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## ВЕСТНИК

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## **AN ANALYTICAL REVIEW OF THE CONTINUITY OF NATURAL SCIENTIFIC EDUCATION IN THE "SCHOOL- UNIVERSITY" SYSTEM IN OECD COUNTRIES**

**Abstract.** The article considers the results of the analysis of international experience in ensuring the continuity of natural science education in the "school-university" system. The rationale for the need to reconsider the training of future teachers is explained in terms of updating the content of university programs to conformity of already updated content of school education in the Republic of Kazakhstan. The structure of the Director of the OECD, who regulates the issues of education and science, is described. A brief overview of the higher education systems of the OECD countries is given.

**Key words:** natural science education, continuity, school-university, renewal of the content of education, OECD.

The development of the economy, the renewal of technology, the improvement of public space and the renewal of the content of school and university education have a different pace. If at the end of the twentieth century education could expect 2-3 generations to preserve books and teaching aids, use educational programs, i.e. fully content of education, regulatory support, etc., nowadays the requirements for the school are changing more rapidly than the reaction of the school's educational environment.

At present, the Republic of Kazakhstan is modernizing the education system. This is primarily due to the renewal of the content of general secondary education, with the provision of its active and developing nature.

Updating of the content and teaching methods necessitates the improvement of teaching staff. The response to this challenge is to ensure the continuity of education in the "school-university" system, the formation of a national system of teaching and teaching staff and the revision of training programs for students of pedagogical universities, future teachers of general education organizations.

Differences between the levels in programs and content, in the forms and methods of instruction, in the formation of the learning environment, lead to difficulties in the transition of students from one level of education to another [1].

According to the definition given by S. M. Godnik, succession is considered as the progressive development of the university educational process in a dialectical connection with the system of general education school activities with the aim of forming the student as a subject of higher education and upbringing. The purpose of succession as a complex phenomenon of psychological and pedagogical activity is to create such conditions of upbringing and education that would allow a painless transition of a child-pupil-student-professional from the lowest level of education to a higher one. As a result his movement would not be interrupted along ways of development of all mental processes and abilities.

Continuity of secondary general and higher vocational education from a practical point of view assumes, first of all, the continuity of state requirements for the graduates' preparation of general educational institutions and the content of state educational standards for higher professional education in terms of requirements for the results of mastering basic educational programs [2].

The quality of schooling in which our children study affects all aspects of their lives, forming the individual way of each child's life and contributes to society and in general creativity and economic development. Therefore, modernization of the school system is a priority not only for education specialists, but also for political leaders.

The level of education is the starting point of economic, scientific and technical progress, a pledge of successful development of the state and society. Educational backwardness has a direct impact on the country's competitiveness, national perspectives and state security [3].

Natural-mathematical education is an essential component for all types of educational institutions at the pre-university level. It covers all types of general secondary education, as well as the system of additional education and extracurricular work in our country and foreign countries. Its role of fundamental training in modern society is due to the magnitude of the problems that humanity confronts [4].

The issue of continuity of natural-mathematical education both at the inter-subject level and at the vertical level between the school and the university requires a systematic approach. According to G.I. Sarantsev, "continuity in the interpretation of the basic concepts of courses in the use of a single terminology and symbols; consistency and systematic courses; availability; expediency and legitimacy of requirements to the level of students' mathematical preparation" [5].

Models of educational policy are discussed in the works of such authors as N.V. Vasilenko [6], I.A. Prakhov [7], L.L. Shpakovskaya [8]. They give a strong indication of the previously created and established models of educational policy, which are currently in the stage of transformation and adaptation to the new institutional conditions of the Bologna process.

There are a number of works by contemporary Russian authors devoted to the study of new trends in formations, in the context of globalization. N.S. Kyrabaev, T.I. Kostina [9], M.F. Kuznetsov [10], V.I. Kuptsov [11], M.V. Tlostanov [12] and many others write about the need for rapid responses from educational systems to new challenges of the era of globalization and integration.

In the modern world of globalization, state and supra-state management of secondary and higher education are being transformed, the state educational policy is changing, organizational forms of school and university education are being modified.

The state as the managing subject provides the legislatively defined rules for the regulation of new and updated relations in the progressive sphere of secondary and higher education, applies new approaches in the legal regulation of administrative relations for the development of national human capital.

