

MODERNIZATION OF THE SYSTEM OF CONTINUOUS NATURAL SCIENCE EDUCATION IN THE REPUBLIC OF KAZAKHSTAN

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Abstract: The article discusses the state and ways of development of the education system of Kazakhstan, taking into account international trends in the modern world. The signing of the Bologna Declaration by Kazakhstan in March 2010 faced the country with the necessity of modernizing significantly the education system, including continuous natural science education. At the same time, the transition from the “knower” concept i.e. armed with a system of knowledge and skills, to “a person prepared for life”, i.e. a person who is able to think and act actively and creatively, as well as to self-improve intellectually, morally and physically. In this direction, the modernization of the education system is a factor for a successful future.

The implementation of the provisions of the Bologna Declaration made it possible to make changes to the goals, content, forms, and methods of teaching subjects to students in secondary school and to pedagogical staff in higher education institutions. Over time, this will enable the country to successfully enter the global educational space.

Keywords: Natural science education, Succession, Continuity, Bologna Declaration, Modernization, Functional literacy, General secondary schools, Institution of higher education.

1 Introduction

After Kazakhstan gained independence in December 1991, the country began reforming the education system, with special attention paid to secondary and higher education, which continued to operate according to the Soviet education system. In the new political and economic environment, the organization of the educational process in secondary schools and institutions of higher education was designed to ensure a planned character of the educational process, a modern educational and scientific level of training of graduates, the implementation of new science and technology achievements in the educational process and its optimization based on the effective use of information technologies, a rational combination of traditional and innovative teaching methods.

For their implementation in the system of secondary and higher education of the country, the conditions necessary for the creative independent work of students were created, including State mandatory educational standards, curricula, full-fledged informational and educational environment, necessary logistics capacity, modern management system. (1)

The history of the creation of the national school of standardization of secondary general education for an 11-year school, taking into account the assigned goals and the social and pedagogical tasks to be implemented, can be divided into five stages: 1992-1996, 1997-1998, 1999-2002, 2008-2010, and 2012-2016.

At each stage, certain tasks were solved taking into account the dynamics of the development of social phenomena, the education system, the level of theoretical understanding of the education standard, which is new for the pedagogical science. In addition, the following issues were considered: creating a conceptual basis for updating the education system; improvement of regulatory legal acts and instructive documents concerning the organization of the education system; development and implementation of textbooks and teaching materials for the updated content of education.

In the higher education system, a new model of education was developed, the main element of which should be the pedagogical staff of the new formation. The following goal was determined: the accelerated development of pedagogical education with the creation of personnel potential corresponding to the growing educational needs of the State and various social groups in society.

The main objectives of the model were:

- creating conditions for enhancing the social status of the teacher and updating the content of pedagogical education taking into account the differentiation and profiling of education;
- training of teachers for integrated specialties, taking into account the peculiarities of teaching in a small school.

To implement the assigned tasks it was necessary to create:

- mechanisms for encouraging teachers' work and licensing pedagogical activities;
- variational teaching methods that provide the maximum variety of content and forms of training including retraining and refresher training of teaching staff taking into account the needs of society and educational organizations;
- updated educational program for the training of teachers in the context of continuous learning;
- teacher certification and re-certification system;
- retraining program for heads of educational organizations and teachers taking into account the new content of education, changes in educational technology and teaching methods;
- system of interaction in educational institutions based on the principles of mentorship.

However, the process of reforming the education system until 2010 was inconsistent and slow, so the country's leadership decided to join Kazakhstan to the Bologna Convention, which was unanimously supported by representatives of the 46 signatories of the Bologna Declaration. Thus, in March 2010, Kazakhstan became the 47th member state of the Bologna Process and the first Central Asian state recognized as a full member of the European educational space. As it is known, before this event, 30 out of 145 Kazakh universities signed the Magna Charta Universitatum, which is the basis of the Bologna Declaration. The decision on the accession of Kazakhstan to the Bologna Convention was made by the Committee of Ministers of Education of the countries participating in the Bologna Process. (2)

After 2010, the modernization of the Kazakh education system began to be built on a number of mandatory principles and conditions:

