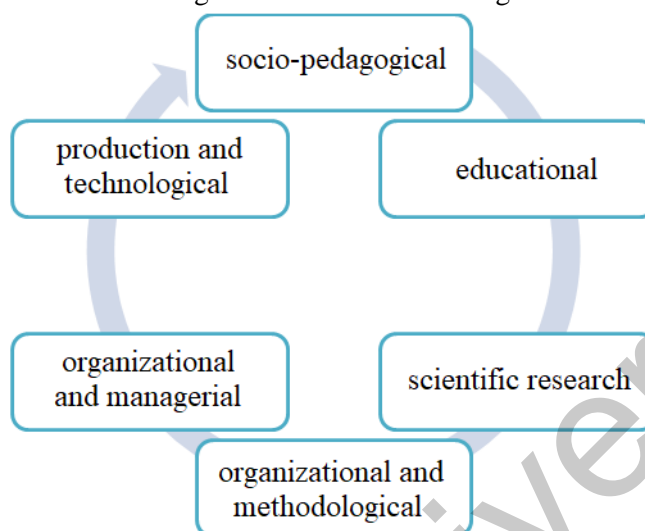


Figure 1. Types of professional activity of future computer science teacher

A future computer science teacher should have the following labour functions:

- training — broadcasts educational information, teaches to acquire knowledge independently, constructs training sessions taking into account the linguistic needs and requests of students, uses new learning technologies, including ICT, etc.;

- raising — introduces students to the social values, observes pedagogical tact, the rules of pedagogical ethics, shows respect for the personality of students, builds the educational process, taking into account national priorities of Kazakhstan, etc.;

- methodical — provides methodological support of the educational process, plans to increase their qualifications, defines the methods and techniques of pedagogical activities, develops teaching materials in accordance with the desired goals of the sessions, etc.;

- research — studies the level of assimilation of educational content by students, explores the educational environment, uses the results of diagnostics of individual characteristics of students;

- socio-communicative — interacts with the professional community and with all interested parties of education, initiates innovative ideas that unite education stakeholders, etc.

As a result of training, future bachelors of education develop key Soft skills and Hard skills competencies presented in Table 1.

Table 1

Results of training of a graduate of the EP “6B01505 — Computer Science”, “6B01506-Computer Science, ICT and robotics”

Type of competencies	Learning result
1	2
Soft skills	Applies knowledge about society as an integral system and a person, the role of spiritual processes in modern society, the legal interests of the parties in the protection of the rights of individuals and legal entities, economic and social conditions of entrepreneurial activity, the impact of harmful and dangerous factors on humans and the natural environment.
	Demonstrates his own civil position on the priorities of competitiveness, pragmatism, mutual understanding, tolerance and democratic values of modern society; collects and interprets information to form judgments taking into account social, ethical and scientific considerations; applies self-learning skills in professional activities.

Continuation of Table 1

1	2
Hard skills Professional pedagogical competencies	Carries out work on the management of the pedagogical process, on the protection of the health of school-children and the creation of optimal conditions for the upbringing of a comprehensively developed younger generation.
	Plans and develops computer science training sessions in accordance with the requirements of curricula, regulatory documents, taking into account the individual and special educational needs of students; organizes and manages the research activities of students; applies academic writing skills; owns scientific research methods in professional activities.
	Understands the functional features of oral and written professionally-oriented texts in English, knows the technique of professionally-oriented translation and academic writing.
	Uses CLIL technology, methods of Criterion referenced assessment (CRA) in teaching computer science in the conditions of updated content of secondary education.
	He is proficient in digital, distance learning and innovative technologies for teaching computer science in general education institutions, including in English.
Hard skills Professional ICT Competencies	Solves practice-oriented, Olympiad problems in computer science using applied programs; applies knowledge and understanding of complex dependencies (relationships) between facts and phenomena in computer science.
	Owens technologies for designing and programming robot models in various development environments.
	Skills in the methods of choosing algorithms and solving applied problems using modern programming technologies.
	Applies methods of designing and developing databases of information systems.
	He is proficient in the technologies of designing, constructing and programming robot models in various development environments
	Analyses the components of the architecture of computing systems and networks, designs and configures computer networks using communication equipment.
	Uses technologies for developing Web applications, computer graphics, video and audio information using specialized software.
Applies methods of multimedia processing, encoding and information protection in various ways.	

