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AB	HISTORY
AC	ARCHAEOLOGY, ANTHROPOLOGY, ETHNOLOGY
AD	POLITICAL SCIENCES
AE	MANAGEMENT, ADMINISTRATION AND CLERICAL WORK
AF	DOCUMENTATION, LIBRARIANSHIP, WORK WITH INFORMATION
AG	LEGAL SCIENCES
AH	ECONOMICS
AI	LINGUISTICS
AJ	LITERATURE, MASS MEDIA, AUDIO-VISUAL ACTIVITIES
AK	SPORT AND LEISURE TIME ACTIVITIES
AL	ART, ARCHITECTURE, CULTURAL HERITAGE
AM	PEDAGOGY AND EDUCATION
AN	PSYCHOLOGY
AO	SOCIOLOGY, DEMOGRAPHY
AP	MUNICIPAL, REGIONAL AND TRANSPORTATION PLANNING
AQ	SAFETY AND HEALTH PROTECTION, SAFETY IN OPERATING MACHINERY

## SPECIALIZED EDUCATION AS A NEW STAGE IN THE IMPROVEMENT OF MODERN EDUCATION

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**Abstract:** The article deals with the problems of specialized education relevant to modern school as a condition for professional training of schoolchildren. The paper defines the problems of specialized education at secondary school according to modern educational objectives in the context of innovative technologies. The article discloses specialized education as one of the ways of development of professional self-determination of pupils and some features of the organization of specialized education in modern secondary schools. In view of the scientific and pedagogical analysis of relevant literature and regulatory documentation on the problem under study, the paper revealed and justified the didactic stages and areas of modernization of specialized education in Kazakhstan. The important place of technological fundamentals and industrial processes in the content of specialized education was defined according to requirements of scientific and technological progress. The experience in organizing high school students' specialized training in the comprehensive schools in Atyrau city was analyzed. The article describes the role of a variation component in the educational process. This component determines the nature of schoolchildren's development and implies their personal characteristics, interests, and inclinations.

**Keywords:** specialized education, innovative approaches, specialty-based differentiation, individualization, variation component, teaching methods, professional training.

### 1 Introduction

One of the main goals of the planned changes in education is to meet the needs of both societies as a whole and individuals in accordance with their characteristics and abilities, as well as to ensure State guarantees of access and equal opportunities to receive a full education. Another form of educational organization is needed in order to take full account of the aptitudes, interests, and abilities of students. Specialty-based differentiation in education is such a form of organization. The ideas of specialized high schools and learning resource centers are considered in this paper from different points of view but in a general context by moving towards to a better provision of education for all students in Kazakhstan. (1, 2) When raising the topic of a "specialized school", the opportunities of an in-depth study of subjects at lyceums, gymnasiums, and language schools are usually considered. The specifics of such institutions are that not every child who has received basic general education can study there. Therefore, it is proposed to organize specialized education in each school. This is a different kind of education, differentiated according to the place of residence, profession, material wealth of the parents and peculiarities of organization of cultural life.

Psychologists, didactologists, and methodologists (3, 4) have studied the problem of differentiated instruction in depth. The individual features of children and their manifestations in school education were considered in the works of B.G. Ananyev, D.N. Bogoyavlensky, N.Y. Bolshunov, E.A. Golubeva, S.A. Izyumova, and E.N. Kabanova-Meller, M.K. Kabardov, E.A. Klimova, G.S. Kostyuk, A.I. Krupnov, O.M. Leontyev, M.A. Matova, V.D. Nebylitsin, A.V. Petrovsky, S.L. Rubinstein, B.M. Teplov, I.E. Unt and others. The problem of differentiated instruction was put forward and developed in the pedagogy of many countries of the world. In the context of Kazakhstan, this problem was disclosed in the scientific works based on the

traditions of national pedagogy. The differentiated instruction is especially relevant now when the center of attention of a pedagogical science is the questions of the shaping of a harmonious personality and the development of children's abilities and individuality. (1, 5)

When analyzing different understandings of the differentiated instruction in the educational process and noting the fruitfulness of the idea of internal and external differentiation, we consider a deeper and more productive concept of classifying the educational process on the principle of level-based and specialty-based differentiation.

The experience of many countries shows that within the framework of differentiated instruction, it is possible to achieve an optimal combination of requirements for the unity of general educational institutions aimed at achieving educational equivalence in accordance with individual characteristics of students. (6, 7)

In Kazakh schools, there is already the experience in the specialty-based differentiated instruction of schoolchildren. However, these educational institutions face the following problems in the course of their work:

Unsolved issues of choice of specialty, educational and methodological support of specialized education, lack of criteria for assessing knowledge;

- Lack of measurers for the admission of students to specialized classes (schools);
- Insufficient logistics capacity;
- Lack of teachers trained to teach specialty-based subjects and elective courses;
- Lack of interaction between specialized school education and primary vocational education institutions.

The idea of specialized teaching of subjects is not new. It has been practiced long and successfully in many Western countries. (2, 8)

All over the world, especially in the last decade, attempts have been made to link the development of economics, technology, science and society with the tasks of restructuring the content of school education. Therefore, education, as the main factor of intellectual potential formation as well as a new quality of economy and society, is given a key role.

#### 1.1 Purpose of the Research

Specialized education is a system of specialized training in the upper grades of a comprehensive school focused on the individualization of training and socialization of students in view of the real and perspective needs of the labor market of the country. The aim of the work is to study the specialized education peculiarities in a modern secondary school. In order to achieve the goal, it is necessary to solve the following tasks: to study the experience of educational specialization profiling in the country and abroad; to consider the main tasks of specialized education; to distinguish specialized educational models. Specialized education requires the development and practical implementation of a flexible system of specialties and the cooperation (close interaction) of high school with institutions of primary, secondary and higher professional education.

The conditions for achieving this goal are

- Ensuring that schools have the right to differentiate the education of schoolchildren in various areas of general and vocational training;
- Providing students with the freedom to choose an educational specialization that optimizes the combination of individual and social interests;

- Ensuring that the new content contains an optimal ratio of time for theoretical, applied and practical training of students, ensuring that graduates of specialized classes have special qualities for their chosen specialty. (9, 10)

We consider specialized education as a very productive means of realization of practical knowledge and skills in the educational process of comprehensive schools. Indeed, specialized education provides knowledge of the scientific basis of a particular industry and thus equips students with practical labor-related and special skills. Because of a specific basic system of knowledge about a particular industry, students obtain practical skills that allow them to orientate themselves in other areas of practical activities. In this case, specialized education serves as a means to avoid the danger of acquiring abstract verbal knowledge. (2, 11)

Thus, in its essence, specialized education orients comprehensive schools to the optimal combination of general education, polytechnic and professional training, and excludes craftsmanship and unilateralism in the activities of educational institutions.

## 2 Materials and Methods

One of the priorities of the concept of modernization of education was the development of a specialized education system in the upper grades of secondary schools. Specialized education should provide in-depth training of high school students in the subjects they have chosen and to a reasonable extent reduce the amount of learning time devoted to non-core subjects. This form of education should take into account the best interests, aptitudes, and abilities of older students. Specialized classes should provide students with plenty of opportunities to realize their own desires. Specialized education is implemented in high school. By specialized education in secondary school, we mean special educational system, which has the following distinctive features:

- Core academic subjects have a sufficiently clear professional orientation;
- The curriculum includes special subjects and electives that reveal the content of a particular professional activity;
- Professional training is organized and delivered under the patronage of a specific special educational institution, which, together with the school, has full responsibility for the quality of the professional training. (4, 12)

The developers of the social and pedagogical system of specialized education have the following tasks:

- 1) To substantiate a set of provisions constituting the theoretical and methodological basis for professional training; to substantiate specific methods and means of specialized education theoretically and experimentally.
- 2) To propose and theoretically substantiate the technologies of designing educational systems that implement in practice the idea of the optimal combination of general, polytechnic and professional education. (9, 13)

Teaching methods at the specialized school should facilitate the mastery not only of knowledge and general learning skills but also various ways of acting. Learners should be able to develop their intellectual abilities, especially when mastering more complex (as compared to what is provided for in an educational standard) content. The following information equipment is also needed: educational videos, electronic texts, use of the Internet. It is very important to conduct creative contests, heuristic tests, rating evaluations of the specialized training success, excursions to the enterprises and specialized exhibitions, training workshops at the educational and working places in the enterprises according to the specialty. (14, 15) It is necessary to provide specialized schools with audio-visual tools to the full extent. The use of such tools will intensify the educational activities of students at the lesson, to shape a stronger and deeper knowledge of the topic. The use of the Internet in specialized schools will be productive and will require the information preparedness of a

teacher and students. A fundamentally new idea of specialized education is being implemented into the practice of general and professional education of young people, which should lead to the convergence of general education and vocational schools in the future. An indisputable effective method of education is the organization of research and project-based activities of students, which allows teaching children to think independently, find and solve problems by involving knowledge from different areas for this purpose. (11, 16)

## 3 Results and Discussion

One of the most pressing problems now is the transition of secondary schools to specialized education of students in high school. The specialization is understood as a type of differentiated education, through which it is possible to take into account the educational interests of students as much as possible and to create conditions for the satisfaction of their intentions for subsequent life activities.

The scientific novelty is as follows:

1. The organizational and pedagogical ways and means of optimizing specialized education in modern conditions are revealed.
2. The problem-oriented analysis for the implementation of pre-specialized training and specialized education has been conducted.

The quality and efficiency of practical training of students for the purpose of the development of specialized education at the present stage have been determined.

The practical importance of work consists in:

- The definition of the importance of the content of specialized education at the present stage in accordance with the requirements of scientific and technical progress;
- Working out of the methodical system for a problem of modernization of specialized education and enhancing specialized training of pupils when studying the basics of the main areas of scientific and technical progress;
- The substantiation of a way of realization of the idea of specialized education at the high-school level of general education. The transition to specialized education pursues the following main objectives:
  - To provide an in-depth study of individual subjects in the program of full general education;
  - To create conditions for significant differentiation of the content of high school students' education with wide and flexible possibilities of building individual educational programs;
  - To promote equal access to full education for different categories of students according to their abilities, individual aptitudes, and needs;
  - To expand opportunities for students' socialization, ensure continuity between general and vocational education, and better prepare school leavers for higher professional education programs. (17, 18)

Many aspects of this transition are not yet clear and raise several questions. In the concept of specialized education, it is noted that the implementation of the idea of such an education at the high-school level puts a school leaver in front of the need for responsible choice (preliminary self-determination) of the specialty of their own activities. (19, 20) The mission of a specialized school is to ensure access to high-quality education for students in the final and pre-leaving grades. This is made possible by concentrating the most qualified teaching staff, technological tools, information, and other resources. Under these conditions, the possibility of entering such a school, a wide range of specialties, as well as the possibility of extensive contacts in a rich educational environment focused on achieving significant progress, will be available to hundreds of high school students.

By using the accumulated theoretical and practical knowledge about this problem, as well as the experience of the authors, it is possible to build an effective system of specialty-based differentiated instruction that allows meeting the country's need for specialists with a high-qualification level. (21, 22)

The research of the scientists of the CIS countries in the field of specialty-based differentiation have formed the basis for 3-level programs for natural sciences subjects:

- General cultural orientation courses (I);
- Courses of applied science (II);
- Advanced level courses (III).

These programs make it possible to implement the idea of the specialty-based differentiation of school subjects. A priority area of functional activities in upper secondary education is the implementation of specialized training to provide in-depth pre-professional training for students. A fundamentally new approach to the construction of upper secondary education is that it is based on the differentiation, integration, and professionalization of educational content. (23, 24)

Pupils at the third level can choose the forms and methods of education and individual educational programs, where creativity and the creation of conditions for the development of individual abilities of students are given a special place.

The main objectives of specialized education are:

- Work-related education of students;
- Preparing students for life in modern society;
- Preparing students for professional activities in the industrial and service sectors.

One of the most promising forms of organizing the training of high school students for working life is specialized classes created and operated with the assistance of universities. The main task of these classes is to complete the polytechnic education of schoolchildren and provide them with the opportunity to obtain a profession. (25, 26)

When providing specialized education, it is essential to increase the use of such methods as:

- a) Lectures;
- b) Seminars, interviews, and debates;
- c) Laboratory instruction and laboratory practical studies;
- d) Independent study of basic and additional literature related to various specialties;
- e) Development and defense of projects, etc.

The problem of accessibility, quality, and efficiency of education cannot be solved without taking into account the world experience of creating specialized high schools and without careful consideration of the possibilities of creating educational centers, complexes, and schools specifically designed to address the problems of ensuring the rights of students in the field of education.

On the basis of research data (questionnaires, the study of experience, conversations with students and teachers, etc.), we developed and applied general criteria for evaluating the levels of specialized education. (27) These criteria have been experimentally tested in schools of the Atyrau region.

#### 4 Conclusion

The following specific conclusions were reached in the present study:

The role and place of specialized education in improving the training of schoolchildren for a conscious choice of their professional path at the present stage has been identified.

Ways of development of the content and methods of the organization of the educational classes aimed at developing

applied knowledge and skills of pupils when studying school disciplines are defined. (23, 25)

Specialized education will ensure that graduates of classes (schools) with specialty-based differentiated instruction aimed at developing personality-related physical, mental, intellectual, social, and business qualities corresponding to the conceptual model of graduate and contributing to a graduate's less painful adaptation to the conditions of market relations in the economy.

Specialized training provides graduates of specialized schools with a broad general secondary but specifically oriented education that meets their interests and requirements of scientific and technological progress. In the future, the work on research of specialized education at the present stage can be conducted in the following areas:

- The development (possibly improvement) of programs for in-depth study of subjects (for schools and classes with advanced studies of physics, chemistry, biology, mathematics, languages, etc.), as well as writing textbooks for these programs on a competitive basis.
- The enhancement of the articulation between school subjects and the productive work of schoolchildren.

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## THE IMPLEMENTATION OF THE SPECIALIZED-EDUCATION MODEL AT THE PRESENT STAGE

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**Abstract:** This article reveals one of the aspects of modern education in secondary school - the problem of preparedness of schoolchildren for a conscious choice of their professional path. The article considers the questions of the differentiation and individualization of the educational process in accordance with the personal features of high school students, the basic aspects and system approaches to the decision of problems of specialized education. In the paper, the principle of the variability of education is stated. This principle promotes the disclosure of individual abilities, aptitudes, interests, and educational needs of students. The article contains a brief description of practical applied work as a means of enhancing the level of intensification of students' cognitive activities in the modern context. The organizational and pedagogical ways and means of optimization of specialized education in the modern context are revealed. In the paper, the conditions of the implementation of the specialized-education model in secondary school are considered. In the article, the problem-oriented analysis for the implementation of pre-specialized training and specialized education is conducted. The quality and efficiency of practical training of pupils with the purpose of the development of specialized education at the present stage are defined.

**Keywords:** specialized education, scientific and technological advancement, specialization, differentiation and individualization, educational process, cognitive interest, elective component, variability, specialized-education models.

### 1 Introduction

Nowadays, when the issues of the shaping of a harmonious personality and development of individual abilities of schoolchildren are in the center of attention of the pedagogical science, the differentiated instruction becomes especially important. The current situation in Kazakhstan and in the world puts new demands on the organization of the educational process at high school. The pedagogical science, based on the long and extensive experience of schools, is called upon to describe and generalize this experience and to offer schools new effective solutions to the problem of the real connection of theoretical education with students' practical life and work. (1, 2) In general, the development of this problem in relation to the conditions of general education school is not yet satisfactory.

The network of educational organizations with an in-depth study of individual subjects is not sufficiently developed. Therefore, the specialization of education in high school should make a positive contribution to the solution of these problems. The implementation of specialized education will contribute to the creation of better conditions for the differentiation of the educational process, the development of students' individual characteristics, self-organization, self-realization, and expansion of life and social competence.

Specialized education is considered as a means of differentiation and individualization of education. Due to changes in the structure, content, and organization of the educational process, the interests, aptitudes, and abilities of students are more fully taken into account, and conditions for the education of senior high school students are created in accordance with their professional interests and intentions for further education. (3, 4) We have analyzed the current state of specialized education in Kazakhstan and abroad.

M.K. Akimova, Y.K. Babansky, I.D. Butuzov, N.N. Vernitskaya, G.L. Ginzburg, A.S. Granitskaya, Z.I. Kalmykova, N.G. Talyzina, and others have been dealing with the problem of individualization and differentiation of education in didactics. A.I. Bugaev, A.A. Pinskiy, and others developed theoretical bases of differentiated instruction. According to A.A. Pinskiy, the system of vocational education could have been a moderator of the interaction between school education and the labor market but, unfortunately, it itself is poorly organized in relation to the rapidly changing demands of labor markets and employers. It was noted by A.A. Pinskiy that the declared ideas of high school specialization require a considerable number of innovations. Such innovations include individualized and networked forms of education, the use of new educational technologies, the application of new methodological support, the development of the system of accumulative evaluation, the introduction of new elements of school economics, improvement of training and retraining of teachers. (4) In Kazakhstan, as well as in other CIS countries, new mechanisms are being created to ensure access to high-quality education. The education restores the lost resource potential and gets new means for the realization of its tasks.

#### 1.1 Purpose of the Research

The specialized education will enable solving the following tasks: to provide students with thorough knowledge of the disciplines of the chosen professional area; to activate the need of students to carry out cognitive activities independently; to develop motivation in students for research and scientific work; to shape critical and creative thinking helping students to actively accept information. (4, 5)

The purpose of the research is to enhance the level of scientific and methodological validity of specialty-based differentiation of the modern high school education, to reveal the quality and effectiveness of specialized education. The following objectives of the research are defined in accordance with the purpose:

1. To analyze the state of specialized education at school in view of the requirements of differentiation and individualization of education at the present stage.
2. To develop organizational mechanisms of specialized education on the basis of innovative educational technologies in the modern environment.
3. To create new organizational forms that are the basis of network interaction.

Specialized education is an integral part of the general problem of modernization of school educational content. The main task of specialized education is to provide conditions for the realization of interests, abilities, and needs of a personality. (6, 7) In the context of the Republic of Kazakhstan, the solution of tasks of training individualization, specialization, the cooperation of high schools with professional educational institutions is carried out in interrelation with such directions of modernization of the Kazakh education system as:

- Restructuring of the educational network;
- Development and introduction of a mechanism for normative per capita financing of general education institutions;
- Inclusion of professional education institutions into educational complexes of the districts and cities of the country;
- Informatization of education;
- Renewal of criteria and forms of evaluation of students, teachers, heads of educational institutions, and employees of the education management system. (7)

The experience of the Kazakh and foreign systems shows that high schools with specialized education to a high degree meet the requirements of a social and economic situation. The logic of specialized education is manifested in the concentration of

educational resources on what ensures the readiness of students and graduates to solve problems of practical importance. In the context of specialized education, pupils should be able to receive not "complex notions" (sets of the same subjects and hours for the whole country, made up according to the standards common for the whole country), but work on demand from what a particular school can give them. The educational potential of an institution is a crucial fact in the extent to which our efforts to make high-quality education available can be real and effective. Professionalization of education in high school corresponds to the structure of the educational and life attitudes of the most school students and gives orientation to future professional activities. It is necessary to recognize the fact of unique resource intensity of education, and at the same time, that today and in the near future, the state of personnel, technology, communications, educational and methodical support of the educational process, etc. is insufficient. In this regard, the tasks of economical and rational use of educational resources are particularly relevant. (8, 9) Along with students' individual aptitudes, abilities and needs, the educational environment, the capabilities of particular teaching staff, the professional competence of teachers, material and technological support, as well as the peculiarities of the organization of the educational process in the classroom, at school and beyond are of great importance. The implementation of the principle of accessibility of high-quality education should be embodied in the fact that every high school student has the opportunity to master the chosen specialty using modern laboratory equipment, computer equipment, digital and traditional information resources, and Internet communications. (10-12) Specialized education promotes:

- Mastering the content of education at an advanced level in profile disciplines and studying elective courses;
- Development of independent work and research skills;
- Preparedness of graduates for a conscious choice of a profession and independent creative learning at a university.

## 2 Materials and Methods

The improvement and modernization of general education and specialized education as its structural part needs scientific rethinking, evaluation of the achieved level, identification of deficiencies and their causes, development of new conceptual theories, definition, and justification of the substantive and procedural basis for the construction of a variation model for its implementation. Previously, the issues of organization of productive activities and self-expression were not principal but it is the main idea of specialized schools. To materialize this reorientation, it is necessary to abandon the ideology and behavioral stereotypes of survival and proceed to build a better model. Such an approach should be laid in the mechanism of institutions providing specialized education in high schools. (13, 14)

The scientific novelty of the paper is as follows:

1. The most important pedagogical conditions characterizing the development of specialized education in the study of school subjects for senior high school students have been defined.
2. The role and place of the variation component in the educational process, providing the character of development of schoolchildren and taking into account their personal features, interests, and propensities are revealed.
3. The conditions of realization of the variation model for specialized education in modern secondary schools are revealed.

The practical importance of the work consists in the following aspects:

- The definition of the problem of specialized education in a secondary school in accordance with the objectives of modern education in the context of innovative technology.

- The development of scientific and methodological recommendations for the implementation of specialized educational technologies in the educational process of secondary school and vocational schools;
- The development of the elective course "New materials in technology."

Specialized high schools and learning resource centers should become similar institutions with constructive activities and, at the same time, adequate to the circumstances of the surrounding reality. (15, 16) The implementation of the specialized-school model, as well as the restructuring of the network of educational institutions in general, will find and already have opponents, significant limitations, and risks. Meanwhile, the positive potential of such institutions seems obvious to us. In our opinion, the implementation of specialized education requires, primarily, the training of personnel who can provide high-quality information work. With all the obviously correct, modern, and relevant interpretations of specialized education, the practical implementation of the specialized-education school model is an undoubted difficulty for general education institutions.

The specialized-education school models have a number of common characteristics with resource-center models. These are institutions where

- The best teachers in a city (district) teach those students who want a high-quality general education;
- High efficiency of investment in education is ensured by the work of relatively large teaching teams consisting of the most qualified teachers specializing in teaching subjects in classes of a particular specialty in order to achieve clearly defined results;
- Intensive use of educational resources is ensured. Each laboratory, computer lab, and media room is used with several classes. (15, 17)

With regard to the organization of specialized education at high school, new requirements for a teacher arise during the transition to specialized education. It should be a high-level specialist, appropriate to the specialization. He or she should be prepared to provide variation and personal orientation in the educational process. A teacher should possess interactive and action-related components of the learning process, i.e. the mastery of project-based, research-based and communication-based methods.

To date, we distinguish two models of specialized education:

- The model of intra-school specialization. In this case, a comprehensive educational institution can be single-specialty (can implement only one selected specialization) and multi-specialty (can organize several educational specializations);
- The model of the network-based organization of specialized education. (18, 19) According to this model, purposeful and organized mobilization of educational resources of other institutions is conducted for the students of a particular school. This model can have two main options. The first option is associated with the unification of several general education institutions around the strongest general education institution that has sufficient material and human resource potential and serves as a "resource center". The second option is based on the cooperation of general education institutions with institutions of additional, higher, secondary and primary professional education and the mobilization of additional educational resources. In this case, students are given the right to choose to obtain specialized education not only where they study but also in educational organizations cooperating with a general education institution (distance courses, distance schools, professional education institutions, etc.). (4, 20)

The improvement of the quality of education is one of the main objectives of high school specialization that, in the new socio-economic environment, should be more oriented to the needs of students and their parents. The variability and difficult

predictability of the market and a limited application of forecasts explain the complexity of solving the problem of interaction between school education and the labor market. Often the choice of profession is conditioned by fashion, and employers need a specialist who will be in demand in 10 years.

The pedagogical essence of high-school specialization is in expanding the freedom of choice and individualization of education, in responding to the pragmatic demand of modern high-school students (associated with their post-secondary life interests and plans), in striving for mass availability of specialized education. When making up specialized educational curricula, it is necessary to address such pressing school problems as health preservation, the normalization of the amount of learning time and education quality improvement. (13, 21)

When developing the content of specialized education, it is important to ensure that all core courses (special, optional, and elective) include both theoretical and practical components. The following components are singled out in the content of profile training:

- Basic invariant component (providing a standard level of knowledge);
- Specialized variation component - mandatory for learning (providing an in-depth study of subjects related to a selected specialty);
- Elective component, which contains a number of modular courses that deepen and expand the basic and specialized courses, as well as identify the specifics of activities and requirements for professionals in various fields. (22, 23)

In the content of textbooks for specialized education, there is a mandatory core and a variation part. In the variation part, the modular principle of educational content presentation is possible. Each individual module includes content corresponding to the type of specialty. For example, the applied module of the physics course reveals its connection with various areas of human activities such as "Physics and medicine", "Physics and economics", "Physics and culture", "Physics in agriculture", "Physics in life", "Physics in industry", "Physics and environmental protection", etc. Therefore, the development of curricula and textbooks for elective courses should be given serious attention in the educational methodological provision. Now, the task of creating an educational methodological set of elective courses related to natural science subjects for specialized education is not completely solved in Kazakhstan. We have revealed the role and importance of physics teaching in specialized education, defined the theoretical basis for the development of physics elective courses for specialized education in high school, and, in accordance with this theory, we have developed a 34-hour program of elective course "New materials in technology" for schoolchildren of 11th grade specialized in physics and technologies. The proposed elective course introduces schoolchildren to the main development areas of science and technologies in relation to the development of new materials, to the general regularities of production and processing technology of materials. The elective course provides good opportunities for the development of students' creative abilities, shaping of polytechnic knowledge and skills in the field of development of materials for modern technology.

### 3 Results and Discussion

The development of society is inextricably linked to the development of education that, at different stages, was determined by specific forms, means, and models of relations between teacher and pupil and, more broadly, between knowledge carriers and knowledge users. In the modern context, the main problem of education is no longer so much the search for ways to enable a person to master a huge and constantly increasing amount of knowledge or at least orientation in an ever-increasing flow of information as the obtaining, creation, and production of a new intellectual product. (4, 24) One of the most important goals of modern education is to get people prepared in time for the new life conditions that are bringing with them a rapidly approaching future. At present, there is a

contradictory attitude of scientists and practitioners to specialized education and the transition from specialized training to the professional education of youth. On the one hand, the changed social and economic conditions have led to a change in the social demand in the field of education: schools are required to create the conditions for more conscious and qualitative self-determination of students. This has led to the creation of diverse educational institutions and the possibility for parents and students to choose one of them. On the other hand, in a context of increasing polarization of society, a process of consolidation of social inequalities through variable education is under way. The education system and each of its links separately can only successfully perform its functions if the structure, content, organization, and methods of work are sufficiently mobile and fully meet the requirements of not only today but also are oriented towards the future. In addition, there are changes in the organization of the general education system associated with its humanization, increased attention to student personality, democratization providing everyone with the opportunity to choose the path and nature of education, differentiation, and individualization of learning, the emergence of new subjects of study. All this has created a number of new problems in both the content and organization of students' labor training. (7, 13)

The content of technological and professional education provides for the study of integrated courses related to general, social, and economic disciplines, special subjects required to master professional educational programs; and the mastery of professional skills in the chosen specialty. In this regard, pre-specialized training is a system of pedagogical, psychological, informational and organizational support for comprehensive-school pupils, which helps them to find themselves. Pre-specialized training implies the provision of information and orientation of ninth-grade pupils regarding their possible choice of a high-school specialty and subsequent study areas for primary or secondary vocational education. (13, 25)

In the course of the research, we have been able to identify those situations in which specialized education is perceived with significant distortions of its meaning, as well as show ways to prevent them. For example, it is important to communicate more clearly to the teaching and parenting community that specialized education is neither a complete "displacer" of non-specialized education nor vocational training. It is also important that specialized education is not designed as an elitist one and is not a motive for closing lyceums and high schools. High-school specialization more clearly demonstrates the redundancy of the main component of the standard and the dominance of formal cognitive approach in high-school education. The conceptual provisions of polytechnic training of secondary-school pupils, its theoretical and methodological basis, and modern provisions of specialized education act as a necessary condition of labor training of the younger generation.

The realization of objectives in multilevel system of specialized training implies the definition of a pedagogical task, i.e. setting of goals and selection of educational content adequate to the prospects of socio-economic and scientific-technological development of a renewed society. To reveal the mechanisms of development and functioning of the process of technological training of students as a system, it is necessary to highlight the system-forming basis of the numerous subsystems, in which the shaping of personality takes place. (15, 26) Such a subsystem is specialized training that ensures polytechnic education. Only a school focused on training a socially mature graduate who can independently set and adjust his or her own educational and professional goals will be more successful among its kind.