- multi-level higher education system;
- bringing domestic educational programs and syllabuses in line with European standards;
- implementation of the academic credit system;
- ensuring the academic mobility of students and teachers;
- convertibility of Kazakh higher education diplomas in the EU and the right of graduates to be employed in any of the countries participating in the Bologna Process;
- systematic control over the quality of higher education; recognition of national diplomas, academic degrees etc. (3)

The signing of the Bologna Declaration faced the country with the necessity of a new and substantial reforming of the system of continuous education. These innovations are dictated by life itself, the requirements of the epoch and the development of the country. Kazakh pedagogy is faced with the task of cardinal renewal, first of all, of the content of school education according to the advanced world pedagogical experience. The development of functional literacy of schoolchildren, their creative skills for

independent search, critical analysis, and evaluation, as well as initiative and the ability to find non-standard solutions is in the center of this new model of education. All these functional skills are formed at school.

Also, an important stage in the development of the higher education system was the transition from the specialist functional training concept to the personal development concept. The essence of this transition was the change of priorities: from public contracts to the training of specialists with the individualized nature of education, which enables to take into account the capabilities of a particular person, and contributes to self-realization and personal development.

2 Materials and Methods

The national education system in Kazakhstan has embarked on the path of updating the content of education, which needs a new type of teacher. The tasks of updating the content of education in accordance with the new requirements of society and the priority areas of development of science and innovative technologies defined by the State Program for the Development of Education of the Republic of Kazakhstan for 2011-2020 served as the basis for developing a State mandatory standard for 11-year secondary education.

The state mandatory education standard defines a set of general requirements for each level of education (preschool, primary, basic secondary, general secondary, technical and vocational, post-secondary, higher, and post-graduate ones). It is approved and put into action by the Resolution of the Government of the Republic of Kazakhstan No. 1080 of August 23, 2012, in accordance with the Kazakh Education Act of July 27, 2007. It deals with:

1. content of education;
2. maximum of students' study load;
3. level of training of students. (4)

The State mandatory standard of secondary education (primary, basic secondary, and general secondary education) is aimed at ensuring:

- preservation of the integrity of the education system of Kazakhstan by expanding the national component of the content of education in the context of the integration of sciences;
- observance of the principle of equal opportunities for students in terms of the functioning of different types of educational institutions;
- unity of knowledge, value and activity components of education;
- preservation of the basic content of education and the observance of the optimal ratio of the invariant and variational components.
- early learning of the foreign language (English) and computer science;
- increasing the priority of mathematical and technological disciplines in the context of increasing innovative and industrial development potential;
- improvement of pre-specialized and specialized education;
- determination of the economic components of the standard. (5)

Today, the educational process in general secondary schools of the Republic of Kazakhstan is conducted according to standard curricula approved by the order of the Minister of Education and Science of the Republic of Kazakhstan No. 115 of April 3, 2013 developed to implement the Kazakh State mandatory education standard 2012 and the National Action Plan for the development of functional literacy of schoolchildren for 2012 -2016 years.

The peculiarities of the content of the curricula for natural science subjects (mathematics, physics, chemistry, biology, and geography) are distinguished from the previous curricula by:

1. strengthening practice-oriented education via the implementation of the system-activity approach;
2. development of functional literacy of students;
3. systematization of the content of subjects by enhancing the interdisciplinary integration and redistribution of educational materials according to a level of education;
4. enhancing the Kazakh component;
5. enhancing educational potential;
6. increasing the number of practical, laboratory, research project works and experimental tasks;
7. exclusion of outdated educational materials and topics from the curriculum and the implementation of new materials reflecting the modern social and economic modernization of Kazakh society;
8. optimal timing for studying the sections of subjects;
9. fleshing out the requirements for a level of training of students in accordance with the materials studied as well as the determination of discipline-based knowledge, skills, and abilities (hereinafter KSA), personal and system-activity results. (6)

However, international and domestic experts have repeatedly pointed out the peculiarities in Kazakh traditional education system, in the center of which is more the ability to memorize than the ability to think. In most cases, teaching is conducted with an emphasis on theory, and less attention is paid to the practical application. (7)

3 Results and Discussion

In domestic education, attempts to move away from the traditional system of KSA have been made several times but the introduction of new subjects, courses, and innovative ideas were superimposed on the old content of education, which just increased the amount of educational information. To date, students continue to be passive "recipients" of knowledge and skills.