The EP is developed taking into account the goals and objectives of the E.A. Buketov KarU, the mission of the university and the faculty. The EP is regularly updated taking into account changes in the education system of the Republic of Kazakhstan and the requirements of the labour market and is coordinated with employers (educational institutions) that participate in determining the list of elective disciplines of the program. For example, elective courses have been developed and implemented, presented in Table 2.

Table 2

**Elective courses introduced in the EP “6B01505 — Computer Science”,
“6B01506-Computer Science, ICT and robotics” at the suggestion of employers**

№	Academic years	Name of disciplines
1	2014–2015	Programming in C, C++, C#, Computer technologies of three-dimensional graphics and animation.
2	2015–2016	Creation of electronic educational resources, Specialized computer science courses, etc.
3	2016–2017	Promising technologies and languages of application development, Technologies of project work using ICT, Innovative technologies in the organization of the educational process at school, etc.
4	2017–2018	Educational robotics, Mobile Application development.
5	2018–2019	Fundamentals of teaching computer science within the updated educational content, Practices of pedagogical techniques in English, Project work in educational institutions.
6	2019–2020	Programming of robotic systems, English for specific purposes, Basics of CLIL-technology, Methods of organizing students' research activities.
7	2020–2021	Distance learning platforms and services, Organization of distance learning in the school education system.

The catalogue of elective disciplines is formed and regularly reviewed taking into account the opinions and wishes of employers, which are reflected and approved bilaterally in the list of disciplines coordination. So, in various academic years, employers represented by KSU ShL No. 66, Secondary School No. 16, Nazarbayev Intellectual School, KPTK No. 9, “Educational Consortium in Balkhash” LLP, Boarding School

“Information Technologies” offered the above elective courses, which were included in the CED EP “6B01505-Computer Science”, “6B01506-Computer Science, ICT and Robotics”.

Together with the school administration, work plans with branches were drawn up and approved, a scientific contract was concluded to conduct research, in November 2016, robotics classrooms were opened in schools No. 16 and No. 66 in Karaganda. As part of the work of the branches, master classes, training courses in robotics, programming are jointly held, classes are held on the basis of the branches.

The content of the educational programs “6B01505-Computer Science”, “6B01506-Computer Science, ICT and robotics” is formed on the basis of modular design, competence approach and consideration of the results of mastering modules and the entire modular program in credits of the Republic of Kazakhstan and ECTS.

The purpose goal of each module is to form clearly defined competencies that the student will receive after mastering the module, shown in Figure 2.