It is necessary to expand the practice of combining the capabilities of educational institutions and enterprises; to create educational and industrial complexes "school - vocational school - college - university - enterprise". One of the ideas to solve the problem of specialized training of high-school students appeared due to the interaction of pedagogical teams of the "partnership" schools of the Atyrau region of the Republic of Kazakhstan. The essence of the idea is the following: specialized education was

implemented in the mode of distance learning with the use of information and communication technology. At five "partnership" comprehensive high schools, specialized groups of students were formed, which were mainly studied remotely. (4)

A group of teachers conducted specialized education in different schools. The group consisted of a leading teacher (teachers), teachers of elective courses, and tutors of the specialized groups. The leading teachers were selected from the most trained teachers of the "partnership". The duties of the leading teachers of the specialized and elective courses included the preparation of the teaching materials for the students and teaching them in the distance mode. The tutors of specialized groups organized the process of drawing up individual educational programs for students and were responsible for their implementation. In addition, tutors assisted children during distance learning. They organized the implementation of the received tasks for groups with different age and different training levels, helped to identify difficulties arising in the course of the educational process, formalized requests to the leading teacher or an e-course teacher, determined the need for face-to-face consultations, maintained the interaction with students' parents, etc. At least once every quarter of a year, face-to-face meetings were organized between the students and teachers of core subjects (so-called face-to-face sessions). The goals and objectives of the face-to-face sessions can be different. They can be orientational, exam, practical, researching, etc. Such meetings include the so-called "winter and summer schools", where in addition to the specialized training objectives, the tasks of education and socialization of graduates were solved. When undergoing specialized training, the pupils are better able to master the subject under study; there are more possibilities for the development of their thinking activities, research skills, and practical competence in comparison with the usual forms of organization of the educational process.

#### 4 Conclusion

After having analyzed practical and theoretical aspects of the topic, we made the following conclusions. On the basis of the analysis (23) of different approaches to this problem, having studied the programs of school subjects, including the 3-level one, as well as taking into account the idea of internal and external differentiation, we come to the conclusion about the productivity of the concept of the educational process on the principle of level-based and specialty-related differentiations.

Specialized education will contribute to the creation of better conditions for the differentiation of the educational process, the development of students' individual characteristics, self-organization, self-realization, and the expansion of their life and social competence.

Specialized education contributes to the development of a comprehensive readiness of high school students to continue learning the natural and mathematical sciences at a university. An elective course and methods for the intensification of the cognitive interest of secondary school students have been developed.

The implementation of specialized education displays the development of the educational system in the country and is a natural response to the social needs of the population. In the future, the work on research of specialized education at the present stage can be conducted in the following areas:

- The improvement of the content and system of specialized education in view of the research of modern innovative technologies;
- The development of students' motivation for research activities.

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#### Primary Paper Section: A

#### Secondary Paper Section: AM, AO

## SOCIO-ECONOMIC BASICS OF SCHOOLCHILDREN'S POLYTECHNIC TRAINING IN THE MODERN INDUSTRIAL ENVIRONMENT

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**Abstract:** The article considers the socio-economic and pedagogical basis for improving schoolchildren's polytechnic training in the modern industrial environment. The article reveals the social and economic importance of modern scientific achievements for the shaping of a comprehensively developed personality. According to the requirements of scientific and technical progress, the article defines the important place of the basic awareness of technological objects, technological, and industrial processes in the maintenance of schoolchildren's polytechnic training. The article considers organizational pedagogical ways and means of the optimization of polytechnic training under the conditions of the further economic and social development of Kazakhstan.

**Keywords:** scientific and technological progress, social development, personality, education, polytechnic education, training, technology, industry, methods, professional training.

### 1 Introduction

Modern scientific, technological and social progress is making great changes in all areas of human activities. It requires further improvement of workers' cultural and technical training in various sectors of the national economy of Kazakhstan. The social and economic transformations taking place in society at present have put everyone in a rather harsh environment when one has to look for internal reserves, opportunities for the realization of available knowledge, skills, and experience rather than rethink and psychologically adapt to market conditions. The development of society is inextricably linked to the development of education, which at different stages was determined by specific forms, means and models of relations between teachers and pupils, and, more broadly, between knowledge carriers and knowledge users. In the modern context, the main problem of education is no longer so much the search for ways to enable a person to master a huge and constantly increasing amount of knowledge, or at least orientation in an ever-increasing flow of information, as the obtaining and creation of a new intellectual product. One of the most important goals of modern education is to train people in a timely manner for new life conditions. The paper considers the socio-economic and pedagogical basis for improving the polytechnic training of students in secondary general education. (1, 2) The problem of polytechnic training of school students is one of the problems, the relevance of which is determined by socio-economic changes in society. In today's conditions, it is amplified by the following factors: technological revolution and the emergence of post-industrial society have led to the fact that an employee is now required both well-developed production functions and abilities, and skills to design, make decisions and perform creative work. These qualities should be formed since childhood and be constantly developed during both learning and working life. Modern civilization is going through such a critical turning point period of development when the future is not strictly deterministic but variable. Moreover, what scenario will be realized depends on many influences and factors including the manifestation of scientific and social activities. It is now that such activities can be truly both useful and effective, acting as the lifesaving impetus that guides the further development of civilization. An analysis of practice shows that we underestimate the economic impact that an enhanced

polytechnic training can have on schoolchildren. If we take into account that such training involves learning the scientific basis of modern technology and methods of using knowledge in it, the social and economic importance of polytechnic education becomes clear. (3) In this article, an attempt was made to build a structure of polytechnic materials related to physics in accordance with the main areas of scientific and technological progress.

#### 1.1 Purpose of the Research

The goals and objectives of polytechnic education are conditioned by the socio-economic development of society. The technical intensity of labor and its intellectual content requires not only a high level of workers' general educational, polytechnic and professional training but also systematic improvement of this level in accordance with objective changes in industrial technology.

The purposes of the research are

- Students' training for transformative activities in social production;
- The shaping not only of natural scientific and socio-historical but also a technological vision of the world in their consciousness;
- The development of such qualities as transformative thinking and creativity;
- The creation of optimal conditions for personal development in the process of participation in various types of educational and labor activities.

The demands of life dictate the need to study work issues at a new quality level. Students' knowledge of industries should include the main provisions of the strategy of the government to accelerate the socio-economic development of the country. (4, 5) It means that schoolchildren should be familiarized with the main areas of scientific, technological and organizational renewal of industries, with the economic aspects of production, with the issues of increasing the quality of production, labor productivity, saving of natural resources, and integrated use of raw materials, i.e. with the main ways of industrial intensification.

The scientific novelty of the work is as follows:

- The social and economic importance of polytechnic education when shaping a comprehensively developed personality is revealed at the present stage;
- The social, economic and pedagogical principles of modeling of organizational forms and methods that ensure the effectiveness of polytechnic education in the modern industrial environment are defined.

The practical significance of the study is:

- The development of organizational and pedagogical ways and means of optimizing polytechnic education in the context of further economic and social development of the country;
- The preparation and publication of the monograph "Innovative aspect of polytechnic education";
- The implementation of methodological recommendations to improve the polytechnic training of students when studying natural sciences.

The study of natural science subjects provides an opportunity to introduce students to quantitative and qualitative physical and technical properties of materials. (5, 6) In this case, it is appropriate to tell pupils about the creation and wide implementation of new constructional, magnetic, and semiconductor devices; superconducting and other materials, and technically valuable crystals. One of the main objectives of the

polytechnic principle is the mastery of the system of knowledge about the scientific basics of modern technology and industries. This system includes general scientific, technological, industrial, social, economic knowledge, and respective skills. Polytechnic education as an integral part of the cultivation of a comprehensively trained personality is conditioned not only by the development of technology but also by social conditions of human activities. Thus, the polytechnic education of students develops in them a conscious and creative approach to their activities, primarily in the field of technology, enriches the area of their social relations and means of activities, and provides norms of conscious behavior, as well as a broad basis for choosing a profession related to material production. (7, 8) All this helps young people to define their place in social life according to their abilities, which is a condition for further shaping of a comprehensively developed personality. The implementation of the objectives in the multilevel system of polytechnic training provides for the definition of the pedagogical objective, i.e., the setting of goals and the selection of educational content adequate to the prospects of socio-economic, scientific, and technological development of a renewed society.

## 2 Materials and Methods

The analysis of numerous studies devoted to the problem of implementation of the polytechnic principle in the educational process of secondary schools gives a basis to outline the main theoretical and methodological provisions of the basics of polytechnic education, both in general and in view of the specifics of regional features of the process of socio-economic development of Kazakhstan. In this regard, the State program, which determines the main priorities of reforming country's schools and their integration into the world educational space, has been developed. Scientists reveal the social and economic importance of polytechnic education. P.R. Atutov notes that three factors or three categories were of primary importance:

- Economic category - the law of change in labor caused by the revolutionary nature of the large technological industrial businesses;
- Scientific-technological category - common polytechnic basics of different industries and industrial processes;
- Social category - the need to overcome professional unilateralism for shaping a comprehensively developed personality. (7, 9)

A comprehensive student's personality development based on student's inner potential and in accordance with the best cultural and historical traditions of society and technological achievements of humankind is the primary goal of education. It determines the main areas of modernization in education oriented not only to the student's mastery of a certain amount of knowledge but also to the development of the student's personality-related nature, his/her cognitive and creative abilities, his/her creative self-realization for the benefit of society and his/her personal benefit.

The new conditions of humankind's existence in the XXI century and the necessity to solve many problems including, first of all, socio-economic and ecological ones, require changes in the scale of priorities and moral values existing in the society at present. It is necessary to pay much more attention to the problem of moral education. Today there is an urgent need for a new philosophy of education that would be adequate not only to the already changed conditions of human existence in the modern social, economic and to the information environment but also to the new problems facing humanity. (10, 11)

The necessity of the comprehension of the problem of schoolchildren's polytechnic training at a new theoretical and methodological level is conditioned by the change of social and economic conditions of society's development. The following factors have placed greater emphasis on the problem of the harmonization of general educational, labor-related, and technological training of the young generation:

- The entry of the modern world community in the period of accelerated social, economic, scientific, technological, and cultural changes;
- The emergence of the post-industrial civilization, the hallmark of which is the universal and highly effective use of information and scientific knowledge as a creative force of society, its strategic resources, and factors of development;
- The subjects and results of labor, and, in turn, the responsibility of the education system in these conditions for the introduction of humans to the knowledge about the world of labor, the formation of their attitude to the world, the definition of their worldview and moral position in this world.

This implies a respective growth of theoretical knowledge and practical skills aimed at ensuring the effective use of modern technology. At present, the requirements for the content, methods, and organizational forms of labor and professional training of students are toughening. They are called upon to actively participate in accelerating the country's social and economic development based on scientific and technological progress. Its objectives cover a wide range of issues including the development of education. (11)

In areas of the economy not related to highly concentrated industries, scientific and technological progress is related to automation. Automation's fundamental element is microprocessors based on large integrated circuits. These are compact computing devices made with one or more semiconductor crystals and carrying out various functions of object control based on a tunable program. It can be a CNC machine, a car with an electronically controlled fuel supply, a washing machine with automatic sequence control, a pilot unit for scientific research functioning in accordance with the given program, etc.).

Competitiveness on the labor market must be ensured by the high quality of general education, economic, technological, and entrepreneurial training of young people whose systematic integration ensures the development of a person capable of working under market conditions and who is ready for the full and creative realization of his or her potential in the chosen professional activity. The level of training should ensure not only compliance with the level of technology development but also the ability to respond flexibly to the alternatives offered by society thus ensuring the stability of the educational system development. (12, 13)

## 3 Results and Discussion

In view of the scientific and pedagogical analysis of the theory and practice of polytechnic training in secondary comprehensive schools, the necessity to enhance the polytechnic training of pupils when studying the main areas of the scientific and technical progress at the present stage is shown. In recent years, two following aspects have become increasingly important in polytechnic education: socio-economic and environmental. The experience of working in the school reveals that more often teachers explain to pupils the major technical and economic problems of the national economy, and the social importance of modern scientific achievements along with studying technological units and areas of technological progress in certain industries. (13, 14) Thus, when studying the use of nuclear energy, the social significance of nuclear energy development, the importance of the integrated approach to design and construct hydraulic structures, and the problems of electric power transmission over ultra-long distances are shown. It can be shown especially brightly when studying nuclear physics by raising the topic of the use of particle accelerators, and tools used for registering elementary particles in computer engineering. It should be emphasized that such two-way communication between physics and technology is an important consequence of the scientific and technological revolution. Competition on the labor market, its multiplicity and instability, and possible unemployment impose increased requirements on school leavers related to their personal and business qualities, the

manifestation of independence and enterprise in professional self-determination and realization of their potential in the chosen professional activity.

One of the poorly solved problems of modern pedagogy is the construction of a structure of general education that would be able to ensure broad functional literacy and professional mobility of an individual. Technological culture can be regarded as an integrative parameter for the professional mobility of future industrial workers. It is an essential element of working culture and has a structurally formative status in a complex and dynamic system. One who possesses technological culture is a creative person with developed creative, communicative, social, research-related, information-related, cultural, and general professional skills. (15, 16) He or she is able to think and act unusually. Since the qualitative indicators of human labor are ultimately determined by the culture development level, when mastering technological culture, high school students have the following functions proper to such a culture:

- The general knowledge building;
- The transfer of knowledge and skills from one area to another;
- Aesthetic approach to the students' activities;
- The development of demand for one's own work;
- Flexibility in thinking, the ability to improvise.

At physics lessons, schoolchildren are introduced to the most important areas of scientific and technical progress, to the principles of operation of objects in modern technology, get an explanation of the basics of some labor processes; gain many practical skills and abilities necessary for work. The definition of technical objects (techniques, technological processes, and materials) for the familiarization of students with them during polytechnic training is made in view of the analysis of the tendencies of development of modern industries, and, first of all, mechanical engineering (including machine manufacturing, electrical engineering, instrumentation, etc.). With this regard, it is necessary to consider the following areas of development of mechanical engineering:

- The maintenance of the required quality of production;
- Reduced production cost;
- Increased level of labor productivity;
- The achievement of high accuracy of processing (including working out of new kinds of cutting tools);
- The search of low- and non-waste technologies, working out of respective techniques (including powder metallurgy, processing by pressure, electrophysical and electrochemical methods of processing);
- Reduction of human labor costs, the economical use of human resources (integrated mechanization and automation of industrial processes based on the use of microprocessor technology, robotic systems, the creation of flexible automated processes, improvement of the ergonomic performance of equipment). (17)

An important application of physical research is to obtain new materials. A decisive role in the creation of materials with predetermined properties is played by physical methods of exposure to matter including electronic, ionic, ultrasonic, and laser beams; ultra-high pressures and temperatures; ultra-strong magnetic fields. Great importance is attached in Kazakhstan to the automation of industries that transforms jobs and helps to make labor more productive, creative, and attractive. The modern stage of automation is based on the revolution in electronic and computing equipment, on the development of electronics in the national economy that has taken place thanks to the achievements of solid-state physics, radio-electronics and other sections of modern physics.

Thus, physical research enables further development and qualitative transformation of productive forces, creation of new types of equipment, materials, and technologies. The constant increase of science contribution to industries is the main condition for further economic and social development of Kazakhstan. (18, 19) The content of schoolchildren's

polytechnic training based on personality-centered and activity-oriented approaches comprehensively and multidimensionally reflects the industrial activities with a leading role of humanitarian, social, environmental, and other factors, and includes worldview-related scientific, technological, economic, environmental, and creative readiness. Such an approach is essentially an achievement of the content of polytechnic training regarding new world-view positions since the acquaintance with the process of expanding its activities and influence on human nature is aimed at overcoming the anthropo-egocentrism in the subject-related activity of students. This provides for the formation of students' personal qualities that give them the opportunity to work successfully in the new conditions of management, a deep understanding of the public importance of work, its creative nature, the desire to increase its productivity. The educational system faces an extremely complex task - to ensure a constant adaptation of a person to changes in the world around him or her. Technological education plays a significant role in the implementation of these objectives of comprehensive schools. To reveal the mechanisms of development and functioning of the process of students' technological training as a system, it is necessary to highlight the system-forming basics of the numerous subsystems in which the shaping of personality takes place. (19, 20)

One of the most important generalized tasks of students' technological training is the development of their technological thinking in its modern understanding as synthetic and integrating the characteristic features of modern technical, economic, environmental, and humanitarian thinking. Such thinking provides the ability of a functional approach to technical phenomena, the ability to synthesize various knowledge in solving complex practical problems, the ability to see and evaluate production phenomena in all their versatility and complexity of their components, factors affecting them, and the ability to see and understand their place in the system "society - nature". With this regard, the most justified are those innovative models of learning, in which the learner is considered not only as of the actor mastering an academic subject but also as an actor changing the very foundations of subject-related activities, that is, as the creator of new norms, relationships, and values. Thus, technological education at school is designed to contribute to the harmonization of personal abilities and aspirations with social needs and interests.

#### 4 Conclusion

The demands of life dictate the need to study industrial issues at a new qualitative level. Students' knowledge of industries should include basic provisions on the strategic line of the state and government to accelerate the socio-economic development of the country. (19) It means that schoolchildren should be familiarized with the main areas of scientific, technological, and organizational renewal of industries, with economic aspects of industries, with the issues of increasing the quality of production, labor productivity, saving of natural resources, and integrated use of raw materials, i.e. with the main ways of industrial intensification.

Thus, at the lessons of natural sciences students receive polytechnic training and are introduced to different types of labor activities of people, which helps them to choose the right future profession. The scientific and theoretical level of school subjects is being raised, the systematization of training courses is being enhanced, the polytechnic orientation of secondary education is being deepened, the distribution of teaching material by class is being optimized, inter-subject relations are becoming closer, the content of programs and textbooks is being coordinated and the necessary methods are being developed. Thus, new opportunities open up for teachers who want their work to meet better social, scientific, and technical progress, and life requirements.



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**Primary Paper Section: A**

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## TRAINING OF COMPETENT TEACHERS IN HIGHER EDUCATION INSTITUTIONS OF KAZAKHSTAN

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**Abstract:** The article deals with the content and structure of the social and professional competence of a teacher. The concepts of competence and skill, social competence, and professional competence are analyzed from different points of view. The methodology of developing and implementing the training course for competent teachers is given. Specific examples of training a competent graduate teacher in higher education institutions are given.

**Keywords:** competence, ability, social competence, professional competence, competent university graduate.

### 1 Introduction

The updated education system requires the training of competitive personnel, who are ready to solve social and professional problems theoretically and practically, who are able to create, apply, and interpret the system of professional activities. The main result of an educational institution should be not skills, but key competencies in various fields.

One of the important problems today is the insufficient professionalism of teachers. Therefore, the improvement of training of competent teachers should become one of the priorities in the development of education in Kazakhstan, which will enable them to carry out professional activities at a high level successfully.

A competent pedagogue must be able to quickly and adequately understand the statements of others, possess complex communication skills and abilities, have certain knowledge about the diversity of social roles and ways of interaction. The effectiveness of a teacher-psychologist's activity depends, first of all, on his/her ability to work with people, on the ability to listen, to empathize with others through the ability of productive behavior in difficult situations. It is difficult to do if he/she does not have developed social competence.

#### 1.1 Purpose of the Research

The relevance of the topic is also conditioned by the fact that social competence, as a professionally necessary quality of a teacher, is the main component of his/her professional competence. (1) John Raven (2) and Kharitonova (3) defines the concept of "competence" as a specific ability necessary for the effective performance of a specific action in the subject area and understanding of responsibility for one's actions.

The Encyclopedic Dictionary provides the following definition of competence - "the range of issues in which a person has knowledge and experience." (4) Another dictionary defines competence as "knowledge of a certain circle of issues, a certain field of knowledge." (5) The explanatory dictionary edited by D.I. Ushakov deepens the concept as "a range of issues and phenomena in which a person has authority, knowledge, experience, and a range of competencies." (6)

When studying scientific research, we propose the following definition of competence - it is a dynamic unity of knowledge and skills to apply in a certain context, attitudes, and relations; the results of learning at the level of a single discipline or module. It follows that competence is formed on the basis of knowledge and skills.

"Skill" as a term is also interpreted differently, for example, as "preparedness for practical and theoretical actions performed quickly, accurately, consciously, on the basis of learned knowledge and life experience. It is formed by exercises and creates the possibility of performing an action not only in habitual but also in changed conditions" (7), or as "the mastery of the ways to put the learned knowledge into practice." (8)

Proceeding from different judgments, we conclude that skill is 1) a category of activity; 2) ability to conduct purposeful activities; 3) quality of activities. (9)

### 2 Materials and Methods

In scientific works, skill is divided into different types: educational, computer, mental, creative, research-related, professionally-oriented, labor-related, household-related, sportive, etc. The Kazakhstani scientists classify the teaching skills as follows:

- Educational computer skills (K. Aganina);
- Self-study skills (A. Arenova);
- Research-related skills (N.G. Daumov);
- Skills related to the computer-based analysis of information analysis (A. Amirbekov);
- Students' self-study skills (N. Zhamankulova);
- Professional and methodical skills of future teachers (M.A. Kudaikulov);
- Professional and pedagogical skills of a teacher related to the implementation of inter-subject communication (O. Musabekov);
- General educational skills of students (O. Salimbayev).

Table 1. Classification of Educational Skills

Y.K. Babansky	N.A. Loshkareva	S.K. Nasharipova	T. Sabyrov	T.I. Shamova	A.V. Usova
Learning and organizational skill; Learning and informational skill; Mindful skill	Learning and organizational skill; Mindful skill; Academic communicability; Learning and informational skill	1) Theoretical and laboratory-based skill (by activity type); 2) Subject-related and specific skill (in terms of subject-related content); 3) Simple, complex, and generalized skill (by increasing in complexity); 4) Primary,	1) Ability to read, write, use numeracy, and work with literature; 2) Working and tooling skill; 3) Sports skill	Interest in learning; Learning and communication skill; Learning and informational skill (work with literature)	Cognitive skill; Laboratory-based skill; Planning, self-monitoring, evaluation

		secondary, supportive, and basic skill (in accordance with the chain of formation); 5) Limited, ample, and general skill (by activity transfer); 6) Perception, memory, and reason (by nature of mental processes)			
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If a person has learning skills and aims to be a good teacher, he or she naturally develop professional competence in a teacher training institution.

The following types of professional competence in I. Shakhmalova's research are distinguished:

- Special competence is the ability to design one's own professional development;
- Social competence is the possession of methods and ways of professional communication, the responsibility for the results of one's own activities;
- Personality-related competence is the mastery of the methods of self-development;
- Individual competence is the mastery of the methods of individuality development, readiness for professional growth, the ability to organize one's own work effectively. (10)

A.K. Markova describes social competence as a kind of professional competence. According to her, social competence is "the possession of joint (group, cooperative) professional activity, cooperation, as well as the methods of professional communication accepted in the profession; the social responsibility for the results of one's work." (11)

In modern Western social psychology, social competence is defined as the ability to achieve one's own goals in the process of interacting with others and maintain good relations with them in any situation. (12) This concept is concretized as the adequacy and efficiency of solving various problem situations faced by a person in society. (13)

A.Y. Petrov considers social competence as a component of the professional competence of a teacher ensuring an individual's realization of different social positions, significant for every modern person. (14)

When investigating the problems of schoolchildren's social competence development, N.V. Kalinina (15) comes to the definition of social competence as an integrative personal education. According to her, social competence is a united system of a person's knowledge of society and oneself, and behavioral skills in society, as well as relations, manifested in personality-related qualities, motivations, and value orientations that enables integrating internal and external resources to achieve socially significant goals and solve problems.

When comparing the authors' presentation of the point of view on what should be the structure of social competence, we could not fail to note their full or partial coincidence, while the number of structural components may differ due to the enlargement of units, and the terminology may be synonymous.

The employers putting forward the mastery of social competence as one of the requirements for an educator are guided by the fact that the range of his/her job duties is not limited to the subject of professional activity but includes a wide organizational and social aspects. The opinion of employers and professional society is reflected in professional educational standards.

**3 Results and Discussion**

Higher education institutions (hereinafter referred to as HEIs) attempt to create the conditions for the formation and development of professional and social competence of students - future teachers. The social competence of a personality occupies a special place among the key competencies of a modern young person. It is competence, which provides personal comfort, professional demand, and success in all spheres of life.

The studies of the methodology of shaping professional and social competence of future teachers, the cycle of training for competent graduates was developed and adapted (Figure 1).

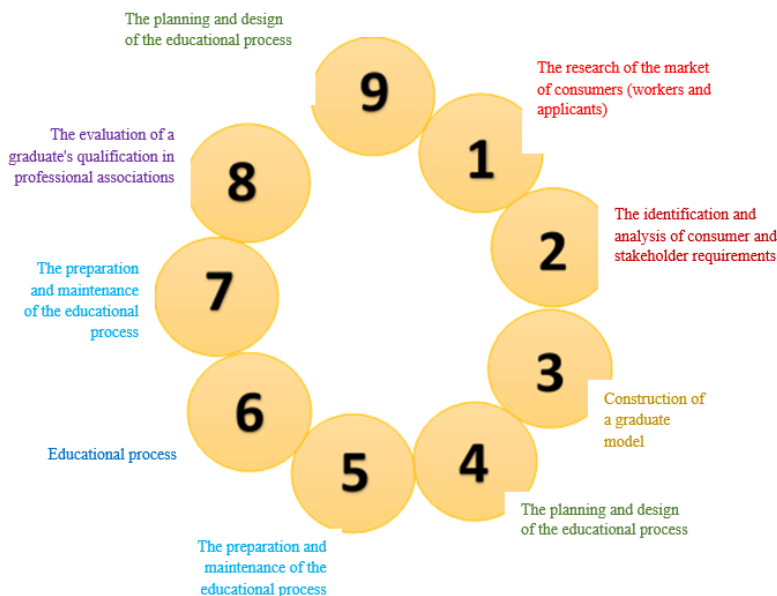


Figure 1. The Cycle of Training for Competent Graduates

The cycle of training for competent graduates includes:

1. The research of the market of consumers (workers and applicants). For this purpose, the need for teachers in a region is studied. In this case, we studied West-Kazakhstan, Atyrau and Aktobe regions. According to the data of regional departments of education for the last five years, all regions need teachers of Russian language and literature (about 90%), mathematics, physics, and chemistry (about 70-80%). In the West-Kazakhstan region, the need for teachers of Kazakh language and literature (up to 10%) is very insignificant. In this connection, state grants

are allocated annually for demanded specialties. The analysis of data reveals the number of requested and allocated grants.

2. The identification and analysis of consumer and stakeholder requirements. Educational institutions have a council of employers, an association of graduates and a council on academic programs. These bodies discuss the issues related to the training of future staff. Many members of these bodies are social partnership enterprises.

3. Construction of a graduate model. There are different graduate models. Below is one of them (Fig. 2). (16)

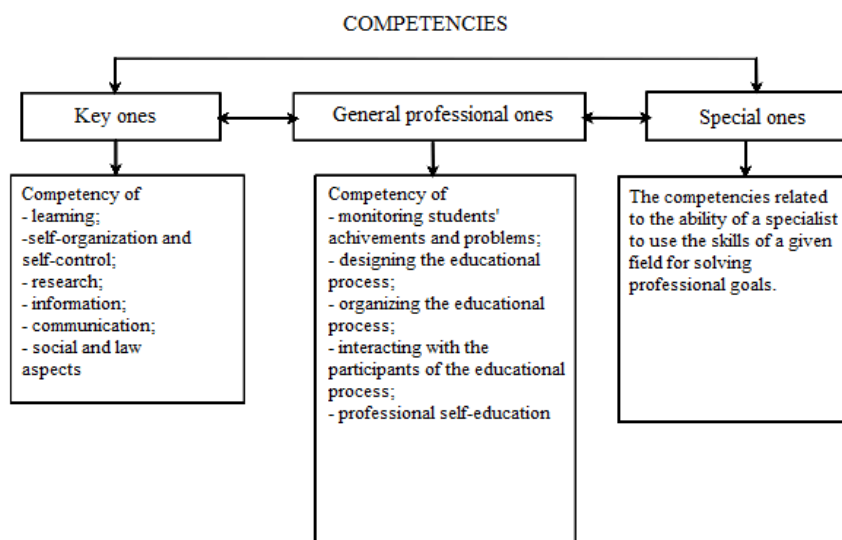


Figure 2. Competence-based Graduate Model for a Pedagogical HEI

The graduate competence-based model we have developed describes:

- The objectives of education according to the curriculum;
- The list of qualifications and positions that a graduate can occupy according to the Typical Job Qualifications;
- The qualification characteristics of a graduate according to the curriculum;
- Areas of professional activity;
- The object and subject of professional activity;
- Types and functions of professional activity;
- Standard objectives of the professional activity (by fields);
- Professional activity content;
- The requirements for the key and special competences of a graduate.