That is why we set the goal of achieving a high quality of education via the transition to a new educational content and the transition from "knower" to "a person who is able to think, act, and self-develop creatively."

The educational processes in foreign countries have been systematically studied to optimize the modernization of education. This made it possible to avoid the isolation of the national education system of Kazakhstan and, on the basis of a comparative analysis of pedagogical experience gained in various countries, to improve and implement modern methods and technologies into the process of training and education of students.

In the context of a dynamically and consistently developing system of higher pedagogical education (particularly with respect to bachelor's and master's degrees), an objective need arose to create new types of educational organizations, variational curricula, and syllabuses, as well as to develop the new content and learning technologies. Everywhere in the country, the search and subsequent implementation of new approaches to the content of training, organizational forms, methods of educational work, etc., into the educational process has started. At the same time, for Kazakhstan, of particular interest is the experience of the pedagogical educational institutions of leading European countries, in which in recent decades modern innovative systems of training and refresher training for teachers have been created.

One of the most important areas of the development of higher education are the issues of international cooperation, the main task of which is the comprehensive integration of the Kazakh system of higher education into the world educational space. In general, international cooperation in the field of education is regulated by law and is carried out on the basis of international treaties, agreements, and conventions. The work on the recognition of Kazakh education certificates created by analogy with foreign documents was of particular importance.

The Ministry of Education and Science of the Republic of Kazakhstan participates in the implementation of programs initiated by international organizations such as UNESCO, UNDP, Peace Corps, the United States Information Service (USIS), the Soros Foundation, The International Research & Exchanges Board (IREX), the British Council in Kazakhstan, the German Academic Exchange Service (DAAD), the National Center for Academic and University Works (CNOUS), the Bureau of Linguistic and Pedagogical Cooperation of the Embassy of France in Kazakhstan, etc.

The Ministry has been cooperating with the American Council for Collaboration in Education and Language Study (ACCELS) for more than 20 years to implement a number of educational programs, research projects, training, and advisory assistance. The cooperation in the framework of the "TASIS" and "TEMPUS" programs of the European Union aimed at establishing academic relations between Kazakh and European universities is efficacious. (8)

The work on the integration of education and science has been intensified. As a result, many institutions of higher education started training scientific personnel jointly with research institutes, thereby increasing the number of research activities at the country's institutions of higher education. As a result, the leading Kazakh universities were represented in the world rankings. In 2017, 9 Kazakh universities were included in the ranking of the universities of the world.

The higher pedagogical education in Kazakhstan, which continues to be in the process of intensive modernization, is both an object and a subject in current changes. To date, in addition to general universities, the training of teachers is conducted by the Abai Kazakh National Pedagogical University, the Women's State Pedagogical University and four regional pedagogical institutes.

The organization of the educational process at the Abai Kazakh National Pedagogical University, which is the leading university of the republic in terms of training of teachers for various fields, includes educational process planning, educational work organization, educational process monitoring, recording and analyzing of its progress and results, educational, methodical, scientific, and informational support of the educational process. At the same time, the university develops and approves educational programs for the preparation of bachelors, masters and doctoral students in natural sciences education.

Today, the system of higher education in Kazakhstan is multi-level, fundamental, universal, dynamic and flexible. Such a structure requires ensuring continuity between levels, establishing optimal interrelations between them with mutual coordination and adaptation of educational programs into a single educational space. It also requires the completion of the professional education at each level with a clearer definition of the status of "bachelor," "master," and "Ph.D." This complex and multifaceted work is carried out directly by higher education institutions, and the overall coordination of these processes is carried out by the Ministry of Education and Science. (9)

President Nazarbayev has determined that education should be the leading and decisive link in the qualitative change in human capital. A new quality of education has always been and will be a strategically important area of human activity, the most important resource of the country, which ensures its economic growth and competitiveness. (10)

That is why according to the new State Program for the Development of Education and Science of the Republic of Kazakhstan for 2016-2019 adopted by the Decree of the President of the Republic of Kazakhstan No. 205 of March 1, 2016, the updating of the content of education is one of the priority areas. (11)

This program assigned to Kazakhs the tasks aimed at continuing the updating of the content of education, which will be completed in 2021. It includes such issues as the introduction of

new state mandatory education standards, curricula, and textbooks, enhancing the quality of teaching the mathematical and natural sciences at all levels of education, the transition to teaching in English certain natural sciences in the 10th and 11th grades.