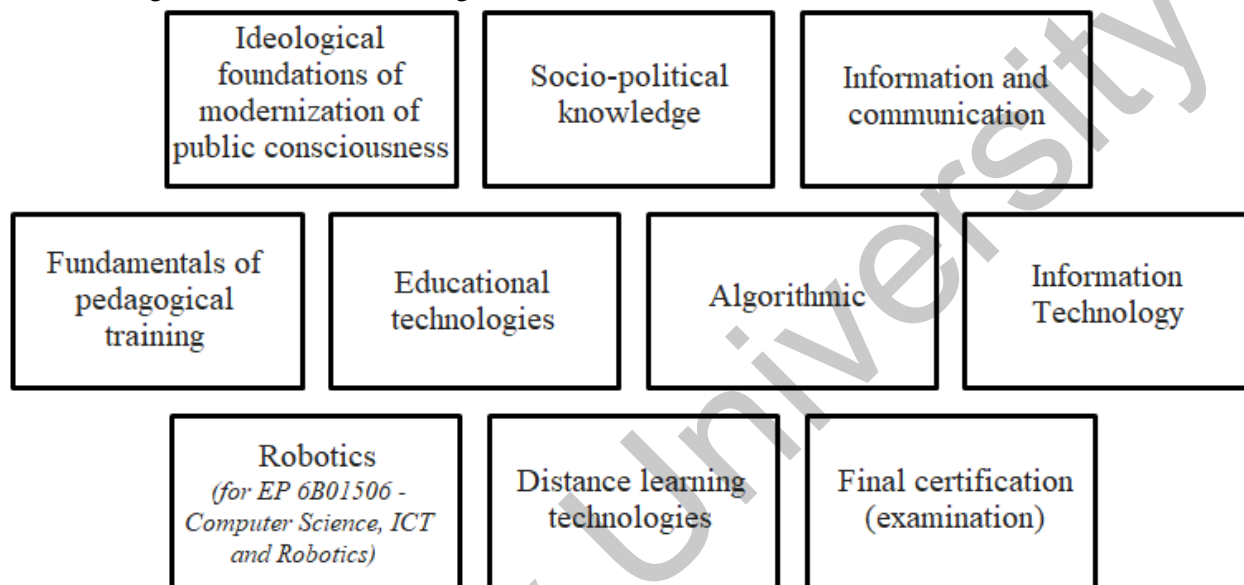


Figure 2. EP modules “6B01505 — Computer Science”, “6B01506-Computer Science, ICT and robotics”

For example, studying the disciplines of the modules “Fundamentals of Pedagogical Training” and “Educational Technologies” contributes to mastering the methods and techniques of conducting computer science lessons in the context of the updated content of education, including in English. The study of the disciplines of the modules “Algorithmic” and “Information Technology” allows you to master modern methods of solving problems of applied computer science using optimal algorithms, use various programming languages and technologies, apply ICT in pedagogical professional activity [9].

In connection with the transition to modular structuring, educational programs are regularly updated not only structurally, but also in content, while the requirements of the labour market and employers are taken into account when developing elective courses and developing the content of professional practice programs.

Didactic training is an integral part of the process of their professional and pedagogical formation, and nevertheless, university graduates experience significant difficulties in organizing the educational process, reveal insufficient level of didactic skills in the use of modern information learning tools.

When preparing future teachers of computer science, the following didactic resources are used in the educational process: textbooks, guidelines, lecture notes, educational and methodological complex and other didactic materials, handouts, Internet services and platforms.

The University regularly evaluates and refines the SP with the participation of students, staff and other stakeholders based on the systematic collection, analysis and management of information in order to ensure their relevance. For example, in the course of a sociological survey, students made their proposals: to include elective disciplines related to the study of robotics in the curricula, to organize seminars and trainings on topical issues of robotics. With this in mind, the elective disciplines “Robotics in Education”, “Educational and Sports Robotics” are included in the EP.

The EP provides for various types of educational activities of students. Contact classes include lectures, seminars and consultations. With the introduction of credit technology of training, classroom consultations have entered into practice, conducted as part of the independent work of students under the guidance of a teacher according to a schedule, the forms of organization vary from traditional to interactive. The main types of extracurricular activities are working in the library fund, with Internet resources, with media library materials. Extracurricular work of students is regulated by the curricula and the curriculum. Individual work of students is actively practiced as part of the preparation of term papers and diploma work.