At the design and development stage, the graduate model is agreed upon with employers and representatives of business entities.

4. The planning and design of the educational process. As it is noted in the Strategy "Kazakhstan-2050", it is necessary to get rid of outdated or unclaimed scientific and educational disciplines and to improve the demanded and perspective areas. It is necessary to change a line of actions and emphasis on higher education curricula by including programs for practical training and obtaining a practical qualification. It is necessary to enshrine obligatory on-the-job training at enterprises since the second study year in a higher education institution. At present, the planning of the educational process is carried out at each higher education institution independently in view of the market demand. Innovative methods including distance learning and online training have been introduced in the national education system. (17)

5. The preparation and maintenance of the educational process. The educational process is implemented via a modular

curriculum. The design and implementation of the professional curriculum imply that the partner company is interested in training personnel oriented and specialized in the activities of an enterprise, its equipment, and technology. Therefore, the partner enterprise is actively involved in the development of educational and methodical documentation, provides practical training of students, and provides assistance in the attendance of professional practical training. The service system for digital training "Platonus" is implemented and provides an opportunity to improve the quality of personnel training.

6. Educational process. School education should be designed so that graduates could set and achieve serious goals on their own, and react skillfully to different life situations - this is the task set for teachers. (18) Therefore, pedagogical HEI graduates should be able to organize the learning process effectively. For this purpose, HEI classes are conducted with the use of innovative methods. Under the partnership program, lecturers from the Institute for Advanced Teacher Training teach methodical disciplines. Under the dual education program, students learn practical classes on how to teach discipline at school, directly under the supervision of practicing teachers. This gives results. Graduates are free to work with students and, given their personal qualities, respond to their wishes.

7. Additional specialized courses. Additional courses are organized at an HEI. For example, the management of M. Utemisov West-Kazakhstan State University invited foreign scientists to teach English to students and teachers because the discipline "Information and Communication Technology" (5 credits) is instructed in English in all HEIs. In addition, some disciplines of the basic component are instructed in English. Moreover, there are courses in management, defectology, and robotics. Various scientific and methodological seminars are often held.

8. The evaluation of a graduate's qualification in professional associations. For example, the indicator of the quality of passing the final exam in pedagogy and discipline teaching methods in 2017 was 75%, in 2018 - 82%, in 2019 - 85%. This indicator is reflected during the evaluation of theoretical and practical skills in professional associations.

9. A competency-based knowledge assessment system was developed. It includes the goals and objectives of the educational program (description of expected qualifications and level of knowledge of graduates); results of training at the program level.

#### 4 Conclusion

In view of the above, we can say that social and professional competence is an integrative quality of a person, which gives him/her an opportunity to live his/her life in society successfully and combine his/her own positions and interests with the positions and interests of other members of society harmoniously and effectively.

Professional competence of a teacher is manifested in his/her relationships with others, in rapid social and professional adaptation, cooperation, healthy lifestyle, success in basic activities, and the responsibility for his/her present and future. Possession of social competence will contribute to successful professional activities and career growth of a graduate.

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## INNOVATIVE APPROACHES TO THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION IN HIGH SCHOOL

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**Abstract:** The article is devoted to the formation of a person with a high level of ecological culture, the components of which are a new environmental consciousness, ecological thinking, ecological worldview. This article reveals innovative approaches to the development of environmental education in modern high school. The paper considers the problems of environmental education in a modern secondary school by the objectives of general education in the conditions of innovative technologies. In the work, based on the scientific and pedagogical analysis of the relevant literature and normative documentation on the problem under study, didactic stages and directions of modernization of environmental education at the present stage in the conditions of innovative development of modern society are identified and justified.

**Keywords:** environmental issues, scientific and technological progress, environment, human health, environmental education.

### 1 Introduction

The modern natural-scientific picture of the world is unthinkable without a reflection of environmental problems. Today, the interaction of society and nature due to the emergence of new fields of science, technology, production and expand the scope of people's work influence on the world has become so small that the human intrusion into nature cannot be chaotic and limitless. The current environmental situation requires a change in the attitude of society and man towards environmental problems. (1) Therefore, environmental upbringing and education are important in education. The main task of environmental education is to equip students with a certain amount of specialized knowledge and skills necessary for life and work. Ecological education of schoolchildren and professional environmental training of future specialists, undoubtedly, occupy the most important place and play a special role in the formation of environmental awareness and environmental culture. (2-3) Today, in the context of social reform, a difficult socio-economic situation, the pace, and direction of the country's future development are largely provided by the person's potential capabilities and his health. The state of people's health is not only an important indicator of social development but also a powerful economic, labor, defense and cultural potential. Currently, environmental education and upbringing in general. Without environmental education, the formation of environmental awareness is impossible. Environmental education and upbringing as factors of social, economic and moral development of society. Therefore, the following elements should be included in the content of school education: a system of knowledge about the interaction of society and nature, value environmental orientation, a system of norms and rules of attitude to nature, and skills for its study and protection. (4-6) The study of the physical aspects of environmental education leads to a deep and lasting assimilation

of educational material, full environmental training of students and their professional orientation; the ability to use knowledge to actively protect the environment; deepening and expanding students' knowledge of physics; strengthening the environmental focus in order to more effectively prepare students for participation in the development of a new direction of scientific and technological progress, which is extremely important for improving educational progress. The analysis shows that the scientific knowledge studied at school performs not only cognitive, worldview, but also ecological functions. At present, students of a comprehensive school receive knowledge on engineering and technology, economics, and the organization of production in various ways that make up the system of environmental training in secondary schools. (4,7) An obstacle in this direction is the lack of modern educational and intellectual resources caused by the unsatisfactory state of modern science. The enrichment of the methodological basis of environmental education is especially important: the use of innovative methods of communication in the learning process, the use of new information technologies with the use of computer programs, interactive video, eco-monitoring, modeling of environmental processes and many others. From the above, the following main problems of school environmental education can be distinguished: there is no system of continuous environmental education; few practical lessons in ecology, as a result of the lack of ecology hours in the curriculum; there is a shortage of material resources: there is no appropriate equipment, materials for organizing practical work within the classroom system; insufficient theoretical and practical preparedness of teachers for environmental education.

#### 1.1 Purpose of the study

The formation of environmental knowledge and skills necessary to understand the processes occurring in the "man-society-technology-nature" system, to contribute to the solution of socio-environmental problems in modern society. Environmental education is a continuous process of training, education and personal development, aimed at the formation of a system of knowledge and skills, value orientations, moral and ethical and aesthetic relations that ensure the environmental responsibility of the individual for the state and improvement of the social environment. (4,8) The goal of environmental education is the formation of a new type of person with new ecological thinking, able to realize the consequences of their actions concerning the environment and able to live in relative harmony with nature.

Theoretical aspects of environmental education and upbringing are developed by scientists such as I.D. Zverev, A.N. Zahleby, B.G. Johansen, N.A. Rykov, I.T. Suraveginova, A.P. Sidelkovsky, E.S. Slastenina, S.N. Glazachev, N.D. Andreeva, N.P. Nesgovorova, T.M. Nosovoy, A.V. Mironov, A.V. Afonin, E.H. Dzyatkovskaya, D.S. Ermakov, G.A. Yagodin, and others. Currently, the following main components of environmental education are known in science such as scientific, normative, value, creative. (5,9) A significant role in solving environmental problems should be played by environmental education and enlightenment, the conceptual basis of which should be considered the concept of sustainable development of civilization. The solution of environmental problems is possible only if a new type of environmental culture is created, greening education by the urgent needs of the individual and civil society.

The scientific novelty of the work is as follows:

- socio-economic and pedagogical principles that determine the main role of environmental education in the development of practical training of students in high school are defined;
- innovative approaches to organizational forms and methods have been developed that ensure the effectiveness of environmental education in modern society;

- the system of students' environmental knowledge and skills was substantiated when studying the course of electrodynamics in high school at the present stage.

The practical significance of the work lies in the fact that on its basis the educational and methodological materials were developed and introduced into the practice of secondary schools in the western region of the Republic of Kazakhstan on the formation of environmental knowledge and skills of secondary school students in the process of teaching a general physics course. The practical implementation of the system developed by the authors for the formation of environmental knowledge and skills of secondary school students has contributed to increasing the effectiveness of this process. The environmental problems of our time, as you know, are becoming extremely acute and global, and today's younger generation will have to solve them, in connection with which it is necessary to form in schoolchildren a conscious caring attitude to the world around us. The need for environmental education is determined by the need to provide a favorable environment for human life since the destruction of the system of environmental relations and the lack of responsibility to future generations are one of the components of the crisis

environmental situation. (5,10) Currently, in the conditions of the ecological crisis, awareness of the state of the environment, knowledge of the laws of nature, the ability to put them into practice is the basis of school environmental education.

**2 Materials and Methods**

The greening of the education system is a characteristic of the trend of the penetration of environmental ideas, concepts, principles, approaches into other disciplines, as well as the training of ecologically competent specialists of various profiles. An effective system of environmental education is one of the main tools for ensuring sustainable development of the economy and society. The environmental education system is a combination of necessary and interacting organizational forms that implements the goals and objectives of continuous environmental education in the general education and upbringing system. (11-12) It includes the infrastructure of environmental education, management, staffing, legal regulation, scientific, methodological and economic component. The described system of environmental education was reflected in Figure 1.

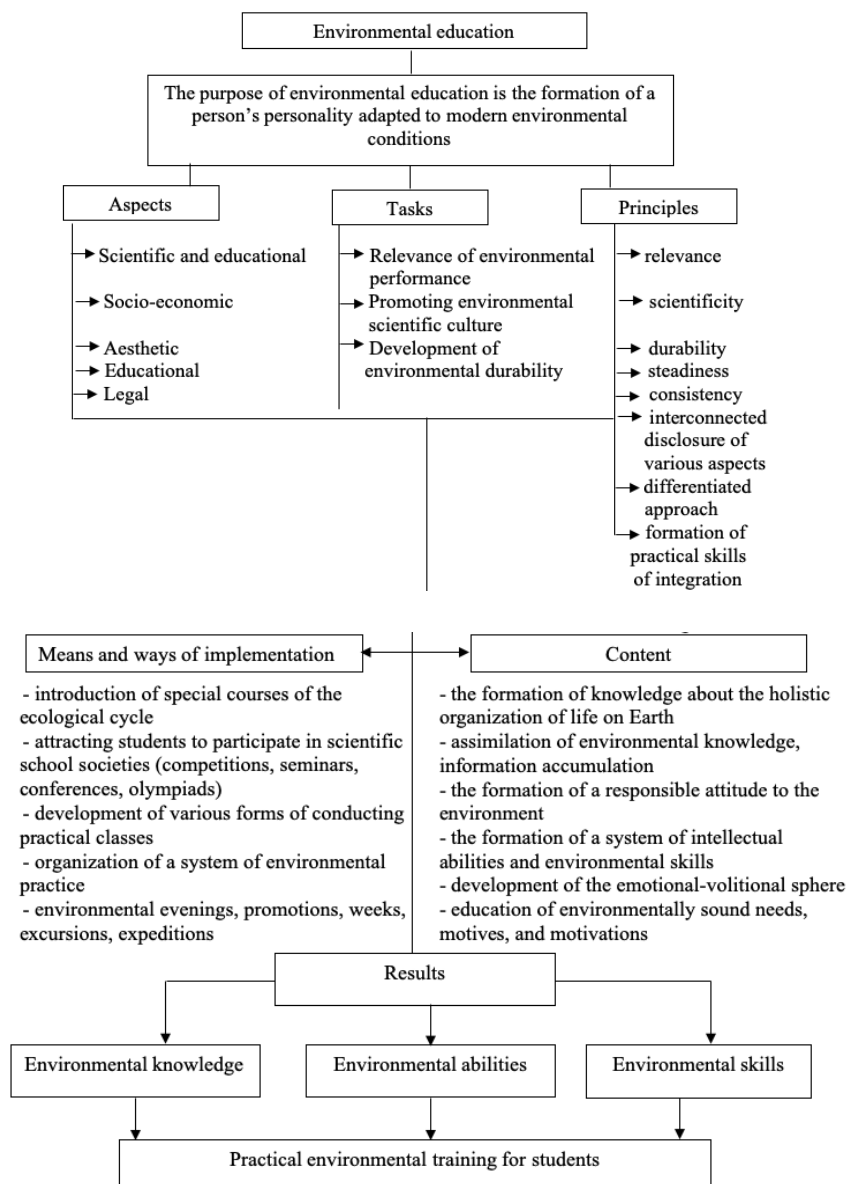


Figure 1. Environmental Education System in High School

The success of environmental education and training depends on the use of various forms of work, their reasonable combination. It should be noted that environmental education requires an indispensable combination of cognitive and practical activities, a change in the methods of scientific, ethical, aesthetic, and practical development of not only nature itself, but how much a person has a real relationship to it in concrete affairs and behavior.

The forms of environmental work at school can be different:

- research (compilation of an environmental passport of the school, issuing an environmental bulletin, studying the composition of air, water, soil, etc.)
- competitive (exhibitions of posters, drawings, conducting environmental competitions, etc.);
- gaming (eco-case, eco-casino, eco-boomerang, etc.);
- cognitive (lecture lessons, seminar lessons, round tables, analysis of scientific literature, debates, tours, trips, etc.);
- productive (planting flowers, trees, landscaping school recreation, etc.). (1,13-14)

Moreover, the innovative method, the method of environmental projects is the most effective in the environmental education of schoolchildren, which is based on the development and improvement of cognitive skills and critical thinking techniques of students, the ability to independently construct their knowledge, search, select and systematize the necessary information, navigate in the ecological space. Project technology is one of the innovative technologies of training and education that ensures the formation of environmental competencies. The application of the method of environmental projects creates an innovative activity, practical development, creative and research environment, which helps to increase the motivation of educational activities, which takes on a problematic research focus. This is the dominant factor in the process of acquiring environmental knowledge by students, the skills of independent research work, the acquisition of new experience - environmental search and advanced design, as a result of which environmental competencies are formed:

- social, involving the formation of the ability to take part in decision-making related to the protection of the environment, to assume environmental responsibility;
- informational, expressed in the ability to use different sources of information and process them;
- communicative, expressed in the ability to acquire new environmental knowledge throughout life and the ability to convey it to others in an accessible form for them. (8,15)

The use of innovative technologies makes it possible to study environmental problems, anthropogenic impact on nature in an interesting and accessible way through a practice-oriented approach, and also activate students' creative abilities, develop memory, critical thinking and ingenuity. Applicable to environmental education, this circumstance makes it possible to simulate real natural and life situations in a certain information environment. Information technology, being inherently a system of teaching methods that provide optimal and effective perception, assimilation and use of educational information in an interactive mode, is most suitable for solving educational and upbringing tasks of environmental education.

One of the innovative technologies is the case technology. Case technology is an analysis of a situation or a specific case, a business game. Its main purpose is to develop the ability to analyze various problems and find their solutions, as well as the ability to work with information.

Computer technology and multimedia presentations. Information and computer technologies are firmly included in the system of environmental education, are widely used to improve and update forms and methods of working with students.

The innovative technologies that we use in educational and design research activities positively affect the quality of training and education, contribute to the formation of key competencies of students and also increase the professional level of a teacher. (13,16) In the course of the experimental work at the lessons, information and communication, training, design, game, interactive technologies, problem education were used. But to teach a schoolboy ecology only in lessons is impossible. Other forms and methods of work are needed such as classes in a circle, field trips, extra-curricular activities. And also, interactive forms of education such as quizzes, conversations, role-playing games, projects, discussions, disputes, environmental evenings, performances, poetry evenings about the beauty of nature, poetry contests, etc.

The introduction of ecologization in the educational process ensures the development, a high level of schoolchildren's efficiency, and the high efficiency of the educational process. Environmental knowledge is necessary to improve the educational process itself: to form a holistic picture of the world, ideas about the interaction of society and nature under the conditions of scientific-technological progress, deep and lasting assimilation of program material, full environmental training of students and their professional orientation. Acquaintance with the greening of engineering and technology allows us to deepen our understanding of the development of fundamentally new areas of scientific-technological progress. (17-18) To solve the environmental problem, orientation is also required by the objective logic of the technical development of nature towards creating the necessary scientific basis for harmonizing human technical activity with processes in the natural environment, and for managing natural factors. In this case, the organic relationship of technical objects and the environment should be considered. Currently, human life and activity are not possible without the use of various technical means. And all of them, as you know, are sources of electromagnetic radiation. The most harmful are high-frequency radiation of the centimeter range. Mobile communications are still operating at the very beginning of this range, but the operating frequency is constantly increasing. First of all, irradiation causes changes, and even damage to tissues and organs. The mechanism of energy absorption is quite complicated. The action of electromagnetic fields on the human body is manifested in a functional disorder of the central nervous system. Subjective sensations, in this case, are increased fatigue, drowsiness, or, conversely, sleep disturbance, headaches, etc. With systematic exposure, persistent neuropsychiatric diseases, changes in blood pressure, and slow heart rate are observed. (7,14) Lasers or optical quantum generators (OCG), are currently widely used in various industries to perform technological operations such as welding, cutting, drilling holes in materials of any strength, as well as for performing measurement and control operations. OCG emission can cause a variety of general functional disorders, manifested in increased irritability, fatigue, sleep disturbance, severity and pain in the eyes. The radiation of OCG in the visible spectrum has a more pronounced local and general effect, causing changes in the function of vision, especially in low light. The most common in everyday life is a low-frequency (50Hz) alternating magnetic field. In descending order of danger to human health, household appliances can be arranged as follows: microwave, electric stove, TV, washing machine, refrigerator, electric shaver, iron, electric kettle.

A special role in the assimilation of environmental knowledge by students was assigned to the principle of polytechnical education. All issues that reveal the physical aspect of nature conservation and its rational use included the technical application of physical ideas as well as consideration of one of the main requirements for the current technology - its environmental friendliness. (3,14,19) The content of environmental material in the physics course is shown in Table 1.



Table 1. The System of Environmental Knowledge Formed in the Course of Electrodynamics

Section, the topic of the course	Environmental Knowledge Content	Forms and methods for the formation of environmental knowledge
Electric field	The effect of the electric field on human health and other living organisms. A decrease in the electric charge of the Earth, a change in its magnetic field. The electric field in the atmosphere.	Conducting a heuristic conversation. Student assignments: study the effects of electrostatics on human health.
The flow of direct current	The value of static electricity in nature, technology, and everyday life. Electric lighting.	Project protection. Solving problems with environmental content.
The electric current in electrolytes	Sources of pollution, wastewater treatment methods. Ecological problems of energy. Electrification of technological processes.	Story. Demonstration of the action of the electroflotation method of water purification. Computer modeling.
The electric current in gases	Ionization of air. Ecological energy converters. The gas composition of the atmosphere. MHD generator.	Lecture. Interactive technology. Training. Demonstration of gas ionization. The solution of experimental problems.
The electric current in semiconductors	Using the energy of the Sun. Environmental friendliness of the energy of the Sun, its use.	Conversation. Independent work with popular science literature. Performing creative tasks.
Magnetic field. The magnetic properties of the substance	Magnetic field and living organisms. Vortex electric field and its effect on a living organism. Earth's magnetic field. Methods of wastewater treatment from impurities.	Demonstration of the principle of magnetic separation. Case technology. To prepare an essay on the theme "Living organisms in an electromagnetic field".
Electromagnetic radiation. Electromagnetic field	The effect of electromagnetic waves on a living organism. Radio waves and man. High-intensity electromagnetic field. Narrowband electromagnetic radiation.	Conference on the topic "Electromagnetic field". Demonstration of a training video. Multimedia presentation.
Electromagnetic waves	The impact of electromagnetic waves on human health and living organisms. Electromagnetic radiation. Increased radiation. Protection against electromagnetic radiation. The impact of power plants on the environment.	Protection of projects on the topics "Electromagnetic radiation and ecology", "Electromagnetic fields of cell phones", "Electromagnetic fields of household appliances", "Electromagnetic fields of a personal computer monitor".

When determining the content of environmental and nature-oriented knowledge, we proceeded from the fact that:

- their volume should include the minimum number of concepts specific to these sciences that ensure that students realize the social significance of this idea;
- the introduction of selected environmental and nature-oriented knowledge should not violate the existing system of physical knowledge;
- environmental and nature-oriented knowledge to be assimilated must meet the principles of science and accessibility.

### 3 Results and Discussion

In the course of the study, it turned out that at the first stage of the formation of environmental beliefs, it is most advisable to use information-communicative methods such as a story, a heuristic conversation, a demonstration experiment, and problem-solving. When consolidating environmental knowledge at the second stage, the most effective were conversations of a problem-generalizing nature, working with government documents, lessons - conferences, seminars, thematic evenings.

The environmental knowledge system has certain specifics. This knowledge is formed as a result of the establishment of causal relationships between natural science, special and technical concepts in close connection with the system of moral standards of attitude to the environment accepted in society.

In order to identify the level of knowledge and skills in the educational process in both experimental and control classes, verification work was carried out. At the same time, students' answers were divided into three categories according to the levels of knowledge and skills such as low, medium and high. (20-21)

The levels of ecological preparation of students in the process of studying physics are presented in the form of Table 1. Table 1 shows a comparative characteristic of quantitative indicators of the levels of formedness of environmental knowledge and skills of students in experimental and control classes.

As can be seen from Table 2, the number of students with a low level of formedness of environmental knowledge and skills in experimental classes is 3 times less than in control classes; 85% of students in experimental classes showed medium and high levels, and 52% in control classes.

Table 2. The Level of Formedness of Environmental Knowledge and Skills

Class	Experimental		Control	
	Number of students	%	Number of students	%
High	237	28	109	13
Medium	483	57	324	39
Low	127	15	399	48
Total	847	100.0	832	100.0

The obtained levels of knowledge and skills formation show that there was an increase in the knowledge of students in experimental classes at all three levels compared with the results of a stating experiment.

The data presented indicate that the level of environmental knowledge and skills in the experimental classes increased by an average of 16% compared with the control class. The results obtained in the experimental classes in comparison with the results of the control classes prove the effectiveness of introducing ecologization into the educational process of the various forms of work that we offer.

#### 4 Conclusion

Environmental education is a continuous process of training, self-education of a person, accumulation of experience, during which the development of the personality itself takes place, as value orientations are formed based on special knowledge gained on environmental protection and nature management, which become the content of norms of behavior in everyday life. Besides, environmental knowledge allows you to make a much safer and healthier life, and not only your own, but also those around you.

As shown by the study and pilot work, environmental education and upbringing of schoolchildren in the process of teaching physics develop some environmental skills, helps to understand the interconnectedness, interdependence, and integrity of phenomena and processes that occur in the biosphere.

The systematic application of the various forms of work of environmental education that we offer increases the general level

of environmental knowledge and skills arouses interest in studying the physics course and the quality of its teaching at the present stage.

Thus, environmental education can be considered as a necessary element of the general secondary education of youth associated with its mastery of the scientific foundations of the interaction of nature and society. At the same time, environmental knowledge acts as a link between the theoretical information acquired at school and practice, life.

In the future, work on the study of environmental education of students in the learning process can be carried out in the following areas:

- modernization of the system of organizational and pedagogical support of environmental education, considering the study of innovative technologies;
- improving the environmental training of teachers in modern society.

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## INNOVATIVE ACTIVITY OF PERSONALITY

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**Abstract:** The authors of this article carried out a theoretical analysis of two approaches to the study of the innovative activity of the individual (behavioral and organizational). Two forms of innovative activity of a person are considered: behavior and activity. The main foreign and domestic research schools on the problem of innovative activity of the individual are highlighted. The following are the basic psychological mechanisms of innovative activity of a person such as locus of control, identification, dynamic balance.

**Keywords:** behavior, dynamic balance, activity, innovative activity of a person, identification.

### 1 Introduction

The modern idea of nature, sources, forms and types, content and mechanisms, formation and manifestations of human activity is based on an analysis of the results of theoretical and experimental studies of problems of behavior and activity.

The main difference between activity and behavior is the presence of a specific goal that the subject faces. It is the presence of a motive that distinguishes such activity and makes it unique. Activity is a system of targeted actions that are subordinate to each other, have a motive, subject, and means.

Besides, the creature's behavior can only be external, while activity can also be internal (thinking, scientific work). Manifestations of activity types also differ.

Behavior is always aimed at satisfying biological needs, and activity is also at fulfilling socio-cultural needs. In science, there is an opinion that it was they who predetermined the development of man and had a significant impact on him.

Activity is the dominant type of activity in people, while the behavior is more characteristic of other living beings that are not endowed with consciousness. There are certain similarities between these categories. So, both behavior and activity are aimed at changing the initial matter, the implementation of certain tasks, the solution of which is very important for the subject of activity.

Thus, the difference between activity and behavior is as follows:

- Awareness. Human activity is always conscious, while the behavior is spontaneous and acts as a reaction to stimuli.
- Levels. Human activity is internal and external, behavior - only external.
- Motivation. Activity is focused, while the behavior may be devoid of any purpose.
- Manifestation. The behavior of a living creature is expressed in a single act, a response to an irritant. An activity is an organized system led by a specific goal.
- Stimulus. The basic need for behavior is the presence of internal needs, that is, instincts. Activities can also be determined by cultural, social needs.

Activity is an integral property and condition of any living organism, including humans. Without activity, a person cannot exist either as a biological being or as a member of society. So, the representatives of the activity approach consider the phenomenon of activity through the prism of the problem of

activity. So, A.N. Leontyev (1) considers the activity as an internal prerequisite for the self-movement of activity. S.L. Rubinstein (2) by activity means the general characteristic of the subject, playing the role of a mediator between the acts of the individual and the requirements of society. In the works of S.L. Rubinstein's problem of activity is considered in close connection with the internal determination of behavior. According to the position of the author, a person consciously transforms the world. In the conscious activity of a person, his activity is manifested. Thus, put forward by S.L. Rubinstein's principle, according to which external influences are refracted through the internal position of a person, opposed notions of the fatal predetermination of activity on the part of external influences, as well as the interpretation of activity as a special force independent of the interaction of the subject with the external environment.

A.V. Petrovsky, M.G. Yaroshevsky (3) defining activity as "the active state of the subject", note that it is determined internally, from the side of his relationship to the world, and is realized outside, in the processes of behavior.

According to A.K. Abulkhanova-Slavskaya (4, p41), "the fundamental difference between activity and activity is that activity comes from the need for an object, and activity from the need for activity". Activity determines activity (its motives, goals, orientation, desire (or unwillingness) to carry out the activity, that is, it is a driving force, a source of awakening in a person of his "dormant potentials." Thus, activity seems to precede activity in time, "activity is caused by the need for activity, represents the battle is the highest-level concerning activity" (4, 1991, p43).

Thus, despite some peculiarities in understanding the role and place of activity in the life of an individual within the framework of various currents of the activity approach, the following provisions are generally recognized: 1) on the decisive role of internal psychological factors of an individual's activity, in comparison with the external conditions for the manifestation of activity; 2) on the activity of the personality as a determinant of its self-movement, self-development.

### 2 Materials and Methods

An important issue is the motive forces of an individual's activity, i.e. about the mechanism that starts the process of self-propulsion. In domestic psychological science, many researchers adhere to the point of view that the driving force of the process of self-development of the personality, the initiation of its activity is intrapersonal contradictions (K.A. Abulkhanova-Slavskaya, A.I. Antsiferova, A.G. Asmolov, G. S. Kostyuk, A.N. Leontyev, V.D. Shadrikov, etc.). These theoretical positions are based on the dialectical approach, according to which "a contradiction is the root of all movement and vitality, only because something has a contradiction in itself, it moves, has an impulse to activity". (5) So, A.G. Asmolov (6) notes that "manifestations of an individual's activity do not arise as a result of any initial push caused by certain needs. The search for the "engine" that gives rise to the activity of the individual must be sought in those contradictions that arise in the process of activity, which is the driving force behind the development of the personality". A.I. Krupnov (7) considering the driving forces of activity, defines them as contradictions that arise in the process of interaction of internal and external factors, in the course of the implementation of activity. V.D. Shadrikov (8), the main contradiction initiating the activity of the individual, considers the contradiction between the individual's abilities and the requirements of activity. Thus, the driving force of an individual's activity is the intrapersonal contradictions that arise in the process of carrying out activities.