Over the past two years, some of the activities outlined in the State Program for the Development of Education and Science have been completed, and most of them are at the implementation stage. For example, State mandatory standards of primary, basic secondary and general secondary education approved in 2016 enshrine the requirements for content, the maximum amount of study load, the level of training of students and the period of study.

In comparison with the previous standards, the current one is focused on building a model of education based on results. For the first time, education is not based on content, when the standard and programs primarily indicated the mandatory content of subjects but based on expected learning outcomes.

Secondary education is aimed at instilling in students national and universal values that are common to all levels of education and are designed to become sustainable life orientations of students motivating their behavior and activities.

Standards and updated curricula are aimed at moving from the concept of "good education for life" to an understanding of the need for "lifelong learning"; from obedience to the initiative; from knowledge to competencies.

The innovation of these standards is the transition from the knowledge-centric paradigm to the activistic one. Its essence is to transform goals into learning outcomes based on values via the formation of a wide range of skills.

Updating the content of education has led to conceptual changes in the approaches to the development of the standard and curricula, that is, the following methodological approaches were used in the development of standards:

- system-activity (competence) approach, i.e. orientation of education on the formation of personal qualities of students, on the development of their functional literacy;
- axiological approach, i.e. strengthening the mentoring and socializing potential of education on the basis of spiritual, moral, national, cultural values and the formation of a noosphere-humanistic worldview.

The updated State mandatory standard

- determines the values, goals, and objectives of school education reflecting modern realities and trends in the development of society;
- ensures the implementation of the nationwide consolidating idea of the people of Kazakhstan "Mangilik El" through the formation of values: Kazakh patriotism, civic responsibility, respect, cooperation, labor, creativity, openness, and lifelong education;
- determines the expected results presented in the form of wide spectrum skills (functional application of knowledge, ICT skills, research and communication skills, critical and creative thinking, ability to work in a team and individually);
- provides the integration of subjects and content for a more holistic perception of the world;
- provides the creation of discipline-based programs with clear expected results that promote the application of knowledge in practice, research and project work;
- reflects the activity aspect, i.e. students "know", "understand", "apply", "analyze", "synthesize", and "evaluate";
- introduces subjects on information and communication technologies with an emphasis on their correct and safe use, as well as on natural sciences, to form a complete picture of the environment from an early age in the program of primary classes;

- introduces a trilingual education with strengthening the communicative aspect in teaching languages (learning speech activities: listening, speaking, reading, and writing);
- introduces a system of criteria-based assessment of educational achievements aimed at student development by increasing the interest and motivation to learn. In modern school, a five-point grading system does not allow to trace the objectivity of grading.
- conducts the specialized training in natural-mathematical, social and humanities areas on the basis of a combination of compulsory subjects and optional majors;
- provides the academic training of students for their admission to higher educational institutions based on a combination of advanced and standard levels of study of academic subjects. (12)

The content difference of the updated curriculum is

- principle of helicity when designing the content of a subject i.e. the gradual increase of knowledge and skills both vertically and horizontally (a complication of skills by topics and classes);
- hierarchy of learning objectives according to Bloom's taxonomy based on the laws of knowledge and classified by the most important types of discipline-based operations;
- pedagogical goal assignment according to educational levels throughout the entire course of study, which enables maximum consideration of intra-subject relations;
- presence of "cross-cutting topics" between subjects both within the same educational area, and during the implementation of interdisciplinary connections;
- correspondence of the content of sections and topics offered to requests with the emphasis on the formation of social skills;
- technologization of the educational process in the form of long-term, medium-term and short-term plans.

In accordance with the standard, natural science education at the level of primary education is implemented in such training subjects as "Mathematics" and "Natural History."

The content of the "Mathematics" subject is aimed at mastering the basic concepts and methods related to arithmetic operations, simplest quantities and measurement, elements of algebra and geometry, as well as interdisciplinary concepts reflecting the connections and relationships between objects and subjects; the formation of the initial mathematical knowledge to describe a variety of objects and phenomena of the surrounding reality; on the development of general methods of solving problems, the ability to build logical judgments based on measurement and computational skills.