Capital, land, and labor force have not been the main resources of competitive development and economic growth in OECD countries since the 1970s. Education has come first. A knowledgeable economy and a knowledgeable society are products of the epistemic, educated population. In order to generate such a population, a profound reform of education was needed. At least, everywhere, where there was a political will in order not to slide down permanently in the hierarchy of countries. In many countries of the West, and then the East, these reforms began long ago [3].

The Organization for Economic Cooperation and Development (OECD) - an international economic organization of developed countries that recognize the principles of representative democracy and a free market economy, is also deeply and shrewdly engaged in the problems of education.

One of the duties of the OECD is to "Encourage scientific research and education".

And, one of the main activities of the OECD is Education.

A permanent OECD office providing the work of its structural bodies is the Secretariat, which collects and processes information, develops documents and recommendations, issues analytical notes, publications on economic and social issues. The preparation of these materials required for the work of the OECD core committees is handled by the following Directors of the OECD Secretariat on various thematic issues, of which there are only 12.

Among the directors, there is a directorate, which oversees the issues of education and science. It's called the Directorate for Education (EDU).

The directorates play a role of international information and analytical centers. One of the functions of the Directorates is to organize annual ministerial meetings, committee meetings with representatives of national governments (twice a year), as well as periodic meetings of experts from research institutes, educational institutions, non-governmental organizations of member countries and OECD partner countries.

The highest political governance bodies of the OECD are the Committees, consisting of representatives of the member countries of the organization and countries that have observer status. Currently, the OECD employs more than 20 Committees in various areas.

Since November 22, 2011, Kazakhstan has observer status in the OECD Education Committee.

The OECD vision for education is reflected in a number of documents and materials with different status and purpose: from the recommended framework documents that countries take into account when developing their own national educational policies to extensive international comparative studies based on an agreed set of indicators for assessing the quality of education. Below are just a few of them:

- OECD / UNESCO Guidelines for Quality Assurance in Cross-Border Higher Education (2005);
- The OECD Declaration on the Future of Educational Policies in a Changing Social and Economic Context (1978);
- International Programme for the Evaluation of the Learning Achievements of 15-year-olds (Programme for International Student Assessment, PISA), since 2000;
- The International Assessment of Adult Competencies (PIAAC) program, since 2005;
- Joint OECD and UNESCO study "Teachers for schools of the future / Analysis of the World Education Indicators";

Annual report «Education at a Glance, OECD Indicators» [13].

Another document that reflects OECD's conceptual vision for educational development is the OECD Declaration on the Future of Education Policies in a Changing Social and Economic Context. The Declaration was adopted in 1978, but even today its provisions sound very relevant both for the OECD countries, and for those, like ours, who have taken the course to join the club of the developed countries of the European community.

The Declaration defined the following objectives:

- To promote the continuous development of national standards. The goal of standards development is to provide assistance to all young people in acquiring the qualities necessary for the successful commencement of adulthood.
- To improve the professional training of teachers. Such training should encourage teachers, in the context of changing needs and targets, to take more active action and play a responsible role in strengthening the school's ties with adult life.
- To develop schools as active communities. School communities should create a stimulating environment for nurturing self-confidence, a sense of responsibility and a spirit of cooperation among young people.
- To implement positive measures in the field of education to establish equality of disadvantaged groups.
- To promote lifelong development for young people and adults.
- To expand the opportunities for emigrant workers and their children to make greater use of education and training.

To ensure closer cooperation between everybody involved in education - authorities, teachers, parents, students - as well as employers and professional organizations and other interested groups of society.

A key message of the OECD Declaration on the Future of Education Policy is that in a rapidly changing social and economic context, all components of the education system (national standards, teachers, schools, etc.) should be "tuned" to readiness to accept changes and become active conductors of innovations [13].

An urgent objective for OECD countries is to ensure the quality of education. The complexity of its solution is determined by the need for active and effective interaction and coordination of efforts of various subjects of educational policy of institutional, national, supranational (regional) and transnational (world) level. The review "Ensuring the quality of education - the experience of OECD countries" shows



how the quality problem is raised at these levels and what initiatives are being implemented in OECD countries to address this problem.

When considering the national level of ensuring the quality of education, the focus is on the role of specialized intermediary agencies, which in most OECD countries delegate the functions of monitoring, controlling and improving the quality of university activities, as well as assessing the prospects for networking of such agencies.