Table 1. Main Approaches to the Study of Innovative Activity of the Individual

	<b>Behavioral</b>	<b>Organizational</b>
<b>Subject of study</b>	Characteristics of personality traits and individual behavior (activities)	Organizational characteristics
<b>Subject of innovation</b>	Personality	Firm
<b>Main directions</b>	- creative behavior - innovative labor behavior - entrepreneurial behavior	- corporate entrepreneurship - innovation control systems - organizational innovation

Appeal to the problems of innovative activity becomes impossible without a preliminary analysis, systematization, and classification of methodological premises, teaching methods and empirical results accumulated by representatives of various schools and areas.

A wide range of concepts is used to study the innovative activity of a person in world literature. Most of them, one way or another, are based on the term "behavior". Accordingly, the concepts arise such as innovative behavior, entrepreneurial behavior, innovative organizational behavior, creative work behavior, etc.

Two approaches to the study of the innovative activity of the personality can be distinguished such as a behavioral approach and organizational approach.

For representatives of the behavioral approach, the innovator is the personality itself. For them, issues of individual creativity of a person (T. Amabile), personal activity in the development and implementation of innovative ideas (M. Basadur), or the receptivity of the closest organizational environment of the innovator to the proposed improvements (O. Jansen) become central.

This approach is represented primarily by American experts in the field of so-called "creative behavior" (Harvard School led by Theresa Amabile), researchers of "innovative labor behavior" (O. Jansen and others), as well as experts in the field of "entrepreneurial behavior" (D. Kuratko and others).

Representatives of the second, organizational approach, believe that innovation is, ultimately, the product of the company that is responsible for it. Within the framework of the organizational approach, we distinguish several areas such as corporate entrepreneurship, organizational innovation, innovation control systems. Research by proponents of this approach combines an interest in structural methods for the development and implementation of innovations. (9)

Despite the need to study innovation from both points of view, in this paper we will focus on the first approach. There are three reasons for this:

1) Today in domestic social psychology there are serious methodological and methodological developments in the field of innovation (S.R. Yagolkovsky, A.D. Karnyshev, V.E. Klochko, and others). First of all, it is necessary to note the contribution of the Department of Social and Economic Psychology of Baykalsky State University of Economics and Law, which systematized and developed a system of basic methodological principles and methodological techniques for studying the psychology of innovation, innovative interaction within business organizations. (10-12)

2) It seems to us that it is at the level of stable practices of the behavior of subjects of innovative activity that we can achieve the most serious results in the analysis of the reasons for the underdeveloped innovative potential of the individual. To this assumption, we are led by studies conducted by the Department of Social and Economic Psychology. The study showed that innovative personality behavior manifests itself at the level of everyday socio-psychological interaction.

3) Social psychology is focused on research not so much on organizational forms of promoting innovation as on the study of

the role of the individual, individual efforts in generating useful innovations. Of course, organizational forms of innovation development are more abstract. Meanwhile, the people responsible for the development of innovations in the company are specific people who, through their activity, zeal, and difficulty, produce new things. (13-14)

The study of this problem area is impossible without solving some questions: What is an innovative activity (behavior, activity, etc.) of an individual? What are its main indicators? How to measure it?

Let us analyze the achievements and achievements of the representatives of the behavioral approach in the study of innovation.

1) Harvard School for the Study of Creative Behavior (T. Amabile) developed and justified a three-factor model of creative behavior. Factors that determine the creative potential of an individual at an individual level are described through three core components:

- 1) skill level;
- 2) creative abilities (general ability to generate new);
- 3) the motivational structure of the personality.

The main attention of the authors focuses on the study of the third factor: the motivational structure of the personality. T. Amabile and colleagues show that depending on how much a particular type of motivation (external or internal) dominates in the work of the individual, fundamentally different basic conditions are formed for the manifestation of creative behavior. In the case of the prevalence of external motivation (associated, for example, with financial reward or with career growth), the creative abilities of an employee have a significantly lower chance of realization than in a situation where they are exclusively motivated by the interest in the process of the activity. Of particular note are the studies of this group of scientists on the role of the organization's internal competitive environment as a factor in innovation activity. It is shown that in a situation where a person receives either high encouragement (when implementing a particular project, solving a specific problem, etc.) or a significant punishment (in the opposite case) - his creativity is sharply inhibited. In this case, traditional, perhaps less effective, but guaranteed from failure methods, methods of work, etc. come to the fore. (15)

The Harvard School of studying innovative (creative) behavior is distinguished by two features:

- strong socio-psychological emphasis
- a specific understanding of innovative behavior.

Indeed, the authors make extensive use of psychological tests and techniques. The advantage of this approach is the ability to measure such a complex parameter as the employee's creative abilities.

Another feature arising from the first is a specific understanding of innovative behavior. The concepts of "innovative" and "creative" are not strictly separated. Any new decision or idea of an employee, one way or another related to the implementation of his professional duties, is considered "innovative". At the same time, the employee's activity in promoting the innovative proposals of other employees, or the employee's activity in

introducing, applying someone else's idea into life, is not considered as innovative behavior. (16)

2) Research on innovative work behavior. Another area of research, whose representatives made a significant contribution to the study of innovative activity of the individual, is concentrated in the Netherlands and the main subject of their research is the so-called Innovative Work Behavior (E. Wilson-Evered, G. Van der Vegt, J. Rank, N. Nelson, and others). Of particular importance for the development of this problem area are the works of O. Janssen. (17)

This group of scientists sees the activity of the employee as a source of innovation. However, unlike the American school, O. Janssen, M. Revers, and others determine innovative behavior not only through the creativity of the actions performed by the employee but also through the useful participation of the employee in creating innovation. Thus, the definition of innovative behavior includes four different aspects:

- employee discovery of a new opportunity;
- generation of a new idea;
- promotion of a new idea;
- implementation of innovative solutions in the life of the organization.

Implementation is understood as the transformation of innovative practices of behavior, structural education, technological solutions, etc. into a standard element of the production process.

A new look at the definition of innovative behavior is one of the main advantages of researchers of innovative labor behavior. Of the other important achievements in this area, it should be noted:

- 1) Developments in the field of studying the relationship of the socio-psychological organization of relations in the company and the innovative behavior of its employees. In particular, special attention is paid to the relationship of the innovator with his environment and bosses.
- 2) Researchers' attention to such organizational parameters as employee autonomy, the degree of differentiation of his functional responsibilities, etc.
- 3) Studies of entrepreneurial behavior in an organization as a form of innovative activity. (18-19)

The concept of "entrepreneurial behavior" only recently began to be used in scientific literature devoted primarily to "corporate entrepreneurship". Entrepreneurial behavior, as a holistic phenomenon, is understood by representatives of this direction as an innovative activity aimed at achieving goals related to the development of innovations such as increasing profitability, strategic renewal of a company, accumulating knowledge for future changes, developing in the international arena, effectively allocating and structuring available resources. Research in this direction has only just begun, but D. Kuratko, R.D. Ireland and others, based on their research and generalization of the achievements of other researchers, have developed a theoretical model of entrepreneurial behavior of managers:

1) Prerequisites for entrepreneurial behavior:

- independence, autonomy;
- a system of encouraging and stimulating innovative activity;
- the availability of a temporary resource;
- the organizational framework of innovation activity.

2) The manifestation of entrepreneurial behavior:

- search, identification of innovative opportunities for the development of the organization, and control over the implementation of these opportunities;
- identification of resource requirements for the implementation of innovative opportunities, accumulation, and use of these resources.

3) The likely consequences of entrepreneurial behavior of middle-level managers:

At the individual level: career advancement, career demotion, redistribution to another position in the organization, development of political (communication) skills, creation of a new network of social relations, material reward, conflict with more conservative members of the organization.

At the organizational level: the development of an innovative organizational culture, the formation of competitive advantages, the allocation of new market niches, economic losses, an increase in the innovative capacity of an enterprise, etc. (20)

According to the authors, a cycle is formed depending on what outweighs: the positive or negative consequences of innovative behavior, prerequisites more or less conducive to innovative activity are formed, which in turn determine the degree of profitability for the employee and the organization as a whole of innovative behavior. This topic requires further development.

Thus, several theoretical developments have been identified, which, of course, will be useful for future research. This includes, inter alia, the preparation and conduct of an empirical study of the innovative activity of the individual.

In this regard, the model of "entrepreneurial behavior" developed by D. Kuratko and others, as well as the three-factor model of creative behavior (T. Amabile and others) are of particular importance. The first sets the conceptual framework for the analysis of innovative activity considering both organizational conditions and individual personality qualities, and the second focuses on individual blocks-factors, presumably playing a decisive role in the formation of innovative behavior: qualification, motivation, creative abilities.

In the study of the problem of innovative activity as a special phenomenon, an important place is occupied by the disclosure of the mechanisms of its implementation. In the modern psychological literature, there is no single approach to determining the essence of the psychological mechanism. However, most often the psychological mechanism is defined as a "subjective description", or reflection at the subjective level of those objective processes that ensure human interaction with the environment. Moreover, the psychological mechanism is not a simple statement of these processes but rather reveals their substantial and functional characteristics. The psychological mechanism performs a regulatory function in controlling various energy levels of human interaction with the environment. (21)

Let us dwell on the analysis of the psychological mechanisms that regulate human activity in the implementation of innovations.

Psychological mechanisms have a different functional load, a different scope of their action, but they all underlie the diverse species, forms of human activity. And therefore, the identification of the nature, principles, conditions of their action are extremely important in the knowledge of the innovative activity. (22)

One of the important psychological mechanisms of innovative activity of the personality is the locus of control.

The emergence of the concept of "locus of control" in the psychological literature is associated with the work of J. Rotter (1954), who proposed distinguishing between people according to how they localize control over messages that are significant for themselves. The locus of control is also called the localization of control of the volitional effort. There are two extreme types of such a localization, or locus of control such as internal and external.

The internal type - a person believes that the events taking place with him primarily depend on his personal qualities and are a logical result of his innovative activity.

The external type - a person is convinced that his successes or failures are the results of external forces such as luck, chance, environmental pressure, other people, etc.

The locus of control is considered by Rotter and his followers as a special, fundamental type of generalized expectations, as "the degree to which a person understands the causal relationships between his behavior and the achievement of the desired".

### 3 Results and Discussion

Experimental data indicate that internals have more innovative activity, they, in contrast to externals, are more consistent in their behavior. They are more productive in decision-making situations and situations associated with risk, they are more willing to defer short-term, easily accessible pleasure to achieve a remote, but more valuable good. (23)

Another important psychological mechanism is identification. Identification (from Late Latin *identifico* - to identify), recognition of identity, identification of objects, identification.

Thanks to the identification mechanism, the senses, relationships, motives inherent in those people whom the person takes as a model are appropriated, an example to follow. Moreover, a person can identify himself not only with another person but also with ideals, models, social values (L.V. Popova, V.S. Mukhina, V.F. Petrenko, etc.).

Professor A.D. Karnyshev (10) showed that innovation, on the one hand, is something new, created reality, the essence and content of which does not correspond to traditions, on the other hand, this is the influence of the minority on the majority.

Innovation, the created reality is half the battle, the main thing is to introduce innovation, turn innovation into a form of innovation, i.e. implement the innovation process and get a positive result. In this case, the identification mechanism is manifested, on the one hand, as identifying oneself with others, immersion in the world of personal meanings of the other; on the other hand, it is the creation and implementation of innovation. (24) At the behavioral level, it is possible to consider the mechanism of identity as a process for solving significant innovative problems.

The basic mechanism for the development of activity is the mechanism of dynamic equilibrium, which is associated with causal characteristics of dynamic processes and the stability of mental activity.

V.G. Leontyev, (25) developing mechanisms of motivation, drew attention to the presence of a certain initial generalized mechanism, which is an important link in all other motivational mechanisms. This is the mechanism of dynamic equilibrium [8]. Conducted special observations showed that the imbalance in any system always arises after reaching equilibrium in another system connected with it. Moreover, equilibrium is the true cause of activity in various systems. The imbalance forms the desire for its restoration and generates the corresponding consequences, which is, ultimately, the source of motivation, the energy element of the activity. This is the mechanism of dynamic equilibrium. So, for example, people, having reached high in labor, begin to introduce elements of creativity or game into this process. According to these positions, people are trying to transform the process of activity so that it becomes more productive, which helps to increase the level of innovative activity.

The English psychologists M. Apter and C. Smith, by research, have established a connection between the level of activity of the subject and his hedonistic tone. According to their findings, two alternative systems control human activity. One such system helps to avoid activity - when it is active, the subject experiences the most pleasant state when the activity is minimal, and the least pleasant - at the maximum value. The second such system is, on the contrary, aimed at searching for activity. When it "acts", the most pleasant state occurs with maximum activity

(joyful or "combat" excitement; the least pleasant state with minimal activity (relaxation). (8)

### 4 Conclusion

M. Apter and C. Smith (26) formulated their ideas in the theory of reverse activity, according to which, in the course of professional activity, the body can switch from one regulation system to another, with a corresponding change in hedonistic tone.

So, the subject deliberately will create difficulties and dangers in the activity, causing a state of "combat" excitement associated with them, as if moving along the "search" curve of activity right-up. After successfully solving the "dangerous" problem, he has a pleasant state of relaxation, which means a reverse activity - a transition from the activity search curve to the avoidance curve. Then the subject will again have a desire to test himself on a "dangerous" task, activation will reverse to the search curve and the described process will be repeated. There is a system of innovative activity.

This theory indicates the mutual transitions of balance and imbalance in related systems and that these transitions are among the main psychological conditions for the action of psychological mechanisms of activity.

Innovative activity differs from the traditional in its uncertainty and risk. The innovative activity of the personality is a systemic psychological phenomenon that includes various levels of functioning that are in complex dynamic interaction. Therefore, in the framework of this article, we analyzed the basic psychological approaches, forms, and mechanisms of innovative activity of the individual.

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**Primary Paper Section: A****Secondary Paper Section: AN**

## THE USE OF MODERN PEDAGOGICAL AND INFORMATION TECHNOLOGIES IN THE EDUCATIONAL PROCESS TO ENHANCE THE CREATIVE POTENTIAL OF STUDENTS

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**Abstract:** In pedagogy, questions inevitably arise: "What to teach?", "Why teach?", "How to teach?", but at the same time, another one appears: "How to teach effectively?" Training turns into a semblance of a certain technological process with predetermined goals and a guaranteed result. Naturally, education cannot be completely likened to production. Nevertheless, the concept of pedagogical technologies appeared in pedagogy. A.S. Makarenko called the pedagogical process a specially organized "pedagogical production", posed the problems of developing a "pedagogical technique."

**Keywords:** learning technologies, traditional technologies, learner-oriented technologies, information technologies, education.

### 1 Introduction

Traditional pedagogical technologies have their positive aspects, for example, the clear organization of the educational process, the systematic nature of teaching, the impact of the teacher's personality on students in the process of communication in the lesson. Widely used visual aids, tables, technical training aids are also of great importance.

Traditional technologies have been tested over the years and make it possible to solve numerous problems that were posed by the industrial society of the late XIX - mid-XX century. In this historical period, the tasks of informing, educating students, and organizing their reproductive activities were relevant. This allowed for a relatively short period to educate a generation of literate people with certain knowledge and skills necessary to engage each educated individual in the process of mass production. Industrial society needed a huge number of skilled workers and engineers who own modern technology. Naturally, during this period, education solved quite definite problems (and solved them, it should be noted, very successfully). (1)

At present, society has already changed its priorities, the concept of post-industrial society (information society) has arisen, it is more interested in ensuring that its citizens can independently, actively act, make decisions, flexibly adapt to changing living conditions.

The modern information society poses for all types of educational institutions and, above all, for the school the task of training graduates who are capable to

- Navigate in changing life situations, independently gaining the necessary knowledge, applying them in practice to solve a variety of emerging problems, so that throughout life you can find your place in it;
- Think independently and critically, see emerging problems and look for ways to rationally solve them using modern technologies; clearly understand where and how the knowledge they acquire can be applied; be able to generate new ideas, think creatively;
- Work competently with information (to collect the facts necessary to solve a particular problem, analyze them, make the necessary generalizations, compare with similar or alternative solutions, establish statistical and logical patterns, draw reasoned conclusions, apply the gained experience to identify and solve new problems);
- Be sociable, contact in various social groups, be able to work together in various fields, in various situations, preventing or skillfully getting out of any conflict situations;

- Work independently on the development of one's morality, intellect, and cultural level. (2)

With the traditional approach to education, it is very difficult to educate a person who satisfies these requirements. Under the current conditions, the emergence of a variety of learner-oriented technologies has become natural.

### 2 Materials and Methods

Learner-oriented training is designed to provide the necessary conditions for the development of the individual abilities of a student. It should be noted that at the moment various types of personality-oriented technologies are used, both more or less universal and private subject (technology of early and intensive literacy, a system of phased education in physics, technology for teaching mathematics based on problem solving, etc.) or highly specialized ("school-park", agricultural school and others), or alternative (involving comprehensive education, training without rigorous programs and textbooks, the project method and immersion methods, students' invaluable creative activity).

Learner-oriented technologies based on the revitalization of students and improving the effectiveness of the learning process.

Learner-oriented learning involves the use of various forms and methods of organization of educational activity, allowing to reveal the subjective experience of students.

At the same time, the teacher faces the following new tasks:

- Creating an atmosphere of interest for each student in the work of the class;
- Encouraging students to make statements, use various methods of completing assignments without fear of mistakes, get the wrong answer, etc.;
- The use of didactic material during the lesson, allowing the student to choose the most important type and form of educational content;
- The assessment of the student's activity not only by the result (right or wrong) but also by the process of its achievement;
- Encouraging the student's desire to find his way of working (solving a problem), to analyze the methods of work of other students during the lesson, to choose and master the most rational;
- The creation of pedagogical situations of communication in the lesson, allowing each student to show initiative, independence, selectivity in ways of working;
- The creation of an environment for the student's natural expression.

Among the various areas of new pedagogical technologies, in my opinion, the most appropriate to the set goals and the most universal are training in cooperation, the project method, game technology and a differentiated approach to learning.

These areas belong to the so-called humanistic approach in psychology and education, the main distinguishing feature of which is special attention to the individuality of a person, his personality, a clear orientation to the conscious development of independent critical thinking. (3).

#### 2.1 Learning in Collaboration

In technologies based on the collective method of training, training is carried out by communicating in dynamic or static pairs, dynamic or variation groups, when everyone teaches everyone, special attention is paid to the options for organizing students' jobs and the training tools used. The advantages of this technology are as follows:



- Skills of mental activity are developed; the work of memory is included;
- Gained experience and knowledge are updated;
- Each student has the opportunity to work at an individual pace;
- Increased responsibility for the result of teamwork;
- Skills of logical thinking, consistent presentation of material are improved.

## 2.2 Differentiated Learning Approach

The principle of a differentiated educational process as well as possible contributes to the implementation of the personal development of students and confirms the essence and goals of general secondary education.

The main task of the differentiated organization of educational activity is to reveal individuality, help it develop, settle down, manifest, gain selectivity and resistance to social influences. Differentiated learning is reduced to the identification and maximum development of the abilities of each student. Significantly, the application of a differentiated approach at various stages of the educational process is ultimately aimed at mastering by all students a certain program minimum of knowledge, skills. (4)

The differentiated organization of educational activity, on the one hand, considers the level of mental development, psychological characteristics of students, and the abstract-logical type of thinking. On the other hand, individual needs of the individual, their capabilities and interests in a particular educational field are considered.

A differentiated learning process is the widespread use of various forms, teaching methods and the organization of educational activities based on the results of psychological and pedagogical diagnostics of educational opportunities, inclinations, and abilities of students.

## 2.3 Gaming Technology

The game is perhaps the most ancient method of training. With the advent of human society, the problem of teaching children with vital and socially significant techniques and skills has also appeared. With the development of civilization, games change, many objects and social subjects of games change.

In contrast to the game, in general, pedagogical games have an essential feature - a clearly defined goal of training and the corresponding pedagogical result, educational and cognitive orientation.

The game form of classes is created using game techniques and situations that allow you to activate the cognitive activity of students.

When planning a game, the didactic goal becomes a game task, the training activity is subject to the rules of the game, the training material is used as a means of playing, a competition element is introduced into the training activity, which translates the didactic task into a game one, and the successful completion of the didactic task is associated with the game result.

## 2.4 Project-based Learning

The project method is not fundamentally new in world pedagogy. It arose at the very beginning of the 20th century. Of course, over time, the idea of the project method has undergone some evolution. Born from the idea of free education, the method is now becoming an integrated component of a fully developed and structured education system. However, its essence remains the same - to stimulate the interest of children in certain problems, which require the possession of a certain amount of knowledge and provide for the solution of these problems through project activities, the ability to practically apply the knowledge gained, and the development of critical thinking.

This is a comprehensive teaching method that allows you to build the learning process based on the interests of students, enabling the student to show independence in the planning, organization, and control of their educational and cognitive activities, the results of which should be "tangible", that is, if this is a theoretical problem, then its concrete solution, if practical - a concrete result, ready for implementation. The project method is based on the development of cognitive, creative interests of students, the ability to independently construct their knowledge, the ability to navigate in the information space, the development of critical thinking. The project method is always focused on the independent activities of students such as individual, pair, group, which students perform for a certain period. This method is organically combined with the teaching method in collaboration, the problematic and research method of teaching. (5)

Thus, the aforementioned technologies make it possible to achieve the solution of the main problem such as the development of cognitive skills of students, the ability to independently construct their knowledge, navigate the information space, and develop critical and creative thinking.

## 3 Results and Discussion

### 3.1 Information Technology as a Means of Enhancing Cognitive Activity and the Creative Potential of Students

The rapid development of computer technology and the expansion of its functional capabilities make it possible to widely use computers at all stages of the educational process: during lectures, practical and laboratory exercises, during self-training and for monitoring and self-monitoring the degree of mastering of educational material. The use of computer technology has greatly expanded the capabilities of the lecture experiment, allowing you to simulate various processes and phenomena, full-scale demonstration of which in laboratory conditions is technically very difficult or simply impossible. (6)

Great opportunities are contained in the use of computers in teaching physics. The effectiveness of the use of computers in the educational process depends on many factors, including the level of the technology itself, and the quality of the training programs used, and the teaching methodology used by the teacher. Physics is an experimental science, it is always taught, accompanied by a demonstration experiment.

In a modern office of physics (as, indeed, in any other office of natural-scientific specialization), not only various installations and devices for conducting demonstration experiments should be used, but also computer technology with a multimedia projector or a demonstration screen. Unfortunately, not every school has such an opportunity, however, the computerization of schools is accelerating, the fleet of computers is being replenished, and shortly, equipping classrooms with personal computers will become quite real.

As for the new information technologies, first of all, Internet technologies, there appeared problems associated with the widely used abstract work of students. To avoid "downloading" material from the Internet or using the existing database of ready-made abstracts on various storage media, the topics of the abstract are formulated so that the student at least uses various sources, choosing from there material that is appropriate for the proposed topic. The use of training programs, Internet resources, and electronic encyclopedias can be of great benefit to expand the horizons of students, to obtain additional material beyond the scope of the textbook. (7)

However, Internet technology is not so important for the lesson. Rather, they help both the teacher and the student in studying a topic, providing extensive educational or methodological material. During the lesson, it is advisable to use a computer, as already indicated, to enhance the cognitive activity of students. Of course, if each of the students will be able to use a personal computer during the lesson and, moreover, have access to the resources of the World Wide Web, then new techniques and

methods of work in the lesson will be required. However, at the present stage, not all schools can “boast” the presence of at least one computer and a VCR in the physics office (chemistry, biology, etc.).

At present, there is already a significant list of all kinds of training programs, in addition to which are accompanied by methodological material necessary for the teacher. Naturally, each program has its drawbacks, but the fact of their existence indicates that they are in demand and have undoubted value.

A variety of illustrative material, multimedia, and interactive models take the learning process to a completely new level. The psychological factor cannot be discounted: it is much more interesting for a modern child to perceive information in this form than with the help of outdated diagrams and tables. When using a computer in a lesson, the information is not a static, unannounced picture, but dynamic video and sound, which significantly increases the efficiency of mastering the material. (8).

Interactive elements of training programs allow you to switch from passive learning to active learning, since students get the opportunity to independently model phenomena and processes, perceive information in a non-linear fashion, returning, if necessary, to a fragment, with a repetition of a virtual experiment with the same or other initial parameters.

As one of the forms of training that stimulate students to be creative, we can offer the creation by one student or group of students of a multimedia presentation that accompanies the study of a course topic.

Here, each student has the opportunity to independently choose the form of presentation of the material, layout, and design of the slides. Besides, he can use all available multimedia tools to make the material the most spectacular.

Undoubtedly, in a modern school, a computer does not solve all problems; it remains only a multifunctional technical training tool. No less important are modern pedagogical technologies and innovations in the learning process, which make it possible not only to “invest” in each student a certain amount of knowledge but, first of all, to create conditions for the manifestation of cognitive activity of students.

3. The use of information technology to implement the goals of educational technology.

The technology of training in collaboration can be largely implemented in group work using a computer and other technical means. Training programs and computer models, virtual laboratory work, creating multimedia presentations are the best suited for collaboration between couples or groups of students. At the same time, the participants in the work can perform both tasks of the same type, mutually controlling or replacing each other, as well as individual stages of the overall work. (9)

When completing assignments in pairs or groups, the same level of proficiency in technical means is not required; in the process of joint work, the practical skills of the “weaker” students in this regard are improved.

All members of the working group are interested in the overall result, so mutual learning is inevitable not only in the subject of the project but also in the efficient use of computer technology and related information technologies.

Training in cooperation with the use of information and communication technologies does not require the direct presence of group members, work can be done remotely, with the transfer of materials and mutual communication using Internet services. It also raises the activities of individual members of the group to a qualitatively new level, making it possible to attract those who for one reason or another are deprived of the opportunity to directly participate in the work of the group. (10, 11)

A differentiated approach to learning can also be implemented using modern information technologies and multimedia projects. The teacher formulates the theme of the project considering the individual interests and capabilities of the child, encouraging him to creative work. In this case, the student has the opportunity to realize his creative potential by independently choosing the form of presentation of the material, the method and sequence of its presentation. In my practice, there are many examples of how a student who showed very mediocre knowledge created independently and confidently presented self-prepared high-level material in the lesson, often beyond the school curriculum. Confident computer skills allowed such a student to increase his self-esteem and, besides, expand his horizons and gain new knowledge.

Computer testing, like any testing, also makes it possible to individualize and differentiate tasks by tiered questions. Besides, tests on the computer allow you to return to unresolved issues and do the “correction of errors”.

Computer simulation of the experiment allows each student to complete the task in a rhythm convenient for him, to change the conditions of the experiment in his way, and to study the process independently of other students. It also contributes to the development of research skills, encourages a creative search for patterns in any process or phenomenon.

The training programs provide almost limitless possibilities for both the teacher and the student because they contain well-organized information. The abundance of illustrations, animations and video clips, hypertext presentation of the material, sound accompaniment, the ability to test knowledge in the form of testing, problematic questions and tasks enable the student to choose not only a convenient pace and form of perception of the material but also allow them to broaden their horizons and deepen their knowledge.

In training programs, the idea of the game was originally implemented. The sound and graphic design of most programs (interface) allow the child to perceive them as “games”. A lot of game situations and tasks encountered in such a program make the learning process as exciting as possible. With great interest, children collect a kind of mosaic, each element of which is a state on the political map of the world, under the guidance of a virtual teacher, conduct experiments in chemistry and physics. In the English program, you can “eavesdrop” on the dialogue of tea utensils in the buffet, practice the pronunciation of new words.

Training programs provide opportunities for computer simulation of experiments and experiments in a game form. You can construct an atom yourself, you can see how weightlessness arises in a moving elevator, how a Brownian particle moves. In the eyes of the child, a diffusion process takes place, a plant develops from the seed, industry, and infrastructure of the city develop, etc. In addition, if something did not work out, you can repeat it all over again. It is interesting, for example, to assemble an electric circuit, choosing the necessary elements from virtual boxes. Moreover, if the light bulb “burns out”, you can throw it into the “bin” (also virtual) and take another one with different characteristics.