The content of the "Natural History" subject is aimed at:

1. clarification of the initial information about the origin and cause-effect relationships and interdependencies of objects and phenomena of animate and inanimate nature;
2. formation of concepts about the interaction of man with nature and the environment;
3. formation of basic information about the natural wealth of Kazakhstan and a home region, the formation of the research and environmental protection skills;
4. adaptation of students to the social, public and natural environment, cultivation of a humane attitude towards man;
5. formation of skills for applying acquired knowledge of nature, man and society in various life situations;
6. formation of elementary concepts about scientific methods of environmental research;
7. Formation of skills to search for information from various sources, its application in the educational process, carrying out practical work, planning, observing, researching, analyzing, designing, forecasting, systematizing, comparing, grouping, modeling and summarizing.

The "Natural History" subject is a propaedeutic course for studying independent subjects such as "Biology", "Physics", "Geography", and "Chemistry" at subsequent educational levels,

and also lays the foundation for research skills important for any field of knowledge.

At the level of basic secondary education, natural science education is implemented in the following subjects: "Mathematics", "Algebra", "Geometry", "Natural History", "Physics", "Chemistry", "Biology", and "Geography."

The content of the subjects such as "Mathematics", "Algebra", and "Geometry" ensures:

1. formation of the worldview about the unity and interrelation of the phenomena of the surrounding reality based on the integration of the content of mathematics and computer science with other sciences;
2. formation of the ability to define and understand the role of mathematics and computer science in the world, ideas about mathematics as a universal language of science, a means of modeling phenomena and processes, the ability to solve problems of the surrounding reality using means of these sciences;
3. formation of common methods of intellectual activity characteristic of mathematics and computer science, which are the basis of cognitive culture, significant for various spheres of human activity;
4. holistic mastery of basic mathematical knowledge and skills and mastering their practical skills in everyday life based on the implementation of the continuity of the content of school education levels, interdisciplinary and intradisciplinary communication in the study of mathematics and computer science;
5. mastering the system of basic knowledge on the theoretical foundations of visual programming technology and modern information and communication technologies, the ability to apply and transform models of real objects and processes using information and telecommunication technologies in the study of computer science and other school subjects;
6. development of functional literacy, logical, algorithmic and operational thinking, spatial imagination, ability to use various languages of mathematics and computer science (verbal, symbolic, analytical, graphic), to perceive and critically analyze information presented in various forms;
7. systematic development of students' skills in operating with various mathematical methods and information technologies when carrying out research projects in various fields;
8. professional orientation and pre-specialized training of students in the natural-mathematical area.

The content of the subjects such as "Natural History", "Physics", "Chemistry", "Biology", and "Geography" ensures:

1. knowledge of the fundamental physical concepts, laws, theories and the principles underlying the modern physical picture of the world; methods of scientific knowledge of nature;
2. presentation of objects for understanding the essence of natural phenomena, processes, laws, and patterns, as well as for interpreting the results obtained;
3. cultivation of skills to apply physical knowledge obtained for a reasoned explanation of the simplest physical processes (changes in the physical state of matter, atmospheric phenomena, electromagnetic interactions, and mechanical phenomena) occurring in the world, life practice, and everyday life;
4. development of skills and abilities to analyze the course of physical laws in natural phenomena and processes, various artificial objects created for the benefit of man;
5. formation and improvement of practical skills for conducting experimental work on the study of mechanical, light, thermal, electrical and magnetic phenomena in accordance with the instructions for measuring and the use of devices and tools;
6. cultivation of skills to synthesize knowledge in physics with other scientific knowledge to solve educational problems, tasks of every day and laboratory practice;
7. algorithms with scientifically based reasoning of their actions based on the physical laws of their organization;