The analysis of the experience of the OECD countries in this area is extremely relevant for the development of a clear national strategy for the internationalization of higher education in Russia, which should contribute to the growth in the volume of export of educational services, the pace of development of international educational programs for the more effective integration of Russian higher education into the pan-European and global educational space [14].

The last few years the education system in Finland is constantly at the center of international attention. Another surge of interest in it is due to the excellent results that Finnish schoolchildren demonstrated in the "Programme for International Student Assessment" (PISA) in 2000 and 2003. According to the results of both studies, Finland was in the first place and, moreover, became the only European country among the leaders.

The way in which high-quality university education is provided by quality school education can be considered in the case of Finland. And, on the contrary, to what extent special attention paid to the training of teachers in higher education institutions affects the education system in general and schooling in particular.

Finnish universities are among the few European universities that have embarked on a course to increase the "social responsibility" of higher education. In Finland, the "third role" of universities is set out in legislation, and its formation is among the priorities of national development.

Of all the institutional factors affecting the quality of schooling, the teacher training system is of particular importance. The reform of teacher training began in Finland in 1978. Its goal is to improve the professional level of teachers and unify the standards of their education.

The distinctive features of the Finnish education system are:

1) Strong internal communication of education segments. Kindergartens are integrated into schools, schools are closely connected with higher education institutions, universities are oriented to work with schools and take an active part in improving the quality of school education. Hence the primacy of continuing education and the requirement to provide "painless transitions" from one educational stage to another (for example, a minimum of exams).

2) Priority of equal educational opportunities and, as a result, weak internal differentiation. The educational system serves as an instrument of social equalization: territorial (the location of schools and universities), content (the prohibition on the differentiation of classes in secondary schools), cultural (the policy of "education - the melting pot of cultures", conducted with respect to ethnic groups in the Finnish north), institutional ("smoothing" the differences between institutions of higher education, eliminating differences between schools), economic (lack of tuition fees). The latter is particularly noticeable from the results of the PISA-2000 survey - Finland is found to have the lowest dependence of the child's performance on the economic situation of his family.

3) Increasing the "social responsibility" of higher education institutions, which has been elevated to the priority level of the national educational policy, and consequently, close interaction of educational institutions with the local community represented by various social groups. This sets the conducive context for the functioning of the education system (high status of the teacher, public support, the system of trustees' councils), but at the same time creates a situation of multiple control instances.

4) The direct consequence of the number expansion of regulatory authorities and the traditional directive management style is the persistent weak institutional autonomy of Finnish educational institutions.

5) High mobilization potential of the education system. This quality, connected with the low degree of autonomy of the Finnish universities and their scarcity, allowed to reform the educational system and, in particular, implement the program of internationalization of higher education (14).

Norway takes a notable place among the countries of the Northern European model. Interest in the Norwegian higher education system is due to several reasons:

1. In recent years, Norway has been holding the first place in the UN ratings due to its education system. The indicators of its functioning "overlap" the successes of the more economically developed countries (the USA, Canada) and consistently provide Norway with a place in the top five in terms of the level of human development in the world.

2. Norway is a striking example of the North European model in the organization of higher education. Being simultaneously egalitarian, centralized and socially oriented, it represents many characteristic features of higher education systems in the Nordic countries.

3. Today in Norway, higher education reforms are being implemented that are oriented towards the goals and objectives of the Bologna Process. Entering the international market reveals both the strengths and weaknesses of the existing educational system. The emerging problems of internationalization are not exclusively "Norwegian" - they are typical for countries with a strong social orientation of education, forming today in a pan-European educational space [14].

The educational system of the United States is one of such centers of modernization in education: it was precisely in it that such attributes of modern higher education as the credit system, the institutional autonomy of universities, the public and professional accreditation of universities were shaped and tested for the first time.

Distinctive features of the American education system:

1. This is one of the few systems dominated by the private sector. It was the non-state universities that formulated the "rules of the game" that determined the institutional shape of the modern educational model.

2. The system of university accreditation proposed in the American model, in fact, is a prototype of the current mechanisms for managing the quality of education, but, unlike European counterparts, is based on university initiatives ("accreditation from below").

3. The management system of higher education in the US differs from most systems (both Atlantic and Continental) by its decentralization and the special role of regional authorities.

4. The difficulties experienced today by the US higher education system, on the contrary, are not specific and can be considered as challenges to all educational systems of the Atlantic type [14].