The credit technology of training is carried out on the basis of the choice and independent planning by students of the sequence of studying disciplines using credit as a unified unit for measurement of the volume of student's and teacher's academic work. The interests of students, taking into account individual abilities and capabilities are fundamental in ensuring the educational process. In the course of mastering the EP, students independently determine an individual learning trajectory. In this regard, there is a practice at the end of each academic year to choose a learning trajectory, elective disciplines and teachers for the next academic year. When choosing, the student is guided by the catalogue of elective disciplines, the recommendations of the adviser. Based on the students' choice of disciplines and teachers, individual student curricula are formed, which are approved by the Dean of the faculty and stored in the Registrar's Office and at the student. In addition, the student has the opportunity to choose the topics of term papers and theses, scientific supervisor. For the formation of the Student's individual curriculum, the department has appointed advisors designed to help students choose the direction of study. The choice of disciplines is carried out with the obligatory consideration of the logical sequence of their study. A student cannot be registered for a discipline if in the previous semester he did not master the prerequisites necessary for its study.

When evaluating educational results, taking into account the formation of students' ability to successful socialization, skills of self-presentation, introspection, self-assessment, a competence approach is used.

Student-centered learning requires the introduction of elements of an active learning environment into the educational process. Teachers create elements of the learning environment: electronic textbooks, lectures, presentation materials, computer training systems, which provides quick access to educational information and allows you to dynamically update the content of the discipline being studied. In the educational process, teachers actively use interactive whiteboards of various types: Interwrite WorkSpace, WhiteBoard, ActiveStudio Board.

Teachers of the department introduce innovative approaches to the training of teaching staff with an emphasis on improving the content of teacher education, the formation of an information culture. Teachers use a variety of technologies when conducting training sessions, thereby future teachers get a good learning experience with digital technologies. So, in the educational process, multimedia, SMART learning technologies, robotics, case study technologies are used; audio and video materials, Internet resources.

Future teachers learn how to develop multimedia materials using iSping, Prezzy, Powtoon, etc. packages, create video lessons, for example, in the CamStudio program, develop test tasks using iSpring Quiz-Maker packages and services; Quizlet, Learningapps, Padlet, Kahoot, etc. The methods of individual and group project work are actively used when students perform independent work. In addition, to identify the level of formed learning outcomes in the classroom, various methods are used: work in small groups to solve situational problems, the creation of didactic materials on the topics of the informatics course; implementation of projects in the field of informatics and programming.

Currently, one of the necessary conditions put forward by society in the process of digitalization is online learning, which is especially relevant in the context of the Covid-19 pandemic. Future computer science teachers should be able to organize distance learning, know the features and disadvantages of online learning among schoolchildren. Online learning has quite a lot of advantages: independent study for a certain time, improving the quality of training using modern tools, including video and audio materials for all types of classes, electronic materials, online testing, electronic mailing, teacher consultations via e-mail, training through case technologies, saving time due to the lack of need to go to the place of study, the possibility of simultaneous training of a large number of students. But there are some disadvantages of education, the restriction of personal communication, the lack of a student environment [10]. However, despite the disadvantages, online learning is a trend of the present time and one of the most popular ways to get an education.

Therefore, future teachers of computer science should be fluent in digital tools, Internet services for effective professional work, which is fully provided by the educational programs "6B01505-Computer Science", "6B01506-Computer Science, ICT and Robotics". Students consolidate the acquired skills during pedagogical practices in schools.

Conclusions

Thus, the requirements of the modern school and the system of training future teachers of informatics objectively impose increased requirements on the professional and personal competencies of future teachers. This requires the university to revise the forms of interaction with stakeholders, reorganize the educational and methodological work of the departments; shifting focus towards student-centered, online and digital learning.

Digital technologies help us to create more accessible, convenient and effective education systems, and this is one of the factors changing the educational environment. A systems approach helps to analyse and solve complex problems, understand interactions in complex systems and improve processes and solutions in this environment.