8. development of the ability to assess the degree of danger of natural and man-made disasters, the importance of energy resources for human life, the impact of human activity on physical processes, natural objects, the ecological state of the environment;
9. cultivation of the responsibility and respect for the environment;
10. formation of diverse knowledge about geographical science, geographical patterns on the globe, the political map of the world, world economy, world population and global problems of humanity based on a comprehensive study of nature and society;
11. formation of a new geographical, political, and ecological thinking in the process of analyzing natural, socio-economic, and geo-ecological processes and phenomena;
12. formation of the ability to systematize and scale the obtained geographical knowledge based on communication with other sciences, to realize the place of Kazakhstan in the world community;
13. geographical and ecological culture, emotional and value attitude to the environment;
14. forming a worldview about the unity and interconnection of the world of substances, living organisms and the environment based on the integration of the content of chemistry with other sciences;
15. formation of a holistic view of the role of chemistry and chemical technology in the transformation of the material, intellectual and cultural spheres of society;
16. presentation of the relationship of chemistry knowledge with modern discoveries of science and technology;
17. manifestation, within the "Chemistry" subject, of the experience and the development of the chemical industry of Kazakhstan;
18. formation of students' biological literacy;
19. formation of a holistic view of the role of biology and biotechnology;
20. implementation of the relationship of knowledge of biology with modern discoveries of science and technology;
21. manifestation, within the "Biology" subject, of the experience and the development of the industry of Kazakhstan;
22. formation of integrated scientific knowledge and research culture of students in the creation of projects, and research works in conjunction with universities, research institutes, and industries;
23. professional orientation and pre-specialized training of students in natural sciences; development of the ability to navigate in the world of geographical professions and in the corresponding system of professional education, taking into account the labor market.

One of the important factors, which can influence the problem of continuity of general secondary and higher education is the specialized training in the senior classes, which is carried out on the basis of the individual interests and needs of students.

At the senior level of the school, the general secondary education of students is completed, ensuring their general development, the formation of functional literacy, social adaptation of the individual, professional and civil self-determination of young people takes place. Specialized training as one of the forms of the pre-professional training process in a general school is the most favorable environment for the formation of professional self-determination.

At the level of general secondary education, specialized training is carried out in natural-mathematical and social-humanities areas based on a combination of compulsory subjects and optional majors. Academic training is also provided for students to enter higher education institutions based on a combination of advanced and standard levels of study in academic subjects. The students are offered a flexible system of choosing subjects at two levels of study, and they choose subjects of advanced and standard levels of study they feel important for themselves. A greater number of hours is devoted to advanced-level majors

than to standard-level study subjects. Non-core academic subjects are studied at the standard level. (12)

In high school, natural science education is implemented in the subjects such as "Algebra and Basics of Analysis", "Geometry", "Physics", "Chemistry", "Biology", and "Geography".

The content of the "Algebra and Basics of Analysis " and "Geometry" subjects is aimed at:

1. systematization and generalization of knowledge gained in mathematics at previous levels of education;
2. continuity with the content of training at subsequent levels of education and preparation for continuing education at the level of higher education;
3. development of logical and dialectical thinking, algorithmic culture, spatial imagination, critical thinking at the level necessary for future professional activities, as well as further learning in higher education institutions;
4. acquaintance with the history of the development of mathematics, the evolution of mathematical ideas;
5. understanding of the importance of mathematics for scientific and technological progress;
6. practical application of knowledge and patterns in the subjects of the educational field "Mathematics and computer science" as a means of organizing a person's productive activities and developing his (her) culture;
7. realization of individual abilities, capabilities, needs and interests of the student;
8. mastering practically significant mathematical skills and abilities, ability to apply them;
9. enhancing the applied and practical orientation of subjects;
10. implementation of the two main functions of teaching the subject: mathematics education itself and education using mathematics;
11. development of skills to use the information and communication technologies in the process of learning and performing project research.

Also, the content of the "Physics", "Chemistry", "Biology", and "Geography" subjects is aimed at:

1. systematization and generalization of knowledge gained in natural science subjects at previous levels of education;
2. continuity with the content of training at subsequent levels of education and preparation for continuing education at the level of higher education;
3. deepening of knowledge taking into account modern co-evolutionary, synergetic paradigm and imperatives of post-non-classical knowledge;
4. focus on achieving the values and goals of ensuring sustainable and harmonious development of the megasystem "nature – society – man – technosphere";
5. formation of the noosphere-humanistic worldview and ecological culture;
6. focus on the development of new high technologies from the point of view of their use for the industrial and innovative development of Kazakhstan;
7. practical application of natural science knowledge and patterns as a means of organizing a person's productive activities and developing his (her) culture;
8. mastering the fundamental scientific knowledge and methodology of scientific knowledge, forming a holistic scientific picture of the world based on the global integration of natural science and other components of the knowledge of the world;
9. development of sustainable cognitive needs and interest, creativity, critical thinking, readiness for self-education;

10. development of skills to use the information and communication technologies in the process of learning and performing project research.