Features of the «Atlantic» model characterize the Canadian system of higher education. By values, strategies and dominant orientations, it strongly resembles the British system of higher education. Historically, the traditions of British universities have been largely adopted by leading Canadian universities. Nevertheless, the development of Canada's higher education system took place in a special geographical and political context, in conditions of cultural diversity and linguistic duality. This led to a difference in the Canadian higher education system from the systems of the "Atlantic" model close to it. These are of particular interest to us:

1. Differentiation of the Canadian system, due to the administrative-territorial differences and political structure of Canada.

2. Implementation of new programs to ensure accessibility of higher education.

3. High level of autonomy of Canadian higher educational institutions, which are independent in making decisions, including the organization of the educational process.

4. Effective practice of financing the activities of higher education institutions [14].

The modern system of higher education in Italy has developed against a backdrop of large-scale state reforms related to the restructuring of the political system and the changing priorities of economic development and, on the other hand, the reforms caused by the Bologna process and the desire to include Italy in the pan-European educational space. Thus, the internal factors of the formation of the Italian educational system and external stimuli for its development proved to be mutually complementary.

Italy successfully participates in the formation of a pan-European higher education space, effectively implements the strategy of internationalization and at the same time preserves the specifics of national education.

In Italy, significant experience has been gained in the implementation of international educational projects that open the prospects for cooperation between Italian and other European universities and create favorable conditions for the mobility of students and teachers. The interesting is the peculiar educational expansion of Italy, in particular, the creation of the University Network of the Adriatic-Ionian region.

The Italian experience of reforms aimed at regionalization of higher education and increasing the role of higher education institutions in regional development, as well as improving the efficiency of financial management in the higher education system, is also interesting.

Particular attention should be paid to the role of the "first universities", which occupy an important place in the cultural and social life of Europe -Italy, being the birthplace of the European university tradition, is trying to work out a strategy of modernization and internationalization that would help preserve its historical heritage [14].

Indicators of the OECD countries, taking into account their future long-term dynamics, this is the basic reference points of our path to the list of 30 developed countries of the planet "[15]. In 2011, Kazakhstan applied for observer status in four OECD Council Committee, including the Education Committee. And, in 2010 Kazakhstan for the first time took part in the International Programme for Evaluation of Educational Achievements of 15-year-old pupils of PISA-2009, which allowed to assess the knowledge and skills of students in 200 educational institutions of the republic [16].

The analysis of Kazakhstan's results in international comparative studies provides an actual perspective for work in such areas as the transition to new educational standards and the creation of a national system for monitoring the quality of education, which have been included in the list of priority directions of educational policy set out in the State Programme for the Development of Education of the Republic of Kazakhstan for 2011-2020. The key idea of the OECD Declaration on the Future of Education Policies is that, in a rapidly changing social and economic context, all components of the education system (national standards, teachers, schools, etc.) should be "tuned" to a willingness to accept change and become active conductors of innovations. Continuous development, empowerment, and equality for disadvantaged groups, Cooperation of all stakeholders - these are the three main values that reflect the spirit of this Declaration [17].

Although enough time has passed since the adoption of this document, we can say that its provisions, sounded several decades ago as an appeal to the future, today have become the basis for developing educational policies in countries seeking to create a competitive economy and a sustainable society. If we talk about the prospects for Kazakhstan participation in international comparative evaluation studies, we can say the following: we have embarked on this path, and this is one of the most important results of educational policy, purposefully pursued by the Government of the country in recent years. These measures are aimed at the introduction in Kazakhstan of universally recognized international standards of public administration. This policy is enshrined in the State Programme for the Development of Education of the Republic of Kazakhstan for 2011-2020, the basic document that defines the political and conceptual framework for the development of the country's education in the long term. In particular, it is planned that Kazakhstan will participate (along with the already known PISA and TIMSS) in such international studies as: PIRLS - an assessment of the level and quality of reading and comprehension of the text by primary school students; TIMSS-ADVANCED - assessment of mathematical and natural-science literacy (physics) of 11th-grade students with in-depth study of these subjects; ICILS - an estimation of computer and information literacy of pupils of 8 classes. It should be noted that for countries included in the OECD organization, as a rule, recommendations are made to join the various thematic evaluation and monitoring studies. In the field of education for the OECD, it is very important that the country (along with PISA) participate in the "Programme for the International Assessment of Adult Competences" (PIAAC) and the joint OECD and UNESCO study "Teachers for schools of the future / Analysis of the World Education Indicators" [17].