References

- 1 Послание Главы государства Касым-Жомарта Токаева народу Казахстана «Казахстан в новой реальности: время действий». — [Электронный ресурс]. — Режим доступа: https://www.akorda.kz/ru/addresses/addresses_of_president/poslanie-glavy-gosudarstva-kasym-zhomarta-tokaeva-narodu-kazahstana-1-sentyabrya-2020-g (07.10.2021 г.)
- 2 Трушников Т.Г. Системная педагогика как инновационное направление в педагогике / Т.Г. Трушников. — 2014. — [Электронный ресурс]. — Режим доступа: <https://cyberleninka.ru/article/n/sistemnaya-pedagogika-kak-innovatsionnoe-napravlenie-v-pedagogike/viewer>
- 3 Бурова И.В. Педагогический менеджмент: учеб.-метод. разраб. / И.В. Бурова. — Нижний Новгород: Нижегородский государственный лингвистический университет им. Н.А. Добролюбова, 2010. — 44 с.
- 4 Путивцева Н.П. Разработка процедуры применения системного подхода к выявлению знаний в автоматизированном режиме при компетентностном подходе к образованию / Н.П. Путивцева // Вестн. Моск. город. пед. ун-та. Сер. Информатика и информатизация общества. — 2008. — № 11. — С. 193–196.
- 5 Bećirović S. Students' perspectives of digital transformation of higher education in Bosnia and Herzegovina / S. Bećirović, M. Dervić // The Electronic Journal of Information Systems in Developing Countries. — 2022. Access mode: <https://onlinelibrary.wiley.com/doi/abs/10.1002/isd2.12243/>
- 6 Bećirović S. Digital Pedagogy / S. Bećirović // SpringerBriefs in Open and Distance Education. The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. — 2023. — P. 1–26. — Access mode: https://www.google.kz/books/edition/Digital_Pedagogy/9WqxEAAAQBAJ?hl=ru&gbpv=1. DOI: 10.1007/978-981-99-0444-0_3
- 7 Симак Р.С. Организация обучения в вузе с помощью информационных технологий / Р.С. Симак, Г.Г. Левкин, Т.В. Вицинец // Теория и практика социального государства в Российской Федерации: научно-производственный потенциал и социальные технологии: материалы II Всерос. науч.-практ. конф. / Омск. гос. ун-т путей сообщения. — Омск, 2012. — С. 373–377.
- 8 Горбунова Н.А. Модульный принцип построения образовательной программы профессиональной подготовки учителей информатики в условиях модернизации современного образования / Н.А. Горбунова // Вестн. Караганд. ун-та. Сер. Педагогика. — 2019. — № 4(96). — С. 56–64.
- 9 Kazimova D.A. Implementation of pedagogical solutions to increase the efficiency of the digitalization of learning at the university / D.A. Kazimova, A. Tussipkhan, G. Adilkhan, A. Suinkhan, E. Tileukhabyll // Bulletin of the Karaganda University. «Pedagogy» series. — 2021. — Т. 1(101). — P. 26–33. DOI:10.31489/2021Ped1/26–32
- 10 Технология дистанционного обучения. [Электронный ресурс]. — Режим доступа: <https://aujc.ru/tehnologiya-distancionnogo-obucheniya/>

Д.А. Казимова, К.Л. Полупан, Р.П. Бух, Е.А. Спирина, Г.О. Тажигулова

Жүйелік тәсіл негізінде болашақ информатика мұғалімдерін даярлау шарттары

Мақалада академик Е.А. Бөкетов атындағы Қарағанды университетінде болашақ информатика мұғалімдерін даярлаудың негізгі мәселелері қарастырылған. Қазақстан Республикасының инновациялық элеуметтік-бағдарланған даму талаптарына сәйкес заманауи педагогикалық және ақпараттық технологияларды меңгерген мамандар ретінде болашақ информатика мұғалімдерінің *Hard-skills*, *Soft-skills* талаптары анықталды. Білім беру бағдарламаларының мазмұны, жұмыс берушілермен тығыз өзара іс-қимыл кезінде жүйелі және құзыреттілік тәсіл негізінде әзірленген 6В01505 — «Информатика», 6В01506 — «Информатика, АКТ және робототехника» білім беру бағдарламалары бакалаврларының элективті пәндерінің каталогы талданды. Болашақ информатика мұғалімдерін цифрлық технологияларды меңгерген кәсіби қызметке дайындау бойынша мақсатты жұмыс сипатталған, бұл олардың белсенді өмірлік және кәсіби бейімделуіне, одан әрі жеке және