Testing with a computer is also much more attractive to a student than a traditional test or test. Firstly, the student is not directly connected with the teacher, he communicates primarily with the machine. Secondly, tests can also be presented while playing. If the answer is incorrect in a row, the student can hear a funny sound or see the disapproving shake of the head of some funny hero. In addition, if the test is successfully passed, the student will be given a virtual laurel wreath, fanfares will sound in his honor and a salute will flash in the sky. Naturally, such testing will not cause student stress or negative emotions.

The project method is fully implemented in multimedia presentations and other computer projects. As mentioned above, such projects can be carried out using information technology (here, by the way, the Internet can provide invaluable assistance). Quick access to a variety of information, the use of

all multimedia features allow you to realize the most daring and unexpected ideas. If the student owns not only the basic means of working with information but also more complex programs, then, in this case, it is possible to create truly unique projects.

Great opportunities for using the project method are provided by computer modeling. Here we are talking about the fact that the development of a computer model of a process or phenomenon is itself a type of projective activity. If the student knows programming techniques, then, in this case, he/she has the opportunity to penetrate deeply not only into the essence of the phenomenon but also into his mathematical model, which then needs to be embodied in a visual image. In my practice, there are examples of the development of such projects - modeling of diffusion, Brownian particle motion, ballistic motion. One of the students independently created a cycle of virtual laboratory work at the 8th-grade physics course.

Work on the project encourages the student not only to study in-depth any topic of the course but also to master new programs and software products, use the latest information and communication technologies. Undoubtedly, many tasks of personality-oriented learning are solved here.

Thus, modern pedagogical technologies in combination with modern information technologies can significantly increase the effectiveness of the educational process, solve the educational institution's tasks of educating a comprehensively developed, creatively free person.

### 3.2 The Use of Modern Educational Technology in the Learning Process. Basic Educational OS Technologies

Today, there are more than a hundred educational technologies proposed for use, which encourages the theoretical generalization, analysis, and classification of these innovations, the selection of the best. Modern concepts of primary education proceed from the priority of the goal of upbringing and development of the personality of a primary school student based on the formation of educational activities. It is necessary to create such conditions that each student can fully realize himself, his characteristics, become a true subject of learning, willing and able to learn. Any class consists of students with unequal development and degree of preparedness, different attitudes towards learning and different interests. Often, the teacher is forced to conduct training concerning the average level of development and training of children. This inevitably leads to the fact that the "strong" students are artificially restrained in their development, lose interest in learning, and the "weak" are doomed to chronic lag. Those who belong to the middle are also very different, with different interests and inclinations, with different characteristics of perception, thinking, and memory. Therefore, it is necessary that each student work to the best of his ability, feel self-confidence, feel the joy of academic work, consciously and firmly assimilate program material, move forward in development. For this, the educational process must be built based on the principle of an individual approach.

A teacher who keeps up with the times is psychologically and technically ready to use information technology in teaching today. Any stage of the lesson can be revived by the introduction of new technical means. The teacher is a creative profession. The inclusion of ICT in the educational process allows the teacher to organize various forms of educational and cognitive activities in the classroom, to make active and focused independent work of students. ICT can be considered as a means of access to educational information, providing the ability to search, collect and work with a source, including on the Internet, as well as a means of delivery and storage of information. The use of ICT in the educational process can improve the quality of educational material and enhance educational effects.

One of the results of training and education in the first-stage school should be the children's readiness to master modern computer technologies and the ability to update the information received with their help for further self-education. To achieve these goals, it becomes necessary for the teacher to use

information and communication technologies in the educational process.

The use of ICT in various lessons in school allows you to

- Develop the ability of students to navigate the information flows of the world;
- Master the practical ways of working with information;
- Develop skills that allow the exchange of information using modern technical means;
- Intensify the cognitive activity of students;
- Conduct lessons at a high aesthetic level; individually approach the student using multilevel tasks.

### 4 Conclusion

An innovative search for new tools leads educators to understand that we need activity, group, game, role, practice-oriented, problem, reflective, and other forms of teaching/learning. The leading place among such methods found in the arsenal of the world and domestic pedagogical practice today belongs to the project method. The project method is based on the idea of the orientation of the educational and cognitive activity of schoolchildren on the result that is obtained when solving a particular practically or theoretically significant problem.

The external result can be seen, comprehended, applied in real practice. The internal result (the experience of the activity) becomes the invaluable asset of the student, combining knowledge and skills, competencies and values. It remains the teacher's difficult task to choose problems for projects, and these problems can only be taken from the surrounding reality, from life.

With the active use of ICT in school, the general goals of education are more successfully achieved, communication competencies are more easily formed such as the ability to collect facts, compare them, organize, express their thoughts on paper and verbally, logically reason, listen and understand oral and written speech, discover what something new, make choices and make decisions, increasing interest in the subjects studied.

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## THE USE OF MODERN INFORMATION TECHNOLOGIES IN THE EDUCATIONAL PROCESS

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**Abstract:** Currently, much attention is paid to the use of information technology in the educational process. At the end of the 20th century, humankind entered a stage of development called the post-industrial or information society. The judgment "we live in the age of information and communications" is not entirely true, since information and communications have always been, but the post-industrial society is unique in that it is characterized by the exceptionally rapid development of information and communication technologies. World experience indicates that the solution to educational problems begins with the training of teachers. That is, thorough training in the field of modern information technologies is necessary.

**Keywords:** information technology, education, educational process, cognitive activity, educational technology.

### 1 Introduction

Teachers should be able to choose and apply exactly those technologies that fully correspond to the content and goals of studying a particular discipline, contribute to the achievement of the goals of the harmonious development of students, taking into account their individual characteristics. A special role in the process of creating and using information technology belongs to the school's education system. A characteristic feature of the education system is that it acts, on the one hand, as a consumer, user, and on the other, as the creator of information technologies, which, subsequently, are used in various fields. This ensures the practical implementation of the concept of the transition from the informatization of education to the informatization of society. However, we should not exaggerate the capabilities of computers, since the transfer of information is not a transfer of knowledge and culture. Therefore, information technology provides teachers with very effective, but auxiliary tools. First, it is necessary to understand the essence of the concept of "information technology". When speaking about this concept, in some cases, people imply a certain scientific aspect, in others - a specific way of working with information: this is a body of knowledge about ways and means of working with information resources, and a method and means of collecting, processing and transmitting information to obtain new information about the studied object. In a sense, all pedagogical technologies are informational, since the educational process is always accompanied by the exchange of information between the teacher and the trainee. Nevertheless, in the modern sense, educational information technology (EIT) is a pedagogical technology that uses special software and hardware methods (movies, audio, and video tools, computers, telecommunication networks) to work with information. (1) Thus, EIT should be understood as an application of information technology to create new opportunities for transferring knowledge (teacher's activity), perceiving knowledge (student activities), assessing the quality of education and, of course, the comprehensive development of student personality during the educational process. Moreover, the main goal of educational informatization is to train students for full and effective participation in the everyday social and professional fields of life in the information society. (2) Systematic research in the field of information technology in education has been conducted for more than forty years. The education system has always been very open to the implementation of information technologies in the educational process based on software products of the most general purpose. Since the 1960s, in research centers and educational institutions in the USA, Western Europe, Australia, Japan, Russia (formerly the USSR) and a number of other countries, a large number of specialized computer systems have been developed specifically

for the needs of education, focused on supporting different aspects of the educational process.

### 2 Materials and Methods

The following classification is accepted for EIT in some countries: CAI (Computer-aided Instruction), CAL (Computer-aided Learning), CBL (Computer-based Learning), CBT (Computer-based Training), CAA (Computer-aided Assessment), and CMC (Computer-mediated Communication). (3) This classification is the intersection of individual technologies. Let us consider each of them in more detail. Computer-aided Instruction is a technology that provides the implementation of the mechanism of programmed training using appropriate computer programs. Computer-aided Learning involves the independent work of a student in studying new material with the use of various means including a computer. Computer-based Learning differs from the previous technology in that it is supposed to use mainly software tools that provide effective independent work of students. Computer-based Training involves all kinds of forms of transferring knowledge to the learner and, in essence, intersects with the above. Computer-aided Assessment can be an independent learning technology, but in practice, it is an integral part of others since the knowledge transfer technology also requires that they have a special system for assessing the quality of knowledge acquisition. Computer communications, providing both the process of knowledge transfer and feedback, are an integral part of all of the above technologies. Computer-mediated Communication determines the capabilities of the information educational environment of a particular educational institution, city, region, or country. The implementation of any EIT takes place within the framework of the educational information environment. Therefore, the tools providing hardware and software support for educational technology should not be limited to just a separate computer with a program installed on it. On the contrary, EIT software and educational technologies themselves are embedded as a subsystem in the educational information environment - a distributed educational information system. (3) To implement the pedagogical process, it is necessary to use the means of information technology aimed at creating forms and methods of training and education that ensure the effective disclosure of learner individuality, cognitive processes, personal qualities, and the development of intelligence. (1) It is necessary to consider the creation of the conditions under which students would want to study and would be personally interested in perceiving educational influences with the use of a computer rather than repelling them.

### 3 Results and Discussion

Information technologies in the educational process are usually considered in three aspects: as a subject of study, as a means of learning, and as a tool for automating learning activities. The emergence and widespread adoption of multimedia and Internet technologies make it possible to use information technologies as a means of communication, education, and integration into the global community. The combination of these traditional and innovative orientations of the implementation of information technology in the educational process creates the prerequisites for the implementation of a new integrated concept for the application of information technology in education. Its essence is to realize the potential of information technology for a personality-oriented development of students and teachers. The practical implementation of new technologies is possible due to the development and implementation of educational information environments in the educational process. Such environments are the most effective form of all previously known educational software. It is advisable to use them in educational and especially in independent information retrieval activities.

Educational information environments allow implementing most of the modern technology opportunities in the educational process, and thus contribute to the following:

- Better assimilation of program material because the submitted material becomes more exciting, visual, its informatization capacity is enhanced. The possibility of a comprehensive examination of the phenomenon under study appears. The arsenal of methods for supplying educational material is expanded. The time necessary for its presentation is saved;
- The realization of the possibilities of intellectual control over the educational process. It will create the conditions for individual and differentiated learning, the choice of the pace to study material, the separation of tasks by difficulty levels;
- Automated evaluation of knowledge, abilities, and skills, which helps to increase the objectivity of such an evaluation and enhances learning motivation;
- Organization of independent study of educational material to allow increasing student intellectual level.

A specially organized information environment built primarily as a diverse school environment provides each child with the opportunity to express themselves, to determine themselves and to realize themselves as individuals. The more diverse the educational environment, the easier it is to reveal the individuality of each student. (1, 4) It is necessary to rely on this individuality when taking into account the identified interests, inclinations, and the richness of personal experience, to direct and correct personal development, its natural and subjective activity. It is necessary to achieve in practice the transformation of students into a true actor in the pedagogical process. Modern society is characterized by the constant development of information technology means. The objectively ongoing process of informatization of a society significantly affects the goals and content of education and makes new demands on the professional training of specialists in the use of IT tools. (5, 6) The main modern requirements for the teacher of any discipline are a high level of computer literacy, information culture, the ability to use various software products to achieve the goal, and knowledge of the functional and didactic capabilities of IT tools. The main task of the teacher acting in the modern educational process is student development and students' personal formation. The informatization of the education sector helps to find ways to use the potential of IT tools in order to increase the effectiveness of the educational process, to develop students' skills in using IT tools in future professional activities. (7) The increasing importance of using modern information technologies in the learning process is currently caused by many factors including

- The complexity of the pedagogical process in an educational institution in the context of the integration of special disciplines, as well as the integration of an educational institution with advanced companies and research organizations;
- The expansion of students' disciplinary knowledge to increase the volume of educational material and the need for its generalization;
- Expanding areas of activity leading to the need to solve a variety of professional tasks (design, research, technological ones, etc.);
- The inclusion of advanced technologies in the learning process, including the base of modern telecommunication and computing facilities. Therefore, information technology in training is a kind of response to changes in the system of higher education related to the management optimization of student cognitive activity. (8, 9) One of the modern approaches to the organization of the educational process in the school is the creation of a special educational environment, i.e. the creation of conditions that would contribute to the development of an active independent creative personality able to freely navigate in the surrounding information space. (10, 11) Modern information technologies provide many opportunities for organizing such an educational environment.

The content of teacher education enriched by the use of information technology associated with obtaining key competencies (social, communicative, informational, cognitive

and special ones) will become much deeper and more meaningful under the following conditions:

- Creation of real conditions for the training of pedagogical personnel capable of taking part in the implementation of educational informatization programs;
- A significant increase in the level of professional interaction between teachers and students due to the possibility of joint projects including telecommunication;
- the emergence of qualitatively new conditions for the realization of the students' creative potential;
- Performance enhancement of students' independent work with traditional and electronic resources;
- Implementing continuous open education, when students will be able to actively participate in the organization of the learning process and to choose courses available at any time thanks to telecommunications.

The fulfillment of these conditions contributes to the achievement of the main goal of modernization of education - improving the quality of education, increasing access to education, ensuring the needs for the harmonious development of individuals and the information society as a whole. (8) It is necessary to understand and evaluate the capabilities of information technologies for more complete development of students' personalities, to see how it is possible to integrate the educational information technologies in the educational process in the most organic way. The question of the role of modern information technologies in improving and modernizing the existing educational system has remained relevant for several decades. Successful implementation of the educational modernization program will require not only modern technical equipment for schools but also an appropriate training of teachers and organizers of the education system. Therefore, for each teacher, the main goal is to ensure the quality of education, which can be facilitated by the use of information technology. IT in school society can be considered as a means of teachers' self-realization and self-affirmation. (12) It contributes to the development of fruitful cooperation with students and to the growth of pedagogical authority. It shapes the skills of functional literacy of a teacher and significantly increases the level of teacher professional culture. It expands the possibilities of disseminating accumulated experience, own views on the content and methodology helping to move from the role of a teacher-translator of knowledge in the lesson to the position of a teacher-tutor organizing and directing the process of independent student cognitive activity. Information technology plays an important role in the development of teaching methods since the work of each teacher is of importance for methodological and pedagogical science development as a whole.

The goal of informatization is the global intensification of intellectual activity through the use of new information technologies such as computer and telecommunication. Information technology provides the following opportunities:

- Rational organization of student cognitive activities during the educational process;
- Enhancing learning performance by involving all kinds of student sensory perception in a multimedia context and by equipping the intellect with new conceptual tools;
- Building an open education system that provides each individual with his or her own learning path;
- Involving categories of children with different abilities and learning styles in the process of active learning;
- Using the specific computer properties individualizing the educational process and turning to a fundamentally new cognitive means;
- Intensification of all levels of the educational process.

The current stage of development of education is characterized by a number of distinctive features associated with scientific and technological progress, the rapid growth of educational information. It is necessary to use the curiosity and high cognitive activity of students for the purposeful development of their personality. The formation of the cognitive interest of

students is of fundamental importance for the conscious assimilation of the material.

The use of project activities, student-centered learning, information and communication technologies (ICT), multilevel and problem-based learning help to arouse students' interest in a given discipline, and to intensify their educational and cognitive activities.

The use of new information and communication technologies in the educational process will help to direct the intellectual potential of students to positive development. It is in the lessons under the guidance of a teacher that schoolchildren can learn to use computer technology for the comprehensive development of their intellect, to master the methods of obtaining information for solving educational, and subsequently practical tasks, to acquire skills that will help to continue education throughout life.

By conducting research in this direction, we propose to intensify the cognitive activity of students through the use of computer technology and thereby integrate information knowledge with the course of high school subjects. Such integration allows developing new approaches to learning and making discipline learning more mobile and adapted to the requirements of modern society. The use of computers in the educational process contributes to the improvement of teaching methods to a greater extent than any other technical means available to teachers. The implementation of information technology in the educational process significantly changes and ultimately increases the effectiveness of teaching. First, the computer significantly expands access to sources of information that teachers use when preparing for classes.

One of the most important methodological principles allowing the effective use of information and communication technologies (ICT) is the combination of computer technology with the traditional one. The use of ICT in the lesson should be appropriate and methodologically justified. Information technologies should be accessed only if they provide a higher level of the educational process compared to other teaching methods. A computer is able to replace the bulk of visual aids and models (and sometimes they are too voluminous and cumbersome. Moreover, the number of manuals is not always enough to provide the entire class). When organizing practical work, the computer becomes an effective assistant. Electronic textbooks equipped with three-dimensional illustrations contribute to the development of spatial thinking. The use of computer models promotes imaginative thinking and better assimilation of the material. In the lessons, computer technologies can be used in the study of new material, during the initial consolidation of knowledge and skills acquired in the lesson, during the development of skills and abilities (training testing), during the workshop, as well as when evaluating and correcting knowledge.

The use of slides during the lessons provides dynamism, visibility, a higher level and volume of information compared to traditional methods. When preparing the slides for the lesson, electronic textbooks and Internet information can be used along with their own presentations.

If there is a need to discuss new material with students at the lesson, then a teacher can conduct a combined lesson in the form of a conversation using a computer presentation. The presentation allows for making this process more visual and vivid. It contributes to the systematization of knowledge and more successful assimilation of it. When presenting slides a teacher can place the necessary formulas and schemes in accordance with the sequence of studying the material in the lesson. In order to timely eliminate gaps in knowledge and consolidate the most important issues of the topic, control questions or tasks should be placed on the last slide of the presentation. If students cannot answer a question, then a teacher can return the slide where there is information for the correct answer by using a special control button with a hyperlink. Therefore, it is necessary to carry out a revision of material that was difficult for students. Multimedia technologies allow not

only building the material in the form of a sequential presentation, but also creating the possibility of nonlinear movement between individual parts of the subject. Students get the opportunity to work at a pace convenient to them and pay special attention to those issues that cause difficulties for them. At this time, a teacher can conduct individual work with those students who need help. Thanks to this, students study the material in the sequence necessary for them. When working with a training program that helps to eliminate knowledge gaps and does not punish for an incorrect answer by lowering grades, students will experience positive emotions that are very important for successful learning.

The use of computers in the lessons facilitates the assimilation of educational material, contributes to an increase in cognitive interest in a given discipline, the development of the desire and ability to learn makes it possible to carry out an individual approach to learning and allows to objectively evaluate students' knowledge. The observations of the learning process show that even "weak" students work more actively in lessons using ICTs.

The use of computer technology enhances perception, facilitates the assimilation and memorization of material, and affects several student information channels at once. At the same time, students become more interested in lessons.

The main educational value of information technologies is that they allow creating an immeasurably brighter multi-sensory interactive learning environment with almost unlimited potential opportunities available to both teachers and students. (13-15) Unlike conventional technical teaching aids, information technologies allow not only saturating a student with a large amount of knowledge, but also developing students' intellectual, creative abilities, their ability to independently acquire new knowledge, and work with various sources of information.

Eight types of computer tools used in training are distinguished in accordance with their functional purpose: (16)

1. Presentations, i.e. electronic filmstrips, which can include animation, audio, video, and interactivity elements. The use of presentations expands the range of conditions for the creative activities of students and the psychological growth of personality, develops independence and increases self-esteem. (17, 18) Presentations are also actively used to present student projects.
2. Electronic encyclopedias. Hypertext systems and hypertext markup languages such as HTML are used to create such encyclopedias. Unlike their paper counterparts, they have additional properties and capabilities:
  - They usually support a convenient search system for keywords and concepts;
  - Convenient navigation system based on hyperlinks;
  - The ability to include audio and video elements.
3. Didactic materials - collections of tasks, dictations, exercises, as well as examples of essays presented in electronic form.
4. Training programs, which perform the functions of didactic materials and can track the progress of the solution and report errors.
5. Virtual experiment systems, i.e. software packages that allow a student to conduct experiments in a "virtual laboratory". Their main advantage is that they allow the student to conduct experiments that would be impossible in reality for security reasons, time characteristics, etc. The main drawback of such programs is the natural limitation of the model embedded in them, beyond which a trainee cannot go.
6. Knowledge Testing Software, which includes questionnaires and tests. Their main advantage is the quick, convenient, impartial and automated processing of the results. The main drawback is the inflexible response system that does not allow a student under test to show his or her creative abilities.

7. Electronic textbooks and training courses, which combine all or several of the above types into a single complex. For example, a trainee is first invited to view a training course (presentation), then put down a virtual experiment based on the knowledge gained when viewing the training course (virtual experiment system). Often, at this stage, a relevant electronic reference book or an encyclopedia is also available for the student, and in the end, he/she must answer a set of questions and/or solve several problems (Knowledge Testing Software).

8. Educational games and educational programs are interactive programs with a game scenario. When performing various tasks during the game, children develop fine motor skills, spatial imagination, memory, and, possibly, gain additional skills, for example, learn to work on the keyboard. (19, 20)

#### 4 Conclusion

In the educational process, a computer can be both an object of study, and a means of training, education, development, and diagnosis of learning content. There are two possible uses of computer technology in the learning process. However, today, at least two more functions have been determined: a computer as a means of communication, a computer as a tool in management, and a computer as a developing environment. In the educational process, the simultaneous use of all these areas is important. The existence and interaction of all of them at the same time, not only in the educational but also in the formative process, leads to the desired result that society sets before schools. As a result of the use of information technology, there are dynamics in the quality of students' knowledge and increased motivation for learning activities.

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## LINGUISTIC STATUS OF CHIASMUS IN SYNTACTIC SCIENCE

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**Abstract:** The functional and stylistic direction of linguistics is attracting more and more attention of linguistic researchers. This is due to the general increase in the interest of linguistic science in the communicative aspect of language. The advent of text linguistics, the development of functional grammar, and pragmalinguistics have activated new directions in stylistic research. In this case, a significant role is given to the phenomena of expressive syntax, the subject of which are structures that can add additional efficiency to the message. Many syntax tools are expressive and, therefore, have stylistic significance. This is one of the richest means of speech expression. The most important means of expressive syntax are stylistic figures.

**Keywords:** chiasmus, linguistics, grammar, parallelism, stylistic figures.

### 1 Introduction

#### 1.1 Parallelism: The Essence and History of Learning

The rhetorical studies of recent decades are an attempt to comprehend modern pragmatic resources, including stylistic means of syntax, on the material of various languages. Currently, there are many works devoted to the study of speech patterns and their stylistic use. So, in some works, the following are studied: repetition (I.M. Astafieva, N.T. Golovkina, N.A. Zmiyevskaya, V.S. Izmailov, A.A. Malchenko, A.P. Skovorodnikov, L.N., Timoshchuk), antithesis (G.M. Belova), G.G. Ivleva, T.I. Filippova), asyndeton (M.M. Antonovich, V.I. Karaban, L.Sh. Kovalenko, R.R. Tchaikovskiy), (1) polysyndeton (L.V. Garuzova, F.I. Dzhaubaeva, R.R. Tchaikovskiy), oxymoron (E.A. Atayeva, N.V. Pavlovich, G.I. Shishkina), ellipsis (T.F. Dubovtseva, A.V. Mikheyev, A.P. Skovorodnikov, V.I. Shulgin), segment (T.N. Akimova, S.N. Andriyanova, E.A. Ivanchikova, T.R. Konovalova, A.S. Popov), parcellation (L.O. Atadzhanova, Yu.V. Vannikov, E.A. Ivanchikova), syntactic parallelism (G.N. Chervakova, (2) R.G. Lozinskaya), chiasmus (E.M. Beregovskaya, (3-5) O.A. Krylova, N.A. Levkovskaya, V.S. Solovyeva), (6-7) and other figures.

Figures constructed on the principle of syntactic parallelism are one of such tools that have not yet been adequately reflected in studies of the expressive syntax of modern Russian and French.

It cannot be said that the phenomenon of syntactic parallelism itself has not yet attracted the attention of scientists. So, syntactic parallelism is considered as a method-model for organizing song syntactic units (E.B. Artemenko), and V.I. Eremin points to him as an essential sign of ditty.

Reception of parallelism is called among the phenomena of the syntactic level that are "often exploited in poetry" (N.Yu. Rusova, V.V. Tomashevsky); as the principle of composition of the stanza folklore lyrics, it is considered by V.M. Zhirmunsky. Syntactic parallelism has been sufficiently studied in the structural and grammatical aspect (I.A. Figurovsky, P.O. Jakobson, G.Ya. Solganik). The indicated phenomenon is considered as a means of communication in the all-union complex sentence. For example, on the material of Russian, T.P. Karpakova, on the material of German - M.A. Ovsyannikov. Sometimes the phenomenon of syntactic parallelism is called the main means of communication of the sentence members (T.I. Belokopytova) and considers this construction as one of the main elements of the period from its syntactic ordering (N.V. Chermisina).

The informative possibilities of parallelism are being investigated by V.V. Khvorova, I.R. Halperin and others.

From a stylistic point of view, syntactic parallelism was studied mainly on the material of foreign languages, in particular, on the material of the modern English (I.M. Astafieva), on the material of modern French literature (I.A. Pulyenko, T.V. Novikova), on the material of German (N.T. Golovkina, D.M. Dreev, I.A. Solodova, G.N. Chervakova).

The place of syntactic parallelism in stylistic syntax is determined by scientists in different ways. So, E.M. Beregovskaya (3) indicates this phenomenon in the system of equilibrium and assimilation figures, i.e. figures that enhance the expressiveness of the text, emphasizing the symmetry. She notes such constructions among structurally determined figures.

I. V. Arnold conventionally divides all stylistic means into pictorial, characterizing them as paradigmatic, and expressive, characterizing them as syntagmatic, i.e. based on the linear arrangement of parts, on what exactly their effect depends, and indicates syntactic parallelism among the latter. Thus, the author calls syntactic constructions that enhance expressivity, expressive means, figures of speech or rhetorical figures.

Yu.M. Skrebnev also includes syntactic parallelism, the structure of which has a purely syntactic, constructive character, into the sphere of syntagmatic syntax.

A.P. Skovorodnikov describes a group of figures having a field organization, based on the principles of economy and redundancy in the language. The field periphery of expressive syntactic constructions is two layers. Syntactic parallelism in the system of expressive eight syntactic constructions of the modern Russian literary language is included in the second layer, remote from the center, which consists of phenomena that are not directly related to the manifestation of antinomy, economy - redundancy. I.V. Pekarskaya points out parallelism among particular syntagmatic principles for constructing expressive language/speech tools.

Thus, having analyzed the literature on the problems of syntactic parallelism, we came to such conclusions:

1. All the attention of linguists is directed to the phenomenon of parallelism or as an integral part of folklore, in particular, song lyrics, the ballad genre (E.B. Artemenko, M.R. Balina, V.I. Eremin, V.M. Zhirmunsky) and poetry (N.Yu. Rusova, V.V. Tomashevsky), either as a grammar phenomenon (G.Ya. Solganik, I.A. Figurovsky, R.O. Jakobson), or as a drill component of the so-called speech periods (the latter were studied mainly on the basis of literature of the XIX century) (T.I. Belokopytova, N.V. Chermisina); or is considered on the basis of materials of separate foreign languages (M.R. Balina, N.T. Golovkina, T.V. Novikova, I.A. Solodova, G.N. Chervakova).
2. There is no universally accepted definition of syntactic parallelism, and while this concept does not have a clear definition based on objective criteria, it is impossible to use it for stylistic studies.
3. To date, syntactic parallelism as a principle of organization of stylistic figures is not fully understood.
4. It should be noted and the lack of a single generally accepted classification of figures based on syntactic parallelism. The place of the phenomenon we are studying in the stylistic syntax is determined by scientists in different ways.
5. Often, researchers consider syntactic parallelism as a phenomenon of only artistic (especially poetic) and journalistic styles. However, constructions built on the principle of syntactic parallelism function in all styles of the modern Russian literary language. It is necessary to identify the pragmatic potential of these constructions in all functional styles of the modern literary (Russian, French) language, since the functions of structures based on syntactic parallelism, to a certain extent, depend on

belonging to a particular language style and/or speech genre.

One way or another, there are no special studies of syntactic parallelism as a principle of organizing syntactic constructions, in particular, stylistic figures. But meanwhile, you should pay attention to it, since:

- 1) syntactic parallelism is the basis for constructing some figures;
- 2) figures constructed on the principle of syntactic parallelism is a high-frequency phenomenon;
- 3) these figures are not the property of the folk song language only. They are also quite widely represented in the language of fiction, journalism, and other styles. They have a huge potential for expressiveness.

So, the relevance of the research consists, first of all, in the fact that syntactic parallelism as a construction principle and a constructive element of a large group of stylistic figures based on the material of modern Russian and French literary languages has not been studied.