Perhaps Kazakhstan will receive such an invitation and this will be another opportunity for understanding and further developing the education system of our country within the broad international perspective. Thus, our President N.A. Nazarbayev firmly stated his intention to implement some OECD standards in Kazakhstan. In the Message of 2014, he says: "I am setting the goal of starting to implement some OECD standards in Kazakhstan, they will be reflected in the concept (Kazakhstan's entry into 30 developed countries)" [15].

In addition, according to the President, "the creation of new high-tech industries will require an increase in the financing of science at least 3% of GDP." In general, the creation of knowledge economy is, first of all, the enhancement of the potential of Kazakhstan's science. In this area, it is necessary to

improve legislation on venture financing, protection of intellectual property, support for research and innovation, and commercialization of scientific developments [16].

To implement further plans by the President of Kazakhstan N.A. Nazarbayev the Government was instructed to develop and submit to the Parliament a package of relevant draft laws by September 1 of this year. The leader of the nation noted that a concrete plan for a phased increase in the financing of science for specific developments and discoveries working for the country and bringing it to the indicators of developed countries is needed. And in the end it should be noted that when implementing these directions and plans, especially in the field of education and science, it is necessary to take into account the safety of the future of our state. For this, one always needs to know that our state must adopt those innovative ideas and technological achievements that we will be able to develop and transform into a progressive field in the future. Therefore, building any plans or projects for the future is impossible, entirely and completely to copy the high technologies of the Western economic model. First of all, we should pay attention to the development of some developed countries of the East, especially South and South-East Asia. For example, Japan or Korea. These countries, despite many internal political and economic difficulties, have over the years not only been able to adapt to the modern processes of globalization, to master and improve many Western-style technologies and to rise to a higher stage of economic and political development, but also retained their identity, language and culture. And our ultimate goal is, having taken as a model the historical experience of these countries, to develop and improve our Kazakhstan, to find its worthy place in the world community [16].

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### ЭЫДҰ ЕЛДЕРІНДЕГІ «МЕКТЕП-ЖОҒАРЫ ОҚУ ОРНЫ» ЖҮЙЕСІНДЕГІ ЖАРАТЫЛЫСТАНУ ҒЫЛЫМДАРЫНЫҢ БІЛІМ БЕРУ САБАҚТАСТЫҒЫНА ТАЛДАМАЛЫ ШОЛУ

**Аннотация.** Мақалада «мектеп-жоғары оқу орны» жүйесіндегі жаратылыстану ғылымдарының білім берудегі сабақтастығын қамтамасыз етудегі халықаралық тәжірибені талдаудың нәтижелері қарастырылады. Болашақ мұғалімдерді даярлауды қайта қараудың қажеттілігінің негіздемесі Қазақстан Республикасындағы мектептегі білім берудің жаңартылған мазмұнымен жоғары оқу орны бағдарламаларының мазмұнының сәйкестендіру тұрғысынан ұсынылады. Ғылым мен білім беру мәселелерін бақылайтын, ЭЫДҰ директорының құрылымы сипатталады. ЭЫДҰ елдерінің жоғары білім жүйесіне қысқаша шолу берілген.

**Түйін сөздер:** жаратылыстану ғылымдары білімі, сабақтастық, мектеп-жоғары оқу орны, жаңартылған білім беру мазмұны, ЭЫДҰ.

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### АНАЛИТИЧЕСКИЙ ОБЗОР ПРЕЕМСТВЕННОСТИ ЕСТЕСТВЕННОНАУЧНОГО ОБРАЗОВАНИЯ В СИСТЕМЕ «ШКОЛА-ВУЗ» В СТРАНАХ ОЭСР

**Аннотация.** В статье рассматриваются результаты анализа международного опыта обеспечения преемственности естественнонаучного образования в системе «школа-вуз». Приводится обоснование необходимости пересмотра подготовки будущих педагогов, с точки зрения обновления содержания вузовских программ на соответствие уже обновленного содержания школьного образования в РК. Описывается структура директора ОЭСР, который контролирует вопросы образования и науки. Дан краткий обзор систем высшего образования стран ОЭСР.

**Ключевые слова:** естественнонаучное образование, преемственность, школа-вуз, обновление содержания образования, ОЭСР.

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