кәсіби өзін-өзі жүзеге асыруына ықпал етеді. Педагогикалық білім беру мазмұнын жетілдіруге, болашақ информатика мұғалімдерінде ақпараттық мәдениеттің жоғары деңгейін қалыптастыруға баса назар аударып, педагог кадрларды даярлауға инновациялық тәсілдерді енгізудің кейбір аспектілері атап өтілді. Авторлар оқытылатын пәндер тізбегінің қалыптасқан логикасы, мектеп мұғалімдерімен тығыз ынтымақтастықта білім беру бағдарламаларының мазмұнын оңтайландыру болашақ информатика мұғалімдерінің кәсіби *Hard-skills* және жеке *Soft-skills* құзыреттерін қалыптастыруға әкеледі деген қорытынды жасаған.

Кілт сөздер: болашақ информатика мұғалімдерді даярлау, жүйелік тәсіл, информатика мұғалімдерінің *Hard-skills*, *Soft-skills*, білім беру бағдарламасы.

Д.А. Казимова, К.Л. Полупан, Р.П. Бух, Е.А. Спирина, Г.О. Тажигулова

Условия подготовки будущих учителей информатики на основе системного подхода

В статье рассмотрены базовые вопросы подготовки будущих учителей информатики в Карагандинском университете имени академика Е.А. Букетова. Выделены требования к *Hard-skills*, *Soft-skills* будущих учителей информатики как специалистов, владеющих современными педагогическими и информационными технологиями в соответствии с требованиями инновационного социально-ориентированного развития Республики Казахстан. Проанализированы содержание образовательных программ, каталога элективных дисциплин бакалавров образовательных программ 6В01505 — «Информатика», 6В01506 — «Информатика, ИКТ и робототехника», разработанных на основе системного и компетентностного подхода при тесном взаимодействии с работодателями. Описана целенаправленная работа по подготовке будущих учителей информатики к профессиональной деятельности, владеющих цифровыми технологиями, что способствует их активной жизненной и профессиональной адаптации, дальнейшей личностной и профессиональной самореализации. Выделены некоторые аспекты внедрения инновационных подходов в подготовку педагогических кадров с упором на совершенствование содержания педагогического образования, формирование высокого уровня информационной культуры у будущих учителей информатики. Авторами сделаны выводы, что выстроенная логика последовательности изучаемых дисциплин, оптимизация содержания образовательных программ при тесном сотрудничестве с учителями школ приведут к формированию профессиональных *Hard-skills* и личностных *Soft-skills* компетенций будущих учителей информатики.

Ключевые слова: подготовка будущих учителей информатики, системный подход, *Hard-skills*, *Soft-skills* учителей информатики, образовательная программа.