## 2 Materials and Methods

### 2.1 Symmetry as the Basis for the Construction of Chiasmic Structures

All expressive syntax phenomena are somehow related to the principle of symmetry. The word symmetry itself means Greek proportionality, proportionality. "This concept is combined with the concept of asymmetry, forming a kind of unity with it. Symmetry, therefore, seems beautiful because it always compares with asymmetry. Without asymmetry, it would seem simple uneventful, monotonous". (4, p7)

According to P. Merle, (8, p95) "this concept appeared very early in our minds: a child from 3.5 years old, drawing little men, that is, reflecting the model of his kind existing in his mind, tries to convey the symmetry of the human figure in his drawing".

"Feeling the symmetry of body, - writes V.A. Soloukhin, (9, p29) - the rhythm of the processes that take place in it, a person learns to recognize the symmetry that surrounds him everywhere in nature - the symmetry of fern and dragonfly, snowflakes and pears, the frequency of day and night, summer and winter, i.e. symmetry in time. Perceiving the symmetry of the world as a natural standard of harmony, the man himself feels the need to create symmetrical things".

"A rake and a spoon, a boat and a sled, a windmill and a violin, a ladder and an armchair, a parachute and a rocket - at every step we come across man-made symmetry. We constantly meet with symmetry in different types of art: in music, in architecture, in the painting". (10, p37)

"Symmetry <...> is the idea through which man for centuries tried to comprehend and create order, beauty, and perfection". (10, p37)

As a factor organizing the matter of language, symmetry was comprehended already in the first quarter of our century. Louis Marten (11) projected the principle of symmetry into artistic speech. He stated that symmetry in linguistic facts is inconceivable without asymmetry, that symmetry, when it appears in speech, can be approximate, that any symmetric syntactic construction must have some center, even if it is not morphologically expressed, that symmetry is characteristic of literary speech, whereas spontaneous speech tends primarily to asymmetry.

The concept of symmetry is combined with the concept of asymmetry, forming a certain unity with it. According to E.M. Beregovskaya, (5, p9) "the symmetry, therefore, seems beautiful because it always compares with asymmetry. Without

asymmetry, it would have seemed simply monotonous, monotonous".

The problem of symmetry and asymmetry is not only linguistic but also of general scientific importance since symmetry has long been the subject of interdisciplinary scientific research. "The universal principle of symmetry (the term P. Curie) reveals itself both in the universal and in the spiritual world (see the works of P. Curie, A.V. Shubnikov, V.A. Koptsik, I.I. Shafransky, M. Seneschal, J. Fleck, P. Davis, G. Weil, V. Gardnek, V. Gilde, I.M. Yaglom and others). The problem flying at the junction of sciences and requiring their synthesis turned out to be so important that organizations such as the International Institute of Symmetry in Los Angeles and the International Society of Symmetry were created". (12, p3) Therefore, the appeal to the "law of laws" - symmetry - in various fields of reality is relevant.

So, in art, asymmetry sets off symmetry. Victor Hugo, the head of the romantic school, wrote in *The Les Miserables* about symmetry, "Nothing bears such a burden on the heart as symmetry. Because symmetry is boredom, and from boredom is not far to grief". In contrast, Paul Valeria presented symmetry as a guideline for comprehending true values, "... the universe is built according to a plan, the deep symmetry of which is in some way imprinted in the most hidden corners of our consciousness. Therefore, poetic instinct leads us to the truth". (8, p192,195)

According to Baudelaire, the contemplation of beauty requires a combination of both of these principles, "regularity and symmetry are the primordial needs of the human mind", on the other hand, "slight irregularities" that stand out against this regularity are also necessary to create an artistic effect, being "seasoning, an inevitable condition for the existence of beauty". (13)

As a factor organizing the matter of language, symmetry was comprehended already in the first quarter of our century. So, Louis Marten (11) projected the principle of symmetry into artistic speech. In his opinion, in linguistic factors, symmetry is unthinkable without asymmetry; symmetry, when it appears in speech, can be approximate; any symmetric syntactic construction must have some kind of center, even if it is not morphologically expressed, while spontaneous speech gravitates mainly to asymmetry.

Later, the problem of applying symmetry to linguistic phenomena was posed by S.O. Kartsevsky in the article "On the asymmetric dualism of a linguistic sign". In contrast to L. Marten, who saw the principle of symmetry in speech, S.O. Kartsevsky saw it much deeper - in the development of the language system itself. He showed the asymmetry of ambiguity and synonymy resulting from the discrepancy between the content plan and the expression plan.

Subsequently, the idea of symmetry/asymmetry took root in philology (Yu.N. Karaulov, G. Schlocker, V.G. Gak, I.I. Kovtunova, (14-15) M.K. Mugduyeva, A.M. Antipova, (16) Yu.V. Shor, (17) N.A. Kozhevnikova, and others).

Exploring the problems of semantic syntax, E.V. Paducheva (18, p181) clarifies which words and sentence segments can be considered symmetrical, "Two words are symmetric if they are composed (symmetry 1), or are subordinated to the same relationship to two words (symmetry 2), or are subordinated to the same relationship to two symmetrical lexically paired words (symmetry of a higher-order). Two segments are symmetric if their vertices are symmetrical".

In 1988, the book of E.G. Etkind's "Symmetric Compositions by Pushkin", (19), in which the author, based on an analysis of twenty poems of the poet, very different in genre and stylistic terms, traced symmetry at all levels, from the rhythmic primary element to the composition. This work clearly shows the whole complexity of symmetry: it is replete with various forms; the symmetry of the structures is broken. Therefore, more or less distinctly realized by the aesthetic subconscious, these

symmetrical constructions by the reader's perception are only vaguely guessed.

A.N. Ruwet (20) in the article "On a Verse of Charles Baudelaire" showed on the example of one poetic line from "Albatross" a manifold manifestation of the principle of symmetry (a verse that does not even constitute a separate complete sentence) *Le navire glissant sur les gouffres amers* 'ship gliding across a bitter abyss'. In the translation of Yakubovich, it looks as follows:

Often, to amuse themselves the men of the crew

Lay hold of the albatross, vast birds of the seas-

Who follow, sluggish companions of the voyage,

The ship gliding on the bitter gulfs.

In our opinion, the opinion of V.G. Haka says that "if fifty years ago the application of the term 'asymmetry' to the facts of language could seem like a metaphor, then the development of linguistics over the past half-century is not only characterized by the ever wider use of the symmetry/asymmetry pair, but also by the awareness of these categories as a reflection of fundamental features the structure and functioning of the language". (21, p 41)

The constancy of the notions of beauty, which formed the basis of the structure of the creations of the material and spiritual worlds, goes back to sacred thinking, to archaic representations of a person about the indispensable duality of everything, the presence of similarity or opposition, a couple and/or opposition. This feature of human thinking was noted by leading psychologists, ethnographers, and cultural scientists (V.V. Ivanov, V. Turner, E. B. Taylor, I.I. Dyakonov, K. Levi-Stros, V.N. Toporov, D.S. Likhachev and others).

The formal redundancy of symmetry, particular manifestations of which are various types of parallelisms and repetitions, can be called one of the fundamental signs of a classic poetic text.

Symmetry, by which we mean a certain proportionate ratio of parts to the whole and each other and/or invariance (immutability) of the structure of an element relative to its transformations.

Any binary pair or opposition is asymmetric structure, and any symmetric structure contains at least two pair elements, similar or opposite.

As a result of the analysis of scientific literature, we have identified such types of symmetry as:

- 1) reflectional symmetry – repetition of elements or structures in the reverse order, with a rotation of 180 degrees relative to the axis of symmetry (effect of the right and left hand);
- 2) translational – linear repetition of elements or structures without rotation about the axis of symmetry;
- 3) rotational – discrete repetition without semantic gradation;
- 4) spiral – discrete translational repetition of elements or structures with indispensable spatial (semantic) gradation;
- 5) asymmetry – a violation of symmetry, the presence in the symmetric structure of an "additional", asymmetric element;
- 6) antisymmetry – lack of symmetry.

A poetic text, in contrast to a prosaic one, certainly contains semantically justified elements of symmetry in its structure. And one of the main distinguishing features of the verse is the redundancy of symmetry, which manifests itself at various levels (primarily visual and sound).

Any relationship fixed by a poetic text becomes more than an accidental game of the imagination of one person, it turns into a kind of artistic system, and therefore we can talk about the connection of such structures with the nature of binary.

No matter how symmetrical the composition of the poem, asymmetric elements are certainly present in it. Absolute symmetry is practically impossible because it would be a completely dead, static system, devoid of any signs of movement and development. In nature, all living beings have pronounced external symmetry, but there is not a single symmetrical.

Using the term R.O. Jakobson and Yu.N. Tynianova, we can call asymmetry the "dominant" that creates internal movement in an automated symmetrical structure and transforms it.

The art of correct, competent and beautifully designed speech determines how much the goal of communication will be achieved - to exert any influence on the listener or the speaker. Effective speech is necessary for authors of all types of speech works, whether it is a well-known politician, newspaper or television reporter, writer or poet, although the degree of importance of having a certain impact on the audience may vary for each of them. So, for a politician, achieving pragmatically determined intentions is of paramount importance, since political speech is not just communication, bringing information to the masses, but the formation of the impressions, conclusions, assessments necessary for the speech producer. For a reporter and a journalist, the informative function and the voluntative-advocacy function are equivalent. For the poet, the main goal will most likely be self-expression, the transfer of one's worldview, feelings, emotions. His works are aimed at exerting an aesthetic impact on the reader, and the impulse of the soul, the pursuit of beauty dictate the need for colorful speech design, which is achieved using various techniques and figures of rhetoric. The principle of symmetry/asymmetry is not the only one possible for constructing a picture of expressive syntactic means in their relationship. So, A.P. Skovorodnikov (22) described a group of figures (ellipsis, anti-ellipsis, syncopation, repetition, and parceling), based on the principles of economy and redundancy in the language.

In our opinion, the principle of symmetry has greater explanatory power concerning expressive syntax, therefore, in further analysis, we will rely on it.

### 3 Results and Discussion

#### 3.1 Chiasmus: Definition and Place in the Language System

One of the most effective rhetorical figures of syntax can rightfully be called the construction of *chiasmus*, which to date has not become the object of special research.

Mention of this figure can also be found in the writings of masters of the literature of ancient times, "Replacement takes place when two phrases, different in content, are expressed by rearrangement so that a subsequent phrase opposite the first appears to follow from the first, for example, you have to eat, to live, not live to eat". (23, p291) A similar substitution is called antimetabole by rhetors or commutation.

In the "Brief Literary Encyclopedia", chiasmus is classified as one of the figures of addition and is considered as a kind of syntactic parallelism. "Chiasmus (from Greek *χιασμός* – cross-shape arrangement in the form of a letter *χ* (chi)) – the stylistic figure of antithetic parallelism: parts of two parallel members are arranged in them in sequence: A B = B1 A1. An almost constant trick is chiasmus in negative concurrency ("Not a bylinushka in an open field twisted in the wind – But my homeless head staggered..."). A sense of parallelism is usually supported by the repetition of intermediate words ("So lively are our Automedons, Our troikas indefatigable" – A.S. Pushkin). A hue of antitotality may be present in chiasmus to a varying degree: from a very strong ("We eat to live, not live to eat") to very weak ("Everything is in me and I am in everything" – F.I. Tyutchev).

The essence of it, according to the authors of the encyclopedia, is that some design is combined with another, which is the first in an "inverted" form. In a later edition of the literary encyclopedia, you can find an explanation of the modern common name -

chiasmus, descended from the Greek word "chiasmusos" - a cruciform arrangement in the form of the Greek letter "x".

*Chiasmus* as a linguistic term has existed only since the 19th century. and is known as "antimetabol", "antimetalepsy", "antimetathesis", "commutation" since the ancient world. A brief description with an example: *Live not to eat, but eat to live* - was already given in the anonymous Rhetoric for Herenius, dated 1 century BC. (The term "chiasmus" has been used only since the 19th century. Etymologically, it goes back, as noted above, to the Greek letter X ("chi"), the capital form of which has the form of a cross. Its origin is related to the cruciform structure of this syntactic figure).

The assertion that chiasmus as a linguistic phenomenon is known ... is only partially true. A terrible fate befell chiasmus: to be always in sight and to remain in the shadows. It has become the property of textbooks on rhetoric and stylistics, encyclopedias, dictionaries of linguistic terms and other reference publications - in this sense, it has a long history. (5, p 22)

But no one until the very last years did not deal with it on purpose, so today not much is known about chiasmus more than 2 thousand years ago. Meanwhile, a lot of cases, extracted from diverse and different times, including modern, texts, indicate that we are faced with a living and interesting phenomenon.

In modern linguistics, some works by E.M. Beregovskaya, who studied chiasmic constructions in English, Russian, German, Spanish and partly in French; (3-5,24) articles by A.A. Tereshchenkova, (25) dedicated to the English chiasmus; thesis of V.S. Solovyeva, (6-7) the object of study of which was the chiasmus in the work of A. Blok.

As you know, the structure of chiasmus is extremely clear: Know how to love art in yourself, not yourself in the art (Stanislavsky). And its definitions do not possess such clarity, because chiasmus, with all its external geometric harmony, has a complex linguistic nature. Some call it a double antithesis, whose members intersect, (26, p57) i.e. see in it a combination of antithesis and inversion. Others qualify it as chiasmus, (11, p47; 27; 28, p249; 29, p209) i.e. see in it primarily syntactic parallelism and inversion.

M.D. Kuznets and Yu.M. Skrebnev (29, p275) interpret chiasmus as a kind of parallelism, which consists in reproducing the structure of the lexical composition of the previous sentence, accompanied by a change in the syntactic relations between the repeating members of the sentence. In other words, for them, chiasmus is parallelism plus repetition with a change in the syntactic functions of repeating elements.

M.L. Gasparov (30, p275) defines chiasmus as a figure of antithetic parallelism, i.e. as a combination of antithesis and parallelism with a change in the sequence of elements in two parallel pairs.

In the definition given by the dictionary of linguistic terms J. Dubois, (31, p84) chiasmus is described as the inversion of two symmetrical parts of a phrase that form an antithesis or establish a parallel. Specifically emphasizing the symmetry of the chiasmic structure and the optionality of the antithesis in it ("... form the antithesis or..."), this definition calls inversion the main mechanism that forms the chiasmus.

A *chiasmus* is called "a figure of speech, consisting in the reverse ("cross-shaped") arrangement of elements of two phrases, united by one common member". (32, p508)

The definition reveals only the syntactic structure of chiasmus, i.e. the formal aspect of this phenomenon, omitting the semantic. Chiasmus, according to French linguists P. Larouss, M. Cressot, J.-F. Felizon is one of the most expressive ways to create an antithesis. Antithesis, on the other hand, is a way of existence of a binary pun structure, the comic effect of which is based on the

collision of conflicting meanings. It is for this reason that we view chiasmus as one of the techniques for creating a pun. (25, p84)

T.N. Senina and O.S. Akhmanova attributed chiasmus to structural parallelism, and P. Laruss, P. Robert consider it an asymmetric construction. In our opinion, the chiasmus is asymmetric in its cruciform arrangement of the members and the methods of antithesis.

N.I. Formanovskaya (32, p126) calls chiasmus a figure of intersection and "mirror reflection of the word order" and emphasizes the special architectonics and rhythm of the figure.

A.V. Kovalchuk 33, p93-94) singles out the functions that the chiasmus performs when filling out not individual sentences, but paragraphs and rows of paragraphs - this is the effect of growth and climax, as well as the function of combining paragraphs.

In the system of V.I. Korolkov (28) places chiasmus among the figures of connectedness, in the group of figures of association, namely in its subgroup, which the author calls "figures based on strengthening similarities". This localization of chiasmus is not objectionable.

According to the classification proposed in "Rhétorique générale" by J. Dubois (31) and others, chiasmus falls into a group of figures formed as a result of a double action "suppression-adjonction". It seems to us that in this taxonomic system his place is not here, but in the class of figures formed by rearrangement.

The textbooks on modern Russian language about chiasmus say the following, "A special figure of the word arrangement is chiasmus. In chiasmus, the components of the structure in its second part are arranged in reverse order compared to the first part of the structure: *It is swooping, swooping, down upon us! In an icy hurricane it flies, swirling in the darkness of hell* (I. Turgenev); *The southern sky hung transparently blue above us; on high the sun beamed radiantly...* (I. Turgenev); *Above the darkened gardens stars just discernible were kindling, and the sounds were gradually hushed in the village* (L. Tolstoy).

In chiasmus, accents are also often arranged in the same order as members: *Знаете, утро, когда мороз на траве и перед восходом солнца туман...* Here, the accents in the first part of the design are located in a descending line, and in the second - in an ascending line. A reverse course is also possible, when in the first part the accents are located on the ascending line, and in the second - on the descending line: *The river was calm, and the reflections were calm and clear...*

But not always the chiasmic arrangement of words corresponds to the same arrangement of accents. Both parts that make up chiasmus can be stylistically neutral in terms of phrases. This happens when one of the parts is a stylistically neutral undivided statement with a predicate preceding the subject (2nd diagram), and the other is a stylistically neutral dissected statement with a subject preceding the predicate (1st diagram): The sun hid behind the clouds and began to drizzle light rain. In the absence of accent chiasmus, the chiasmic arrangement of words is less noticeable". (14, p125-6)

M.D. Kuznets and Yu.M. Skrebnev (29, p143) place chiasmus in a circle of structures that fall within the competence of syntagmatic syntax. If we follow the internal logic constructed by Yu.M. Skrebnev's stylistic system, according to which syntagmatic syntax differs from paradigmatic in that it deals not with the problems of the sentence structure, composition, and placement of its components, but with the sequences of sentences that make up the text - if you follow this logic, then the chiasmus that most often occurs within the same phrase than in related or, moreover, context-sensitive sentences, the paradigmatic syntax also deserves attention.

The modern literature on rhetoric says that "...chiasmus can be considered as a combination of a junction and a ring since one element is repeated at the very beginning and the very end of a statement, and the second element is on the border between the parts of this statement:

1) *The breathtaking leap-frog of the executive branch is taking place ... vacuum (1) of power (2), and maybe power (1) of vacuum (2) (from parliamentary speech); ...*. (27, p268)

An attempt of a comparative analysis of the chiasmic construction based on the material of Indo-European languages was made by E.M. Beregovskaya, (4) which gives a rather voluminous definition of this phenomenon, "Chiasmus is a transformational syntactic figure in which both the transform and the original form are given, and the transformation includes from one to three operations:

- 1) permutation of the elements of the original form according to the principle of mirror symmetry (inverse parallelism);
- 2) double lexical repetition with the exchange of syntactic functions;
- 3) change of the meaning of a polysemic word or replacing one of the words of the original form with its homonym". (4, p16)

The first operation is necessary and sufficient for the formation of a simple syntactic chiasmus, the first and second form a semantically complicated chiasmus, all three together - a chiasmic pun.

The volume of the definition is not surprising, because several figures are involved in the formation of the structure of the chiasmus. This, as already mentioned, such syntactic and lexical expressive means as syntactic parallelism, inversion, repetition, antithesis, if necessary - an ellipse.

A *chiasmus* is a kind of syntactic parallelism with the opposite, "cross-shaped", word order in the second, parallel construction (33, p198-211): *I have my eye on it and worry, My heart is beating in dismay...* (A. Blok "I Bless My Lucky Stars Above"); *As the crowd applauded around the idols, overthrows one, creates another, And for me, blind, somewhere shine Holy fire and youth sunrise!* (A. Blok "As The Crowd").

D. Feling highlights the external arrangement of the repeating parts. For him, chiasmus is "the cross-arrangement of two correspondences, whether it be two opposed pairs or opposition and repetition", (4, p116) i.e. binary construction with direct and inverted word order in which antithesis and repetition are possible.

Antithesis and repetition as the main chiasmus-forming moments appear in the definition of C. Todorov. (34, p207) It emphasizes that chiasmus is the relationship between two words, which in the second part of the phrase is repeated in inverted form.

P. Bacry (35, p282) sees in chiasmus a cross-arrangement of two syntactic segments (AB - BA), which connects in the center, on the one hand, and along the edges, on the other hand, elements of the same nature or performing the same function.

According to J. Dubois and his followers, (36) "... at the beginning of the period a certain order can be set, symmetrically opposed to the order of its deployment. This technique is called chiasmusus.

Traditionally, *chiasmus* is associated with central symmetry, which can manifest itself both semantically and grammatically; here we give examples where central symmetry affects syntax.

*Le passé me tourmente et je crains l'avenir* (Corneille)

'The past torments me and I fear the future'

*Charles se sentait défaillir à cette continuelle répétition de prières et de flambeaux, sous ces odeurs affadissantes de cire et de soutane* (Flaubert)

'Charles felt himself fainting at this continual repetition of prayers and torches, under the scorching smells of wax and cassock.

In the last example, we are dealing not only with the inversion of the "adjective + noun" group: here in the singular with two definitions - plural nouns - the plural name is opposed with two definitions - nouns in the singular. (36, p150-1)

A special place in the structure of chiasmus belongs to the reception of syntactic parallelism. Sometimes chiasmus is considered as a variation of the latter, "Cases of inverse parallelism are characteristic of poetic speech ... in which the construction components in the second part are arranged in the opposite order compared to the first part: *In the evening came the quiet sun, And the wind carried smoke from the chimneys* (A. Blok). *Her black eyebrows are thin, And harsh speeches are intoxicating...* (A. Blok)". This, in our opinion, is a case of exactly the opposite parallelism, but not chiasmus in the full meaning of this word. Inverted concurrency, according to E.M. Beregovskaya (4) represents a primitive, purely syntactic chiasmus. In general, the chiasmic structure is more complex, in character it is most often aphoristic. Syntactic concurrency is a repetition at the syntax level, where the syntactic construct itself acts as a reduplicator or repeated unit. B.N. Golovin in "Fundamentals of Speech Culture" gives a very successful example in which the expressiveness of a poem is achieved precisely by repeating syntactic structures, usually accompanied by a lexical repetition - a poem by R. Rozhdestvensky:

I am bribed...  
I am bribed without a trace...  
I am bribed by Kronstadt's blistered ice...  
I am bribed by military commissars...  
I am still bribed with snow white and white...  
I am bribed by the blood of the fallen in the forty-first...  
And I am bribed by a random bonfire...  
I am bribed by both Palanga and Kizhi...  
I am bribed by a nascent word...  
I am bribed by Mayakovsky and Svetlov...  
I am bribed.  
I am bribed with giblets.

Syntactic parallelism can give a rhythm to poetry and prose works. Here is what B. Shalabayev (37) writes about this, "Prose works also have their rhythm, a rhythm of their pronunciation. Here is an excerpt from the drama 'Kozy Korpesh - Korpesh - Bayan Sulu':

"Жел Баян деп ызындайды, көл Баян деп теңселеді,  
Өзен Баян деп ағады, Тау Баян деп күңіренеді,  
Көк Баян деп күрсінеді!  
Анам Баян деп мұңаяды, балаң Баян деп толғанады". (37, p 172)

(The wind flies at Bayan, the lake is staggered by Bayan,  
The river flows through Bayan, Tau Bayan,  
The Kok Bayan is squeezed!  
My mom is sorrowing at Bayan, my child is filling with Bayan).  
It is plain to see that we get a kind of verse novel thanks to the appropriate syntactic design.

G.N. Chervakova (2) says that theoretically, the repetition of the sentence model in the figure of parallelism should be purely grammatical, i.e. exclude lexical repetitions. However, according to the observations of the scientist, linguistic material most often has examples in which the grammatical repetition is closely intertwined with the lexical and interacts with it. Emphasizing that the influence of lexical content should certainly be considered, the researcher considers the repetition of the syntactic drawing in the figure to be the leading.

In the construction of *chiasmus*, one can just observe the integration of syntax and vocabulary, not in vain the other name for this phenomenon is "antithetic parallelism". The antithesis is attributed to the lexical-syntactic means of syntax, its essence

lies in the contrast/opposition of ideas within the framework of the syntactic structure. Contrasting necessarily involves the use of words expressing opposite meanings, i.e. antonyms. Antithesis is a technique that almost all poets resort to, let's turn to A.S. Pushkin:

1. They met...  
Water and stone,  
Poetry and prose,  
Ice and flame  
Were not more different than they.  
2. Besides the enthusiasm of youth  
Could never hide a single thing,  
Love, hatred, pain or gladness,  
It will blurt out quite readily.  
3. But the summer in these northern parts  
Of southern winters is a caricature,  
It flashes and is gone: this is known for sure,  
Though we do not admit it in our hearts ("Eugene Onegin").

The antithesis itself is quite a vivid phenomenon, in style, there is another expressive tool - the so-called *oxymoron* - a technique based on the opposite, on a combination of seemingly completely non-valent words directly opposing each other in meaning, for example: terribly beautiful, terrifying glad stunning silence, etc. Oxymoron is not a rare phenomenon in poetry:

The Lord speaks from the throne  
Opening the window over the edge,  
"Oh my faithful slave, Mykola,  
Go around Russian edge.  
Protect there in black troubles  
With sorrow tormented folk.  
Pray with them for victories  
And for their beggar comfort" (S. Yesenin "Rus").  
There's nothing else to count  
They ripen under the cold sun.  
Papers even mess up  
And they don't know how to (S. Yesenin "In the Caucasus").

The antithesis framed by the geometrically correct syntax is an even more effective means that increases the chances of the poet and writer to "reach out" to the heart of his reader. In turn, wit, the brightness of chiasmic constructions is a direct effect of the antithesis, if the syntactical arrangement gives the poem a clear rhythm, melody of intonation, the beauty of the syllable, then the chiasmus is due to the pun effect by promoting lexical means: Russia is plagued by two great misfortunes:

the power of darkness at the bottom  
and the darkness of power at the top (V.A. Gilyarovskiy).  
You call pirates Pilates.  
I call Pilates pirates.  
You - because it's hard to say.  
I - because I know Pilates (F.D. Krivin).

EM. Beregovskaya (4) calls this kind of chiasmus a *chiasmic pun* (examples of the so-called chiasmic pun are borrowed from the book of "Expressive Syntax" by E.M. Beregovskaya).

This pun is based on polysemy, sometimes metaphorical use of words. No less bright is the chiasmus built on the antonymy of words that cannot be considered antonyms in the full sense of the word:

Friendship like this is quite unknown to us.  
We prejudge others with bigotry,  
And write them down as ciphers merely,  
Deeming ourselves alone as worthy (A.S. Pushkin "Eugene Onegin").

The words "cipher" and "alone" should be considered as contextual antonyms. In a specific example of the expressiveness of the construction and the preservation of rhyme, ellipsis contributes to the intentional omission of any member of the sentence, which is easily recoverable and understandable from

the surrounding context. While maintaining the completeness of sentences, the rhythm-melodic structure of the verse may be violated:

Friendship like this is quite unknown to us.  
We prejudge others with bigotry,  
And write them down as ciphers merely,  
Deeming ourselves alone as worthy.

The antithesis may not be present as clearly as in the above lines, but the contrast between the two parts, between the two sentences that form the chiasmus, is not in doubt:

Sing a song, poet,  
Sing.  
Chintz sky so Blue.  
The sea is also roaring  
Song.  
They were 26.  
26 they were,  
26.  
No one will forget  
Their execution  
On 207th  
verst (S. Yesenin "The Ballad of Twenty-Six").

The author resorts to the "violation" of the mirror image of the first sentence in the reverse order, placing the predicate "was" in the final position. This arrangement makes it possible to distinguish a verb as a rheme, thus contrasting it with the contents of the first part: even without reading the following lines, it will not be difficult to understand that those twenty-six in question are the deaths of heroes. The repeated appearance of chiasmus already in a truncated form at the beginning, middle or end of each poetic verse shows the poet's attitude to his heroes. In the given case of the chiasmus, the main role belongs to repetition, here the original syntactic structure and its lexical content are preserved.

Taking the concept of overexpression introduced by O.A. Krylova and E.N. Remchukova, (38, p62) by which the authors understand "... such a stylistic device, which is the result of stringing homogeneous or combining dissimilar means within the same statement", can be called a chiasmus not so much an expressive or expressive tool, but a hyper expressive syntactic-stylistic device that concentrates repetition, inversion, antithesis, syntactic concurrency, ellipsis in various combinations.