Thus, the modernization of natural science education at school is associated with the requirements of the time imposed on the knowledge of students. The main goal of natural science education at school is to develop mathematical and natural science literacy, which implies the ability to use the knowledge acquired at school to solve various problems of interdisciplinary and practice-oriented content for further education and successful socialization.

In the context of transition to a new result-oriented education model, and also because of the functioning of various types of organization of general secondary education and the multiplicity of small schools, the training of teachers in several specialties is of particular relevance. In this regard, university and postgraduate teacher training provide for the possibility of obtaining an additional specialty and it is carried out only at higher educational institutions.

The system of continuous natural science education in Kazakhstan began to be built on the basis of the continuity of all its links and is a unity of five levels.

The level I is the pre-higher education professional orientation to obtain the teacher profession implying the implementation of 12 years of study in the country and the presence of pedagogical classes among the specialized ones.

The level II is the training in pedagogical colleges possible only after gaining a twelve-year education with the right to join the 3rd year of study at a pedagogical higher education institution.

The level III (basic) is higher pedagogical education.

The level IV is the postgraduate education: specialized master's-level studies (for one and two years) and doctoral studies (for 3 years).

The level V is the system of refresher training and retraining of teachers. (2)

The general activities of the system of training future natural science teachers at higher education institutions are brought into line with the updated content of the natural science education at general education schools.

The content of educational programs of higher education implies the study of the cycle of general education disciplines, the cycle of basic disciplines, the cycle of major disciplines, as well as following the professional practice in relevant areas of training with a focus on learning outcomes and compliance with the national qualification framework and other qualification frameworks. (12)

The basis of the continuity of educational programs are the principles of the sequence of training at different levels of education, which relate to the content of curricula and the interaction of participants in the educational process. They allow step-by-step mastering of the established laws, connections and relations between objects and natural phenomena. In the educational process, the principle of continuity is implemented in the process of drawing up standard and working syllabuses, curricula, and modular educational programs while studying the compulsory disciplines of state mandatory standards of an appropriate level of education as well as when choosing elective disciplines and thematic planning. When conducting the lesson-by-lesson planning, a school teacher compiles topics in such a way that the theory will always be ahead of practical, laboratory and seminar classes. (13)

The authors' long experience in the work at a pedagogical higher education institution shows that the teaching of natural sciences must be correlated with the methodology of teaching a school subject, i.e. for the professional readiness of a future teacher, a balance of special discipline-based and methodical training is

necessary. In this regard, professionally and pedagogically oriented natural science education should start from the first years of study at higher education institutions and then be studied in depth when learning methodological disciplines.

4 Conclusion

Thus, in Kazakhstan in the last decade, after its entry into the Bologna Process, purposeful work began to carry out the reform of higher education including pedagogical education. The using of the mechanisms of pan-European integration into the international educational space can make the education system and the country fulfill the requirements of the Bologna Declaration. At present, it can be argued that many of its provisions in Kazakhstan have been successfully implemented.

Studying international trends and areas of development of education was a prerequisite for further education reform in the country since it was important for us to evaluate the diverse experience of developed countries, which completed the reform of their higher pedagogical education systems in accordance with modern requirements. The modernization of the education system in Kazakhstan is moving in the right direction, which will enable it to meet international standards over time. Updating the content of education is aimed at fulfilling the main task of the education system - improving the quality of education and moving from the paradigm "education for life" to the paradigm "education through life." (14)

In conclusion, it is worth presenting the main data on the development of the education system of the Republic of Kazakhstan over the years of independence. Thus, 5 major State programs aimed at developing the education system were successfully implemented: the State Informatization Program of the Secondary Education System for 1997-2002, the State Program for the Development of Technical and Vocational Education for 2008-2012, the State Program for the Development of Education for 2005-2010, the State Program for the Development of Education for 2011-2020, the State Program for the Development of Education for 2016-2019, as well as the main provisions of the Bologna Declaration.

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