References

- 1 (2021). Poslanie Glavy gosudarstva Kassym-Zhomarta Tokaeva narodu Kazakhstana «Kazakhstan v novoi realnosti: vremia deistvii» [The message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan “Kazakhstan in a new reality: a time for action”]. Retrieved from https://www.akorda.kz/ru/addresses/addresses_of_president/poslanie-glavy-gosudarstva-kassym-zhomarta-tokaeva-narodu-kazakhstana-1-sentyabrya-2020-g [in Russian].
- 2 Trushnikova, T.G. (2014). Sistemnaia pedagogika kak innovatsionnoe napravlenie v pedagogike [System pedagogy as an innovative direction in pedagogy]. Retrieved from <https://cyberleninka.ru/article/n/sistemnaya-pedagogika-kak-innovatsionnoe-napravlenie-v-pedagogike/viewer> [in Russian].
- 3 Burova, I.V. (2010). *Pedagogicheskii menedzhment [Pedagogical management]*. Nizhnii Novgorod: Nizhegorodskii gosudarstvennyi lingvisticheskii universitet imeni N.A Dobroliubova [in Russian].
- 4 Putivtseva, N.P. (2008). Razrabotka protsedury primeneniia sistemnogo podkhoda k vyavleniiu znaniia v avtomatizirovannom rezhime pri kompetentnostnom podkhode k obrazovaniiu [Development of a procedure for applying a systematic approach to the identification of knowledge in an automated mode with a competence-based approach to education]. *Vestnik Moskovskogo gorodskogo pedagogicheskogo universiteta. Serii Informatika i informatizatsiia obshchestva — Bulletin of the Moscow City Pedagogical University. Series: Informatics and Informatization of Society*, 11, 193–196 [in Russian].
- 5 Besirovik, S. (2022). Students' perspectives of digital transformation of higher education in Bosnia and Herzegovina. *The Electronic Journal of Information Systems in Developing Countries*. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1002/isd2.12243/>
- 6 Besirovik, S. (2023). Digital Pedagogy. Springer Briefs in Open and Distance Education. The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. Retrieved from https://www.google.kz/books/edition/Digital_Pedagogy/9WqxEAAAQBAJ?hl=ru&gbpv=1. DOI: 10.1007/978-981-99-0444-0_3
- 7 Simak, R.S., Levkin, G.G., & Vitsinets, T.V. (2012). Organizatsiia obuchenii v vuze s pomoshchiu informatsionnykh tekhnologii [Organization of education at the university by using information technology]. *Teoriia i praktika sotsialnogo gosudarstva v Rossiiskoi Federatsii: nauchno-proizvodstvennyi potentsial i sotsialnye tekhnologii: materialy II Vserossiiskoi nauchno-*

prakticheskoi konferentsii — The theory and practice of the social state in the Russian Federation: scientific and production potential and social technologies: proceedings of II All-Russian Scientific and Practical Conference. Omsk, 373–377 [in Russian].

8 Gorbunova, N.A. (2019). Modulnyi printsip postroeniia obrazovatelnoi programmy professionalnoi podgotovki uchitelei informatiki v usloviakh modernizatsii sovremennogo obrazovaniia [The modular principle of building an educational program for the professional training of computer science teachers in the context of modernisation modern education]. *Vestnik Karagandinskogo universiteta. Seriya Pedagogika — Bulletin of the Karaganda University. Pedagogy series*, 4(96), 56–64 [in Russian].

9 Kazimova, D.A. (2021). Implementation of pedagogical solutions to increase the efficiency of the digitalization of learning at the university. *Bulletin of the Karaganda University. Pedagogy series*, 1(101), 26–33. DOI:10.31489/2021Ped1/26–32

10 *Tekhnologiya distantsionnogo obucheniia [Distance learning technology]*. Retrieved from <https://aujc.ru/tehnologiya-distantsionnogo-obucheniya/> [in Russian].

Information about the authors

Bukh, R.P. (contact person) — Master of pedagogy and psychology, PhD student, Department of applied mathematics and computer science, Karaganda Buketov University, Karaganda, Kazakhstan; e-mail: rosa.bukh@gmail.com. ORCID ID: 0000–0001–7071–9633

Kazimova, D.A. — Candidate of pedagogical sciences, Professor, Karaganda Buketov University, Karaganda, Kazakhstan. ORCID ID: 0000–0001–7169–7931

Polupan, K.L. — Doctor of pedagogical sciences, Professor, Deputy director of the Project office, Immanuel Kant Baltic Federal University, Kaliningrad, Russian Federation. ORCID ID: 0000–0002–2141–8444

Spirina, Ye.A. — Candidate of pedagogical sciences, Associate professor, Karaganda Buketov University, Karaganda, Kazakhstan. ORCID ID: 0000–0001–7446–4869

Tazhigulova, G.O. — Doctor of pedagogical sciences, Associate professor, Karaganda Buketov University, Karaganda, Kazakhstan. ORCID ID: 0000–0001–7026–3947