The basis and obligatory component of the chiasmic construction remains the figure of parallelism of syntactic structures. The correlation of chiasmus and poetic works will most accurately be expressed directly through the most discussed construction: chiasmus: the pragmatics of poetry: the poetry of pragmatics, paraphrasing the famous title of the book ("The Prose of Life or the Existence of Prose"), which has become an aphorism. If it is necessary to decode what has been said, it can be noted that this is one of the most beautiful, accurate, vivid figures of rhetoric or modern stylistics, which demonstrates the wit of the author, his skillful use of stylistic means - in this meaning chiasmus is a poetic design of the addressee's pragmatic intentions. On the other hand, chiasmus is one of the designs that are most often found on the material of poetic works, and also allows you to save not only the rhythm and rhyme, but also implements all the author's attitudes, expresses his attitude, his assessment (an example of this is the above-mentioned poem by S. Yesenin).

#### 4 Conclusion

Looking ahead, we note the practical absence in the linguistic literature of any work devoted to the characteristics of the chiasmus, which emphasizes the importance of the attempt made to fill the gap in science in this direction. This work is the first step in studying the chiasmic constructions of the Russian and French languages in a comparative aspect.

Mirror symmetry is a *sine qua non* condition for chiasmus. All syntactic operations that are involved in the construction of a

complex framework of chiasmus — inversion (rearrangement), parallelism, double-cross lexical or semantic repetition with the exchange of syntactic functions of repeating elements — all this is perceived as a relatively arbitrary axis of symmetry, but real tangible in each case. The axis of symmetry is expressed either by a union (union word) or by an elongated syntactic pause (graphically it is transmitted by a dot, comma, semicolon).

To summarize, we can propose the following definition of a chiasmus: chiasmus is a transformational syntactic figure in which both the transformation and the original form are given, and the transformation includes from one to three operations:

- 1) rearrangement of elements according to the principle of mirror symmetry (inverse parallelism);
- 2) double lexical repetition with the exchange of syntactic functions;
- 3) change of the meaning of a polysemic word or replacing one of the words of the original form with its homonym.

The first operation is necessary and sufficient for the formation of a simple syntactic chiasmus, the first and second form a semantically complicated chiasmus, all three together - a chiasmic pun.

The lexical background, on which the chiasmic construction unfolds, can enhance its symmetry: the more unconstitutional elements of the left side are repeated in the right, the brighter the architectonics of the chiasmus appears, the more symmetrical the whole structure becomes. The maximum symmetry of the structure is manifested in those chiasmus of the second kind in which the lexical content of the right and left parts, not separated by context, completely or almost completely coincides: *This is when we feel bad, we think: And somewhere it's good for someone. And when it's good for us, we don't think: But somewhere to someone - it's bad* (V.M. Shukshin); *One man is worth a hundred and a hundred is not worth one* (proverb) – One man is worth a hundred, and a hundred is not worth one.

But in many cases, we note some deviations from the ideal symmetry of the chiasmic scheme, since here we have stylistic symmetry, one of the most important features of which consists, as shown by D.S. Likhachev, (39) in the incompleteness of the symmetrical construction, "... both terms of symmetry, although they speak about the same thing, they speak differently. This inaccuracy of the correspondence of both terms of symmetry is associated with the characteristic difference between the poetic description and the scientific description. The first is always somewhat "inaccurate": the metaphor is inaccurate, metonymy is inaccurate, and any artistic image is inaccurate. This inaccuracy in art is of a special kind: it is dynamic, it is always as if filled out by the reader, listener or viewer. Thanks to this inaccuracy, the perception of a work of art is, to a certain extent, co-creation. It's as if we are solving a certain task posed before us in a work of art". (39, p172)

This shows a general pattern, which is stated in Dubois's rhetoric as follows, "We can say that there is no poetry without figures. But there are figures without poetry". (40)

We can say that chiasmus maximally manifests the principle of symmetry, which underlies the affective syntax. The striking ornamentality of the chiasmus, its playful, dynamic character and the possibilities of diversity in uniformity make chiasmus a very attractive form for the artist of the word.

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## CURRENT QUALITY ASSURANCE METHODS FOR HIGHER EDUCATIONAL ACTIVITIES

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**Abstract:** The article substantiates the need for the modernization of organizational structures of higher educational management in the context of innovative development. The experience of the creation and functioning of innovative educational structures is described. The article reflects the role of intra-departmental control as part of the higher educational management system. Systemic changes caused by the processes of modernization of higher education necessitate the improvement of the management system of a higher educational institution, the organizational structure of management, and the introduction of more effective management methods.

**Keywords:** quality assurance in education, higher education, higher educational management, intra-departmental control, educational program committee.

### 1 Introduction

The educational community is aware that the project and research-based methodologies contribute to the development of the most important creative, orientational, and general competency-based abilities and skills. However, it is still difficult to single out the personality-related qualities and abilities that are most successfully developing during the implementation of research activities; as well as to substantiate their importance for socialization and professionalization, and to propose methodologies for consolidating educational outcomes. (1, 2) A solution to this problem could contribute to a change in ideas about the content of specialized learning. (3-6)

Many practitioners raise the issue of developing narrow-subject teaching research methodologies. However, it is not the methodology that matters, with the widespread implementation of research results, the key is the question of changing a teacher's position: either refusing the image of a bearer of an amount of ready knowledge or switching to the functions of an organizer and analyst of students' independent work. (7, 8) It is important that a teacher knows how to highlight problems in the teaching material and motivate students to creatively solve them; independently develops a methodology for research work, otherwise, he/she returns to the beaten path of reproductive individual work with students (such as, for example, tutoring). In this aspect, it is important that a teacher possesses the culture of research and research thinking, mastering the methods of designing such forms of educational activity in which the teacher would be an ally in relation to students, a senior friend in solving educational legal problems.

### 2 Materials and Methods

The modern environment determines the number of features of higher educational management including

- The multiplicity of higher educational goals;
- The complexity of the system of interconnected processes;
- Many control channels;
- Close interconnection of controlled processes;
- System management with no clear boundaries;
- The high inertia of a higher educational institution as a system;
- A high level of democracy in governance;
- Increasing, in recent years, the degree of independence of a higher educational institution's units and, as a result, decentralization in management;

- Widespread use of information technology in the activities of a higher educational institution. (9)

The above-listed factors actualize the analysis of higher educational management problems and the search for new managerial models that can increase the susceptibility of higher educational institutions to new requirements and adaptability to new operating conditions.

### 3 Results and Discussion

Educational program committees (EPCs) are established in the structure of some Kazakh higher educational institutions. An EPC consists of qualified teaching staff who have experience in methodological work in relevant educational areas, health care practitioners, and students. The main goal of EPCs is to improve the educational process at a higher educational institution.

The main objectives of the EPC are

- Systematic implementation of the principles of the educational model in accordance with competency-based training at all levels of education;
- Control over educational and methodological support and the educational process assistance at a higher educational institution;
- Scientific and methodological support for the implementation of educational programs;
- Monitoring the implementation of innovative educational technologies and promising forms of organization of the educational process;
- Assessment of the quality of educational programs in areas of specialization and development of recommendations for quality improvement;
- Coordination of the intra-departmental control activities;
- Systematization and control over the provision of the educational process with educational and methodological literature.

The following activities are carried out by EPCs:

1. Examination of educational programs within specialty areas.
2. A systematic study and comprehensive assessment of educational programs with the aim of improving and guaranteeing their quality (determining the value of the program, achieving the goals and the required degree of compliance with the needs of society and the requirements of employers, and achieving the effectiveness of training methods).
3. Monitoring the formation of specific competencies among students, interns in each discipline within the framework of educational programs; Participation in the preparation of projects and peer review of standard curricula.
4. Monitoring the implementation of innovative educational technologies and promising forms of educational process organization in a higher educational institution.
5. Planning and reviewing elective disciplines with the determination of the place of study, pre- and post-requisites.
6. The selection of optimal methods for assessing key competencies of students and quality monitoring.
7. Monitoring the preparation of teaching and methodological complexes of disciplines for their compliance with regulatory documents such as instruction letters, state compulsory education standards, standard discipline programs, and educational competency-based models; discussion and approval of work programs and their vertical coordination.
8. Determining the need for the development and publication of textbooks and teaching aids for the relevant specialties;
9. Planning for the production of textbooks, teaching aids, methodological recommendations, teaching, and methodological complexes, and their review and discussion

followed by approval at the HEI (higher educational institution) Methodological Council.

10. Independent review of teaching materials submitted by the staff of the associated departments for approval by the Committee.
11. Analysis of the quality and procurement of teaching materials within specialty areas.
12. Coordination of educational and methodical work in the departments, discussion of plans and reports of departments concerning the optimization of the educational process; providing advisory and methodological assistance to departments in the preparation of educational programs at all levels.

In view of the goals and objectives, in addition to the EPC chairman, deputy chairman and secretary, the following functional responsibilities of the Committee members are provided for experts monitoring the educational process in accordance with technologies (innovative, interactive ones, etc.), courses and specialties; a test expert; an expert dealing with educational programs; experts dealing with teaching practicum; an expert assessing competencies; a person responsible for the analysis of methodological support, publishing, and advisory work.

The following expert groups are to be created in order to effectively carry out functions within the EPC:

1. Expert group for the development and assessment of educational programs;
2. Expert group for monitoring teaching quality;
3. Expert group for educational and methodological support of educational programs;
4. Expert group for development and assessment of testing tools;
5. Section for the implementation of 3-language learning.

The most important function of the EPC is the constant analysis of the educational process, monitoring educational programs within disciplines. As part of this activity, the continuity of pre- and post-requisites is monitored; a catalog of elective disciplines for undergraduate, internship, master's-level and doctoral studies is formed; the educational path is adjusted according to the declared competencies of a graduated specialist. EPCs participate in the development of educational standards and programs within specialty areas; EPC chairpersons are part of the Central Methodological Council (CMC).

EPCs are actively involved in creating integrated training programs. For example, departments and modules included in the EPC for basic disciplines have mastered the methodology of conducting integrated lectures. The departments of such an EPC are currently developing a methodology for the integrated teaching of basic disciplines based on the PBL method.

Another relevant area of EPC activities is the development of trilingualism in education. EPCs are doing a great job of introducing elements of trilingualism in the disciplines within a specialty, as well as individual work programs aimed at professional language learning.

Therefore, the EPC is the entity responsible for the direct creation, implementation, and monitoring of educational programs including methodological support for them. A lot has been done and is being done but more needs to be done to achieve our common goal - the formation of a highly competitive specialist.

The most important tool for assessing and monitoring the implementation of educational activities is the intra-departmental control (IDC). IDC exists as a tool for continuous monitoring of the learning quality, the work quality of each teacher, and of the department as a whole. IDC is aimed at assessing and analyzing the level of professional and pedagogical competence of a teacher, providing educational activities and, ultimately, assessing the student training quality.

In the narrow sense, IDC is a system for evaluating the work of each teacher by conducting open classes and by attending classes mutually. In this case, control is carried out by direct observation and a report on the results of such observation. Mutual attendance of classes enables assessing many teacher competencies such as the knowledge and the application of teaching methods and technologies including active and interactive methods; the level of knowledge on the topic of the lesson (subject and teaching discipline); time management; communication skills; the ability to maintain motivation and student interest; the ability to organize productive student activities during the lesson; providing feedback; using formative assessment, etc. Mutual visits are most productive in terms of assessing the performance of teaching staff.

An interesting and important point is the fact that in the process of mutual visits and reports on them there can be several options for interactions. (10, 11) The first option is when a more experienced (more competent) teacher evaluates the work of a younger and less experienced one. In this case, in the control process, to a large extent, there is an element of mentoring and training via feedback from an experienced colleague. The second option is when a less experienced teacher is present at the lesson of a more competent teacher. At the same time, one should not confuse it with a demonstration lesson carried out specifically for the purpose of training young teachers. In the case of IDC, a less experienced teacher is required to evaluate the work of a more competent one. In this case, a number of the following interesting problems are solved: the junior colleague must give an objective assessment despite the pressure of the authority of the senior colleague; the senior colleague must adequately and kindly accept the assessment, the view from the young colleague by showing a model of correct reflection. Both teachers get the opportunity to learn something new from the point of view of pedagogical technology and from the point of view of pedagogical psychology. The third option is to attend a lesson conducted by a teacher with an equal competency level. In this case, the assessment will probably be the most objective since there is some healthy competition in the assessment. An evaluator unwittingly imagines himself/herself in the same situation - "how would I conduct a lesson on this topic (using this technique)."

However, mutual attendance of classes is not only productive but also the most time-consuming method of control. Ideally, attending classes for an objective assessment should occur from its start to finish. This means that the supervising teacher himself/herself must be completely free from all types of work (academic, clinical, scientific one, etc.) for this time. It is especially difficult to organize this with sufficient multiplicity.

Modern technologies enable solving this problem differently - via the use of video recordings of a practical lesson, lecture, training, real work, etc. Moreover, the video recording of the lesson allows for debriefing (analysis of the lesson) with the participation of a greater number of teachers of the department (or the entire department), to review and analyze the key points of the lessons repeatedly, to work out the positive and negative sides more deeply. Particularly promising and relevant is the use of video recording of an active teaching method. The method of debriefing has proven itself in conducting training for the assimilation of practical and communication skills by interns. It is also very productive in the process of mutual control and self-training of teachers. This control tool can be indispensable for monitoring the work of part-time workers.

Another very important component of IDC is the peer review of the methodological support of classes. It is very important for the formation of effective teamwork that all the teachers of the department, not only the headteacher and the head of the department, participated in the examination of the educational and methodological developments, work programs, syllabuses, visual aids, and presentations.

An IDC method is also a cross control of the educational achievements of students. It can also be a midterm (intermediate) control by another teacher (usually a more experienced one). In

the case of part-time workers, such control should be organized and carried out as mandatory (a full-time teacher, usually an assistant professor or professor, carries out mid-term control of a group of students who studied with a part-time job). Crosschecking can also affect the assessment of students' assignments (essays, presentations, creative assignments, discussions, projects, etc.). The next significant component of IDC is the mutual examination of the developed test tasks and tasks for assessing practical skills (situational tasks, simulation scenarios, and tasks for objective structured practice exam).

A very important component of IDC is the assessment of the process by students themselves. First of all, this refers to the assessment of a teacher's work by students. Such feedback (usually in the form of an anonymous questionnaire) is most unbiased, of course, only if the learning process is completed at a given department. However, feedback in the form of questionnaires, interviews, or open discussions is also possible within the team between teachers.

The ultimate goal of any method and form of IDC is to increase the effectiveness of the pedagogical process, increase the level of competence of teaching staff, and improve the mastering of the students' professional competencies. IDC, subject to constant and continuous use, is the most effective tool to increase the level of competence of the department teaching staff. An open and friendly discussion of the IDC results works to consolidate the department as a team of like-minded people.

The case-study method or the specific situation method is a method of active problem-situational analysis based on learning by solving specific situations (solving cases).

The main purpose of this method is to train students for solving specific problems. There are the following classical case-study schools: Harvard (American) and Manchester (European) ones. (12-14) The implementation of the method at Harvard Business School began in 1924. The Case Clearing House of Great Britain and Ireland was created in 1973 at the initiative of 22 higher educational institutions; it has been called the European Case Clearing House (ECCH) since 1991 and is the leader in collecting and distributing cases.

The teacher provides problematic questions on the topic together with a described situation. Students show interest and try to solve a specific problem by analyzing and synthesizing the information received. (15-17) In order to solve a case, the following is recommended:

- 1) Students work in groups of 4 to 6 people;
- 2) A group selects a coordinator who will try to engage all members of the group to participate so that no one monopolizes the work;
- 3) The coordinator activates the attention of the group if it decreases;
- 4) The coordinator proposes solutions;
- 5) The coordinator writes down the above solutions;
- 6) The coordinator will act as a representative of the group to state the final solution.

Students and a teacher built an associogram that helps students to better remember and learn teaching material. A project is a set of actions specially organized by a teacher and independently performed by students. These actions culminated in the development of a creative product. The project is valuable because, in the course of its implementation, students learn to acquire knowledge on their own, gain experience in cognitive and educational activities. (18-20)

When studying the methodology of using modern approaches and teaching methods that improve the quality of teaching, teachers should know that there are distinguishing features of non-standard tasks different from traditional ones.

Distinctive features of non-standard tasks from traditional ones are as follows:

- 1) Creative approach;
- 2) An independent students' search of ways and solutions to the educational task;
- 3) The active reproduction of previously acquired knowledge in unfamiliar conditions;
- 4) Unusual working conditions.

The success of the professional activities often depends also on knowledge of a foreign language, which is necessary when interacting with foreign partners, colleagues, as well as for detailed familiarization and preparation of various documents. (21-23) It is generally recognized that the motivation of students is half the success of a teacher. Today we need to take care of the role of youth education, so we must grow up healthy, young, intelligent, harmonious and patriotic professionals. Teachers should pay attention to students' reading, not only scientific and educational literature but also the press (media).

The assessment of educational outcomes is an integral and important part of the activities of educational institutions. In modern higher education, various approaches to assessing the results of education are practiced, nevertheless, each of them must answer one or several questions such as "what, when, whom, by whom and how to evaluate?"

The effectiveness of the educational program, each studied discipline, as well as the educational process as a whole directly depends on the goals and objectives of the training, the achievement of educational results and the compliance of monitoring and evaluation tools with expected results. The most commonly used method for assessing educational outcomes at a university is testing. A test is a method of measuring a learner's ability, knowledge, or activity in a particular field.

The state, society, employers, students, and their parents are interested in improving the quality of education. At present, most HEIs in Kazakhstan are primarily focused on fulfilling the requirements of the state, as reflected in state compulsory education standards, and indicators of state certification and accreditation of HEIs. Both can be considered as regulatory requirements for educational services, the need for which is a condition for the existence of HEIs financed from the government budget.

Employers are most interested in university graduates since it is in the real economy that the result of an educational service, expressed in the knowledge and skills of a graduate, can fully manifest itself. Therefore, it is obvious that, with potential employers, universities should determine which characteristics of graduates are most significant for them. At the same time, not all employers are now able to formulate impartially and competently their own requirements for graduates. Therefore, the marketing of potential employers should be active, i.e. it should be not only studying but also shaping the demand for future graduates. As a result, a number of wishes (requirements) of enterprises will be obtained.

When creating systems for ensuring and assessing the quality of higher education institutions, various approaches to quality management, as well as methods and criteria are used. There are three main methods for assessing quality, which is somewhat close, but still differ from each other:

- The assessment method for quality management of university activities (SWOT analysis);
- A concept based on the principles of Total Quality Management (TQM);
- An approach based on the requirements of international quality management standards ISO 9000:2000.

The quality assessment method based on the SWOT analysis involves a systematic self-assessment to identify the strengths and weaknesses of the university, as well as positive and negative factors of its development. Based on the use of this method, measures are developed and proposed for resolving problem situations and improving the activities of higher educational institutions.

In accordance with the terms of the evaluation method, performance assessment is based on statistical data obtained from the centralized services of the university (planning and financial department, accounting, research department, personnel department, etc.), annual reports of departments and information provided by deans of faculties. Based on these data, relative indicators (per teacher, researcher, and student) are calculated for the university as a whole, as well as for each faculty individually.

Based on the data obtained, a self-examination report is prepared. The purpose of the self-examination report is to analyze all aspects of the university's activities that affect the quality of education and scientific research. In the process of conducting a university self-assessment, a SWOT analysis is used, which involves identifying the strengths and weaknesses of the university, as well as the positive and negative factors of its development. A particularity of this method is that its parameters and characteristics may vary depending on national and local characteristics.

The quality assessment method based on the principles of TQM is based on a deeper analysis of the university as a producer of services. The TQM concept assumes that the university has a clearly formulated mission, strategic goals that are developed as a result of comprehensive studies of the needs of the external environment in the basic services of the university. The TQM method implies a process approach to the activities of universities, uses a number of specific, quite complex, but very effective methods and tools of quality management. (24)

When choosing a TQM strategy, quality in the broad sense of the word becomes the main goal of the organization's functioning. It is not only about the quality of the actual services or products, but about the quality of the organization's interaction with the outside world, the quality of its functioning and management, the quality of life of its employees.

In addition, another method, based on the requirements of international quality management standards ISO 9000:2000, involves identifying stakeholders, their requirements for services' quality, creating a system for continuous improvement of activities. This method is based on the fundamental principles of quality management including the process approach. In it, unlike the TQM model, a key management toolkit is a documented management system focused on quality.

In particular, such documents as "quality manual", "document management", "personnel management", "classroom management", "logistics management", "library information resource management", "management of the applicants' selection process", etc. are being developed. In order to support and ease the use of this documentation, an information model of the quality management system is created, access to which is available to all interested audiences. A feature of ISO-based models is that they do not imply uniformity in the quality management structure and uniformity of documentation.

In accordance with the requirements of international standards, the quality system is interpreted as a quality management system consisting of three subsystems: a quality management system, a quality assurance system, and a quality confirmation system. (25-27) Quality management is based on documentation in which all processes are described (documented), as well as the actions of process participants to achieve the required level of quality. The necessary documentation is available in each university including technological documentation (educational programs), regulations on structural units, internal audit plans, etc. (28-30)

Technological and regulatory documents form the foundation of the entire quality management system, so it should be brought into line with modern requirements (including the requirements of state standards).

The mandatory documents of the quality system include:

- Quality objectives and policies,
- Instruction on quality management,
- Description of processes,
- Description of the interaction between processes,
- Registered data on quality (quantitative indicators).

Currently, HEIs, on the basis of the above methods, use the following models of quality management systems:

1. EFQM (European Foundation for Quality Management) model. Among European organizations, the most popular model is that of the European Quality Award developed by the European Foundation for Quality Management (EFQM). The use of the EFQM model implies not only a competitive assessment but also a serious diagnostic study and measurement of the capacity and effectiveness of the organization's management potential, an assessment of the maturity of the management system in relation to a benchmark, identification of strengths, as well as areas where improvement is advisable. It also uses two groups of criteria, like the industry competition model.

2. Model of the American "Baldrige National Quality Award" in the field of education. In order to achieve excellence, this model is based on the following educational criteria: leadership, strategic planning, focus on students, stakeholders, and the market, measurement, analysis and knowledge management, focus on faculties and staff, process management, and results.

3. Model of a quality management system based on the international standard ISO 9001:2000. This model implies a demonstration of the university's ability to produce services that satisfy consumers; moreover, their needs are regularly monitored and studied. In accordance with the requirements of the standard ISO 9001:2000, the main goal of a HEI should be to increase the satisfaction of individuals, society and the government in educational services, training of specialists, scientific products, etc.

4. Model of the Association of Universities in the Netherlands (VSNU). The basis of this model is the idea of dividing all HEI activities into three main business processes: educational activities, research, and services offered to society.

5. Benchmarking model for Australian universities. The purpose of this model was to develop the perfect Benchmarking Guide for Australian universities with the aim of conducting a self-assessment and independent evaluation of their activities and the results obtained and evaluating the university's quality management system. (31) The benchmarking guide is intended.

- To provide the university top management with tools to identify development trends and conduct continuous improvement of activities;
- For structural departments of universities that wish to compare the quality of various types of their activities;
- To determine the competitiveness of the university.

6. Model of the Center for Higher Education Policy Studies (CHEPS) of the University of Twente (the Netherlands). The model is based on a self-examination guide developed as part of a cooperation project between the Center for Higher Education Policy Studies (CHEPS) of the University of Twente and the Information Scientific Center for State Accreditation of the Russian Federation. The basis of the self-examination is the so-called checklist, which is a combination of various indicators, questions, and requirements divided into several blocks and covering almost all aspects of the educational institution.

7. The Belgian-Dutch model (HBO Expert Group) or "Method of improving the quality of higher education based on the EFQM model" was developed in 1999 by an expert group consisting of representatives from the Netherlands, Denmark, and Belgium. The method is focused on issues of quality management in higher educational institutions and can be used to conduct self-assessments and determine orientations for improving the activities of an educational institution, and allows universities to carefully prepare for external testing.

8. The standards and directives of the ENQA (European Association for Quality Assurance in Higher Education). The ENQA was created in order to coordinate the development of European quality standards and solve the problems of certification and accreditation of educational programs and institutions. In accordance with the decision of the Berlin Declaration, ENQA has developed "Standards and Guidelines for guaranteeing the quality of Higher Education in the European Region". This document is the basis for building systems of the internal and external assessment and the quality assurance of education and accreditation of the European agencies for assessing the quality of education.

Each model is used in HEIs in different countries in function of the policy and structure of an educational institution. Kazakhstan, for example, has chosen a management model based on the requirements of international quality standards ISO 9000:2000. The choice of model is most likely due to the following advantages:

- The transformation of the educational process into a modern system focused on quality, i.e. oriented on the satisfaction of the needs of interested parties and primarily a student, as the main consumer of education;
- Improving the quality of applicants' recruitment;
- Increase in student attendance and academic performance;
- Advantages in licensing and certification;
- Measurability of indicators by which teaching work is assessed;
- Enhancing the teacher competency level, improving the qualification level for the conduct of disciplines;
- Clear planning of the lesson schedule, early communication of changes in the schedule and replacements of teachers;
- Streamlining the management of external and internal documentation including in cases of changes made to the documentation, and familiarizing specialists with them;
- Enhancing the competitiveness and the image of the teachers of higher educational institutions;
- The clarity of the activities of the university accreditation indicator "the effectiveness of the university system to ensure the quality of education."

The advantage of the quality management system (QMS) is that the system covers all the activities of higher education institutions without exception. The QMS in an educational institution, like the quality management system in any other organization, considers the entire technological chain of activities according to its processes. The process approach inherent in the international QMS standard clearly regulates research and analytical work, planning and quality control of educational services, internal audits, educational work, market analysis, and customer satisfaction assessment, as well as complaint management. The quality management system also regulates such activities of an educational institution as personnel management, and infrastructure, which includes not only educational buildings but also social facilities, as well as the management of the professional educational environment. (32)

#### 4 Conclusion

The intra-university quality system of the educational process is monitored at 4 levels. Student-level monitoring is carried out to identify students' satisfaction with the quality of the educational services provided. The form of diagnostic procedures, in this case, is a questionnaire. The timing of the diagnostic procedures is 2 times a year (questioning students to identify the degree of satisfaction with the quality of the educational services provided and the questionnaire "Teacher through the eyes of a student"). In order to conduct questionnaires, they are developed and constantly reviewed (in view of changes in the organization of educational and other processes at the university), then approved by the rector. An analytical report is compiled in accordance with the results of the questionnaire. This report is discussed at the academic council of the university, educational and methodical councils of faculties, who compile an action plan.

The department-level monitoring is carried out to identify experience in the use of new teaching technologies, exchange of experience, to relate the quality of teaching to learning outcomes, to identify the reasons for the low level of students' assimilation of knowledge in individual disciplines, to assess the availability and quality of work programs and methodological support.

The faculty-level monitoring is carried out in order to identify the level of educational and methodical work in the department, assess the quality of educational programs, educational literature, and organize certification procedures.

The university-level monitoring is carried out in order to identify the relationship between the quality of educational and methodological work and the results of training with different teachers and in different departments, as well as to assess the quality of the educational services provided at the faculties and at a HEI in general.

The quality assurance of the organization of the educational process can be carried out in the educational unit as a whole and in certain areas of work, for example:

- Quality of lecture classes at the department;
- Organization of final certification at the faculty;
- The state of regulatory documentation on the organization of the educational process at a university, etc.

When implementing the quality assurance of the organization of the educational process at any level, a verification program is drawn up, which selectively includes quality indicators corresponding to the area being checked.

Therefore, in the intra-university system of quality assurance of the organization of the educational process, the following types of checks can be used:

- Comprehensive one, which implies the analysis and assessment of the activities of the structural unit of the university in all aspects of its activities. These checks are carried out by the decision of the rector;
- Self-examination is carried out annually by the head of the structural unit in all areas of activity and is issued in the form of a report for the academic year;
- Spot checks are carried out with the aim of analyzing and assessing a particular area of activity of a particular structural unit;
- Operational verification implies working with structural units, the activities of which revealed deficiencies or deviations in the implementation of regulatory documents governing the organization of educational activities;
- Questionnaire (in the form of a sociological study) assesses the quality of the educational process by consumers (students, teachers, employees, parents, and employers);
- Testing can be conducted to control regulatory documents when determining the level of methodological training for the purpose of expert analysis.

Organizational issues for verification are assigned to the department for monitoring the quality of the educational process, which includes

- Preparation of the rector's order on the composition of the commission, the timing, type of control, and date of submission of the final document;
- Scheduling a check;
- Preparation of a final document based on the results of verification of internal university control.

The procedure for the implementation of intra-university quality assurance of the organization of the educational process of a faculty (department) includes

- Creation of a commission consisting of the chairperson and those responsible for the identified areas of verification;

- Approval of the composition of the commission, inspection plan and schedule of its work by the university rector;
- The activities of the commission created to analyze the work of the unit according to the relevant audit plan;
- Preparation of an analytical report on the results of the audit;
- Familiarization of the head of the unit with the results of the audit;
- Speech of the chairperson (members) of the commission at a meeting of the Council of the faculty (department), Teaching and Methodological Council of a university;
- Making decisions and drawing up plans for preventive and corrective actions based on the results of the audit.

In order to ensure the required quality of the audit, the commission may include university staff, as well as representatives of the teaching staff and employers.

The commission conducting the audit has the right: to request any information necessary for work related to the issue being studied; carry out the monitoring of students' knowledge and their questioning, attend training classes, if this is provided for by the verification plan.

The analytical report reflects all the sections highlighted in the verification plan. The content of each section should be built according to the following system: positive aspects; limitations; conclusions and offers.

The copies of documents certifying the facts stated in the audit materials and confirming the correctness of the conclusions of the commission may be attached to the certificate.

At the university level, quality assurance of the organization of the educational process by the faculty and departments is organized according to the following indicators:

Status of regulatory documents:

- Provision of all specialties of the faculty with government standards.

The status of operational syllabuses:

- Provision of all specialties with standard syllabuses;
- Provision of all specialties with approved operational syllabuses;
- Timeliness of approval of operational syllabuses;
- Conformity of operational syllabuses to standard ones.

The quality of operational disciplinary curricula:

- Provision of all disciplines with standard curricula;
- Provision of all disciplines with approved operational curricula;
- Timeliness of approval of operational curricula;
- Compliance of operational curricula with standard ones;
- Compliance of curricula formalization with the requirements of university standards;
- Timely updating of the content of operational curricula in accordance with the requirements of the current state of science;
- Availability of operational curricula for elective courses, special seminars, and special disciplines.

Educational work planning:

- The availability of a long-term plan for the development of the faculty, the timeliness of its consideration and approval;
- Completeness of the relevant areas of the faculty;
- Timeliness of the discussion of the issues posed by the academic council of the faculty and dean's office; the recording of the issues in the minutes;
- Timeliness and validity of decisions made.

Organization of work with graduates:

- An operational plan for working with graduates and external consumers of educational services;
- Forecasting and long-term development of specialist training for certain areas;
- The effectiveness of employment activities;
- The effectiveness of ongoing activities.

Career guidance:

- Availability of a career guidance plan, teaching materials, advertising booklets;
- Clear and timely organization of lectures in schools, lyceums, and gymnasiums for parents and schoolchildren, coordinated with other faculties;
- Organization of effective work in nearby secondary schools;
- The effectiveness of career guidance work carried out by the faculty.

Qualification level of the teaching staff:

- Compliance of the education of teaching staff with the positions held;
- Professional level of teaching staff;
- Availability of a continuing education program for faculty's teaching staff and its feasibility;
- Organization of work to guide the training of undergraduates and doctoral students.

Organization of educational activities:

- Availability of schedules of the educational process and its compliance;
- Availability of student work schedules;
- Timeliness of drawing up and approval of the class schedule.

Educational and methodological support:

- Methodological support of the educational process, compliance with modern requirements for the training of specialists;
- High quality of methodological support;
- Sufficient quantity of educational and methodical literature (manuals, developments, etc.) published by the teaching staff of the faculty;
- Organization of methodological seminars (intra-university and inter-departmental ones);
- Implementation of modern educational technologies, new teaching methods, and means for enhancing the cognitive activity of students;
- Provision of disciplines with test materials;
- Timeliness of updating educational and methodological support.

Certification organization:

Organization of current and midterm monitoring:

- Timely conduct of the register of educational achievements of students;
- Clarity and timeliness of the organization of current monitoring;
- Timeliness, completeness, and effectiveness of measures taken upon absenteeism;
- Timeliness of providing information on underperforming students to the dean's office;
- Compliance with the rules for conducting current monitoring and reporting the results of midterm monitoring in the rating sheets;
- Work plans of the faculty have to include questions about the organization, results and effectiveness of current monitoring;
- Recording of issues related to the results and performance of the current monitoring in the minutes of meetings of departments and faculties.

Organization of intermediate certification:

- Availability and adherence to a consultation schedule;
- Timeliness of preparation and approval of the exam schedule;
- Correct preparation of examination sheets and referrals.

Logistics capacity support of the educational process:

- Provision of educational and laboratory equipment and training aids;
- Participation of the faculty in the formation of logistics capacity support of the educational process;
- The presence of exhibition stands to show the state of the educational process at the faculty.

The presented intra-university system of education quality assurance enables the provision of the educational process with various types of control and monitoring measures. The system analysis and the evaluation of all indicators, on which the educational outcomes depend, enable developing corrective measures and determining areas for improvement in educational activities at all levels, is one of the most important elements of the educational quality management system in a university.

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**Primary Paper Section: A**

**Secondary Paper Section: AM, AE**

## COMPETENCE IN THE STRUCTURE OF RESEARCH ACTIVITIES

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Abstract: The article presents various points of view on the concept of "competence", gives an author's interpretation of this concept. The essence and structure of competencies are considered, the relationship between competencies in the framework of research activities is determined.

Keywords: competence, competencies, research activities.

### 1 Introduction

Competency may be described as a level of intensity and demonstration of professional experience that a person has within the competence of a certain activity. In this context, we can define the research competences of a teacher as integral professional and personal characteristics, which determine the requirements of a teacher's abilities to realize the functions of their research activities: informational, analytical, predictive, planning, constructive, managerial, communicative, personal and reflexive function. In our opinion, the main function in a teacher's position as a researcher is reflexive. It contributes to the implementation of not only the pedagogical goals by a teacher - to find a good solution to a problem, to achieve positive result in activities, and make positive changes and improvements in the state of the students but also research ones - to find a reason, to justify a solution of the problem, and to identify ways for positive changes in the state of students, methods, and conditions to achieve this result (due to which this result was achieved).

The organizational and activistic block of research competences is characterized by the criterion of acquiring skills to organize research activities by a teacher. Mastering ways to carry out practical research activities by a teacher requires the ability to plan, organize and realize research activities. We classify such ways as (a) goal-setting, which includes the setting of goals for research, closely related with the goals of education and upbringing; determination of pedagogical and research tasks; the planning of a new educational system, and its forecasting; (b) diagnostics, necessary for the realization of current educational work, obtaining scientific facts, monitoring the process and results of research activities; (c) communication which allows the establishment of emotional and psychological contact with students and colleagues; builds interaction with students during the educational and upbringing process based on cooperation, trust and goodwill in communication; (d) the process of decision making is the process to select one variant from several possibilities.

The competency-based approach and the concept of competence associated with this approach have become quite well established both in the world and in domestic pedagogy. (1, 2). This concept is found today in the legal acts regulating educational activities, and in the teaching materials used by teachers at all levels of the educational system. Nevertheless, many problems of the competency-based approach remain unsolved both in methodological and methodological terms, which results in sufficient convention and inefficiency of both the process and the results of educational activities based on this approach. Therefore, at the level of theoretical analysis, most

pedagogical researchers find it difficult to interpret the concepts of a competency-based approach and their correlation with other pedagogical categories. (3-5) The big question is also the qualitative and quantitative characteristics of competencies. However, practicing educators are forced to form competencies among students, which, according to various scholars, are either personal qualities or a combination of knowledge and skills. (6, 7) At the same time, at the organizational and methodological level, the competency-based approach did not offer anything new, therefore, practice teachers work using long-established forms, methods, and techniques of pedagogical activity. (8, 9) It is clear that, without a solid methodological foundation, the educational process today risks becoming an eclectic set of pedagogical events, the results of which are at least unpredictable.

### 2 Materials and Methods

An analysis of studies on this problem showed that most scientists, as a rule, study individual aspects of competence, competencies and their particular types. Some consider professional and pedagogical competence; others study educational-cognitive, social and professional ones, etc. (10, 12)

One of such private types of competence of a specialist in research, presented in the federal state educational standards for the training of bachelors and masters. The content analysis of the texts of educational standards revealed an infinite variety of types and directions of research activities presented in the respective competencies. Nevertheless, the analysis and comparison of the formulations of scientific research competencies presented in these documents allow us to conclude that the basic invariant structural components of scientific research competence are determined by knowledge, abilities, and abilities to carry out various types of scientific research activities.

Thus, the absence of a generally accepted concept of the competence structure of the subject of activity leads to the fact that both in the draft standards and the research literature a huge range of types of competencies is presented, which, being devoid of an invariant basis (invariance is the property of any object does not change with changing conditions in which it operates) often does not meet the criterion of completeness and representativeness. (12)

Therefore, clarification of the essence and relationship of the concepts of research competence and research competence is an extremely important methodological issue that needs to be resolved. Analysis has revealed an infinite variety of approaches to the definition of the term "competency", and differentiation in the understanding of the concept of interest is observed not only between different areas of scientific knowledge but also within a particular science. It must be noted that today in pedagogical theory there is no unambiguous definition of the term competence, and its essence, as a rule, is interpreted depending on the aspect of the study of the problem: qualification characteristics, the orientation of vocational training, type of activities carried out, etc.

Nevertheless, it seems possible to systematize most of the definitions of the term competence, deduced by domestic teachers, within the framework of the three main psychological and pedagogical schools of the largest scientists who study this problem. So, in the framework of the functional school, the term "competency" is used to designate the integrated characteristics of the quality of graduate training, categories of educational outcomes. Theological school characterizes competence as a set of subject skills in a special way to structure scientific and practical knowledge to better solve problems. However, the most widespread in modern educational practice was the school of humanistic education, in the framework of which competence is defined as the possession of the relevant competence including the attitude to it and the subject of activity.



### 3 Results and Discussion

The whole diversity of the above examples of definitions of competence by representatives of pedagogical science is reduced mainly to the issue of the component composition of competence. Some scientists reduce it to the sum of knowledge, skills acquired during the educational process, others add a set of personal characteristics to this composition, others associate it with the presence of certain personal qualities. However, the search for almost all researchers converges on the idea that a particular competency is associated with the experience of the relevant activity.

V.V. Kraevsky (13) emphasizes that competence requires a minimum of experience in applying competency. M.A. Cold (14) believes that "the difference between a knowledgeable and competent person is intuitive to everyone. Compare, for example, a knowledgeable doctor and a competent doctor: a knowledgeable doctor knows and tries to treat, while a competent doctor knows and cures."

An essential point in understanding competence, in this case, is a specific situation in which generalized knowledge should turn into a specific algorithm or procedure of actions leading to a successful result. Hence, the concept of competence that is characteristic of a European understanding is the establishment of a causal relationship "competence – success." (15).

S.G. Thieves and E.V. Orlova (16) directly indicate that competence is the experience of the successful implementation of a particular type of activity, and they believe that it is not only being formed and improved but also manifests itself in his activity."

Accepting these ideas, we can conclude that competence is not reducible to knowledge, skills, personal qualities, as well as their totality, but is only determined by them.

Following this logic, it is appropriate to quote the words of V.I. Sakharova (17) that competence is an estimated category; it characterizes a person as a subject of specialized activity in the system of social development of labor with bearing in mind the level of his development, his ability to competently make adequate and responsible decisions in problem situations, to plan and perform actions leading to rational and successful achievement of goals. In other words, competence is the ability to work with knowledge of the matter and moral responsibility.

The appraisal of the term competence is confirmed by examples of its use in speech. The analysis showed that, as a rule, a colleague, clients who evaluate the results of the activities performed by this person, are called a competent specialist. A competent or incompetent specialist is a representative of any profession, not based on the level of his professional training or the duration of his work experience, and above all, depending on the effectiveness of his activities, which can be characterized by the concept of quality. In the aspect that interests us, quality is a combination of the results of labor activity, determined by the ability and desire of the employee (team) to perform a specific task following the established requirements. When the results of the work are positive, and in general, the activity is successful, the person who carried it out is called competent. On the contrary, if the activity is unsuccessful and ineffectual, then no matter how much time and effort a person has spent on its implementation, he will be called incompetent.

We consider it expedient to single out three main orientations for determining the structural elements of scientific research competence. The first orientation can be attributed to the division of competences, into two main groups - general and professional, which is most clearly represented in the state educational standards for the training of bachelors and masters.

For the second orientation, the structural content of research competence is formed by various component composition. The analysis of studies on the problem of scientific research competencies made it possible to establish various variants of

the component composition of scientific research competence, filled with combinations of motivational, orientational, operational, volitional, evaluative and other components. However, at the same time, the question remains unanswered that if the research competence already has one or another component, for example, a motivational one, can it be present again in the structure, for example, of scientific research activity in which this competence is realized.

Finally, the third direction in determining the structure of research competence is associated with the search for a number of its forming competencies.

The analysis of the above examples allows us to talk about a certain hierarchization of competencies included in the structure of research competence. We are interested in the approach to the substantiation of this hierarchy since it is not clear why, for example, this or that competence is included in the structure of scientific research competence. So, for example, analytic-reflective competence can just as well be included in any other competence, for example, creative.

Therefore, before starting to determine the composition of scientific research competence, it is important to determine the basic structural elements of competence as a generic concept, referring to its interpretation. The effectiveness of the implementation of any activity is determined by competencies, understood as a combination of knowledge and skills. At the same time, the totality of certain knowledge, skills, and abilities necessary for the effective implementation of one of the stages of scientific research may be useless at another stage. Therefore, for example, the skill associated with the detection of contradictions is important at the initial stage of research and does not represent any value at its other stages. In this regard, there is a need to search within the competence of its structural elements that would most fully correspond to the procedural structure of a particular activity. Research activity has a specific process structure, each stage of which involves a special type of researcher action. At the same time, it makes sense to designate these elements with the term "sub-competence", since their combination forms integral competence, and the used prefix "sub", according to Ozhegov's explanatory dictionary (18), forms nouns and adjectives with the meaning of secondary, subordinate, small in comparison with what named in a manufacturing basis.

Since the process of research activity consists of four main stages, it becomes appropriate to divide research competence into the number of sub-competencies corresponding to these stages.

Considering the first stage of research activity, which consists in posing the research problem, it should be noted that the clarification of the degree of problemativeness. It means that the ratio of the known and the unknown in the information required to be used to solve the problem is called cognition, and therefore, it will be appropriate to name the set of knowledge and skills that ensure the success of this process with cognitive sub-competence.

The next stage of research activity is research planning, the basis of which is the formulation of assumptions - hypotheses. Since a specific method of searching for hypotheses is called abduction, it is possible to designate the sub-competence ensuring the success of this process as an abductive one. (19)

The logical consequence of putting forward the research hypothesis is the search for arguments by intending to provoke or enhance the sympathy of the other side for the advanced position, which is called argumentation. (20) In this regard, the name of the sub-competency that ensures the success of the third stage of research activity related to the implementation of research methods may sound like an argument.

When the experimental plan is completed successfully and appropriate measurements are taken, the researcher proceeds to assess

The results of the study, serving as the final stage of research activity. Since verification, empirical confirmation of the theoretical principles of science by comparing them with observable objects, sensory data, and experiment is called verification; the sub-competence corresponding to the final stage of scientific research can be called verification.

Thus, it seems possible to single out cognitive, abductive, argumentative and verification sub-competencies in the structure of scientific research competence, formed by a specific set of knowledge, skills, and abilities, specific for each of them.

Research sub-competencies implemented at each stage of research activity determine its success, and at the same time, the development of research competence as a whole.

#### 4 Conclusion

The implementation of the first stage of research activity, which consists in posing the research problem, is possible when the researcher has a sufficient level of knowledge about phenomena and processes that cause anxiety, the ability to formulate the problem using a scientific language, as well as the skills to choose the object and subject of research, forming cognitive sub-competence.

The successful completion of the second stage of research activity, involving the planning of research, implies that the researcher has special knowledge about the object of study, the ability to use various imaging techniques, as well as the skills to explain the causes of any phenomenon that form abductive sub-competence.

The next stage of research activity related to the implementation of research methods may succeed when the researcher knows theoretical and empirical research methods, the ability to search for hypothesis testing and the skills of applying research methods that form argumentative sub-competence.

Finally, the final stage of scientific research, involving the evaluation of the results of the study, can be successful if the researcher has knowledge of how to verify the results obtained during the study, is able to measure the dynamics of processes and phenomena, and has the skills to process and analyze information that makes up the verification sub-competence. Thus, the analysis allowed us to draw the following conclusions:

- Research competences are interrelated and interdependent categories, with the first concept applicable to the process of research activity, and the second to results;
- Research sub-competencies determine the success of each stage of research activity;
- Research competency, which is the criterion for the success of research activities due to the presence of research competence.

The constructive level of mastering research competence (level of theoretical schematization, strategic), is characterized by the ability to independently define a problem, conciseness, and theorization, and a level of complete mastering skills to plan and predict. There is the possession of fundamental notions in the structure of methodological and scientific knowledge and the application of empirical and theoretical research methods in his/her activities. Theoretical knowledge is characterized by consciousness, generality, and breadth of the transfer. Processes of self-organization, self-regulation, and communication are clearly demonstrated in research activities; a system of research competences is established. Thus, the structure and content of research competences are determined, the levels of their development dynamics are described, and such levels may be used to identify criteria to determine the efficiency of the development of research competence.

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**Primary Paper Section: A**

**Secondary Paper Section: AE, AF**

## PROFESSIONAL COMPETENCIES AND METHODS FOR THEIR FORMATION IN THE UNIVERSITY

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**Abstract:** The article discusses the main aspects and trends of the modernization of the education system, which, if properly organized, will, in the long run, contribute to the accumulation of intangible forms of student capital. The analysis of existing and promising ways of forming professional competencies in the university. A special place is given to the functioning of the volunteer center of the university, organized by student self-government. As well as the importance of the proper organization of this activity in the university in terms of its accounting and assessment.

**Keywords:** competency-based approach, lifelong education system, competence, university environment, service learning, human capital, volunteering activities, the integration of science and education.

### 1 Introduction

The current stage of development of a post-industrial society and knowledge economy in the world is characterized by changes in requests made by employers to specialists. The requirements that a graduate must meet today are increasing and tightening. The list of such qualities includes: 1) possessing a formed innovative thinking and high creativity; 2) the ability to use methods and means of independent organization of professional growth; 3) possession of integrated interdisciplinary knowledge; 4) the ability to work in a team on projects, interact with experts in various subject areas; 5) possession of practical experience in the development and implementation of research, design, economic, environmental and other solutions; 6) knowledge of the scientific foundations and methods of technology transfer, etc. (1)

These qualities form and reflect the student's human capital, which accumulates in the process of higher education. Therefore, the forms and methods of teaching and upbringing are of great importance in the process of formation and preparation of this type of personality. At present, economic theory has begun to pay more and more attention to the importance of the accumulation of human capital as one of the factors that constitute the productive forces of new methods of production in a changing socio-economic formation. It is believed that it is a person, a professional, who will be the determining criterion for development (cadres decide everything), and, it seems, a tendency toward the humanization and greening of science and economics has emerged. Besides, the interest of society in the development of institutions providing a high level of training is confirmed by the new institutional model of the economy, the formation of which ended with the adoption of laws on education.

It should also be noted that this goal is fully consistent with the basic provisions of the "Concept of Long-term Socio-economic Development of the Republic of Kazakhstan for the Period until 2020", the basis of which is a breakthrough in improving the global competitiveness of the economy through its transition to a new technological base, improving the quality of human capital and social environment, structural diversification of the economy. (2)

Currently, dramatic and promising changes are taking place in the education system of the Republic of Kazakhstan. The transformation of socio-economic relations is taking place gradually and the development of information technologies mainly influences this process. The trend of blurring the boundaries between national and world intellectual spaces expresses the view that the world is becoming flat (flat world) and suggests the need for constant updating of knowledge, which in the long term (including through distance learning) should ensure the transition to a system of life-long learning.

Thus, the role of man as a creator grows, because to build an innovative economy, a new type of specialist is needed, namely, a competency-based one. The benchmark is a manager engineer with both technical skills and liberal education.

With the introduction of new state educational standards, the construction of a new educational paradigm based on the "competency-based approach" has begun. This concept lies in the orientation of the formation of students not only and not only exclusively knowledge, skills that are formed from fundamental knowledge, but also the qualities of personality development, the formation of which is promoted by normative and value guidelines. It is also difficult to disagree with I.D. Frumin, who believes that "the competency-based approach is manifested as updating the content of education in response to a changing socio-economic reality".

One of the main constructs of this approach is competency. Distinguish between simple or basic (formed based on knowledge, skills, and manifested in professional activities) and key competencies (reflect the spiritual world of the individual, his motivation, are manifested in all types of activities).

Basic competencies affect the field of specific knowledge and skills, rather than personality traits and abilities. While the characteristic of key competencies, presented considering their special significance in the vocational education of the countries of the European Community, contains a personality orientation (motivation, value orientations) and its abilities applied in the process of life activity (flexibility of thinking, independence, volitional qualities).

It is worth highlighting the particular importance of the work of teachers since in this situation, the emphasis of training is shifting towards the independent work of the student. As a mentor and directing students, we believe that a modern teacher should apply new methods of presenting material, instill interest in cognitive, scientific activities. Therefore, the list of innovations at present are organizations of the educational process in the Republic of Kazakhstan, which are actively used in higher school: 1) introduction of a credit-modular system; 2) the introduction of asynchronous education; 3) the introduction of design training methods, cases, and simulators, etc.

It is also worth noting the importance of combining theory and practical application of acquired knowledge (skills development), as well as the focus of training on preparing for professional activities. This is the main difference in approaches to both education and business in Kazakhstan and the USA. In the Republic of Kazakhstan, there is a gap between theoretical developments, research, and their practical application or commercialization, in contrast to foreign countries, in particular, the USA. In this, we see a restraining effect on the processes of modernization and the reason for the inhibition of innovative development, both the university and the country.

### 2 Materials and Methods

#### 2.1 Competencies Feature

The content of the main (basic) professional competencies:

- Technical professional knowledge, skills, and abilities necessary for effective implementation by graduates of their job responsibilities and workplace requirements (the ability to use technical means to achieve results).
- Technological ability to master and apply methods and particular techniques for solving problems in the selected subject area.
- Informational ability to receive and apply information necessary for solving problems in the subject area
- Positional depending on the formal status in the organizational hierarchy are divided into 1) management competencies — abilities and personal qualities that make up the totality of skills that managers need to successfully achieve projects; 2) specialist competencies — abilities and personal qualities that are necessary for specialists to complete their work.

Content of key professional competencies:

- Social (intercultural, political) ability to take responsibility, develop decisions and take part in their implementation; tolerance; manifestation of the conjugation of personal interests with the needs of production and society.
- Communicative proficiency of oral and written communication technologies in different languages, including computer programming language; ability to use the Internet system.
- Information possession of an information resource; knowledge of information technology; critical attitude to the information received.
- Special preparedness for independent, creative fulfillment of professional functions; readiness for an objective assessment of yourself and the results of your work.
- Personal (cognitive) willingness to constantly improve their educational level; the need for updating and realization of personal potential; the ability to independently acquire new knowledge and skills; desire for self-development, continuous enrichment of one's professional competence.

The innovative development of the university is a set of activities that ultimately lead to the development and implementation of new ideas and knowledge with the aim of their practical use to meet certain requests of consumers of educational services. (5, p9) That means it should be ensured by effective implementation.

Thus, the third generation of state educational standards is characterized by a new educational goal, a new educational content, a new goal setting for students and teachers, new requirements for teacher training, new technologies and teaching aids. Upon graduation, a modern graduate of a technical university should possess not only competencies that reflect his professional suitability, but also those that characterize his personal qualities in terms of interaction in society.

### 3 Results and Discussion

What methods of forming professional competencies and complex characteristics of a successful graduate already exist at the university, and what are the prospects for creating new forms today?

So, when describing the methods (forms, mechanisms) of the formation of the competency model of the graduate, we proceed from the fact that the formation of competencies occurs as a result of combining the acquired knowledge and skills in the process of obtaining education and upbringing (and self-education) with their practical application in interaction with others.

Research activity is associated with virtually all of the above methods and is carried out: in the process of undergraduate and industrial practice (students conduct a research at the enterprise); in project activities, depending on its type (educational project, research, information project, social project planning, and others); in the form of research work for Small Innovative

Enterprises of a university or participation in Students' Scientific Circle, etc. This indicates the key importance of this method of forming competencies.

Besides, in modern realities, there is an increase in the number of projects developed by students as a result of the establishment of intrapreneurship practices within the university. As an example, we use the Fundraising School - an annual event held as continuing education courses). This activity involves the use of creative potential, which allows you to accumulate experience and skills of entrepreneurial activity, to form critical and innovative, innovative thinking. This approach is important for society as a whole, since it allows, in the opinion of P. Drucker, the formation of an entrepreneurial society in the ongoing entrepreneurial revolution (as N. Macrae said). (6) In the case of a project involving the development of international relations, it will contribute to the development of student mobility, communicative competencies and the internationalization of education.

Ways to build competency:

- Pre-degree and industrial practice at the enterprises technical, technological, informational, social, informational;
- project activities (intrapreneurship) within the university, for example, the Fundraising School) social, communicative, informational, special, cognitive;
- research activities (research work for Small Innovative Enterprises of a university, participation in Students' Scientific Circle); communicative, informational, special;
- the practice of international exchange (various programs (TEMPUS)) social, communicative, informational, special;
- additional education (advanced training courses) communicative, cognitive, special;
- teamwork (simulators, for example, methods of group projects) positional, social, communicative, special;
- business games (cases, simulators) positional, social, informational, special;
- events of student self-governance (contests, holidays, KVN, etc.) social, special, personal;
- volunteer activity (in the form of "service learning") social, special, personal.

In teamwork and business games, usually, students get the skill of working in a group. This allows us to develop along with positional, communicative and special also social competence. As can be seen from the table, social competence is formed in the process of any of the listed activities, which indicates its importance for effective collaboration in collective work. Also, the application of the described method of organizing student activities will contribute to the cohesion of the study group. An example of the implementation of this method is the group project methodology, adapted by young Kazakh teachers as a result of participation in the international exchange program TEMPUS. (7)

We would like to dwell on the volunteer activities of students since currently there is an actualization of the use of this resource in the universities of the Republic of Kazakhstan as a result of the implementation of the main goal of the state youth policy in the Concept of long-term socio-economic development of the Republic of Kazakhstan 2020.

In foreign countries, this part of academic public life plays a large role in any successful University, as it is a factor that increases its competitiveness and the importance of various world ratings. (8) In foreign practice, such forms of training as "action learning", which consists in the assimilation of knowledge and their application, as well as "service learning", designed to contribute to a deeper development of knowledge through activities for the good, have long been used of society. Again, following Western universities, it seems to us to intensify youth volunteerism, especially since there is a good prospect due to the observed growth in the role of student self-government in the life of the university. This becomes relevant in connection with the increased attention of the government, namely the

committee on youth policy and interaction with public organizations. Participation in educational and motivational employment programs, students have the opportunity to be accepted by large companies, which in turn are interested in attracting people with an active lifestyle, on the one hand, and representatives of the volunteer community on the other. The program has already been supported by Alfa-Bank, GlobalPointFamily, Corus Consulting, etc. (9)

Besides, in the Republic of Kazakhstan, there is an objective need to activate this student resource, due to the lack of non-profit organizations (NPOs), whose activities are simultaneously aimed at the development of science and economic development. (10, p10)

According to Johns Hopkins Center for Civil Society Studies, at the end of 2010, about 140 million people in 37 countries of the world were engaged in volunteer activities (12% of the adult population of these countries). The contribution of volunteers is about 600 billion US dollars. The contribution of volunteers to the national economies of developed countries is 4-8% of GDP. (11)

In connection with the foregoing, we believe that such a way of forming general cultural and professional competencies as the functioning of voluntary organizations at a university on an official basis should soon appear in universities of the whole country. Examples of existing and operating in universities are volunteer centers. (12, p19)

This mechanism, on the one hand, contributes to the formation of moral standards and values of the young generation in the university environment and, as a consequence, to a civic position, and on the other hand, to economic growth due to work and cost savings, as well as the formation of closer ties in society and the accumulation of social and cultural capital of society.

Nevertheless, there are difficulties for both the student and the university. (17) The lack of statistics on this issue creates additional difficulties in assessing their effectiveness. However, there are difficulties such as the lack of real accounting and evaluation of the results of such activities for both the student and the university. The lack of statistics on this issue creates additional difficulties in assessing their effectiveness.

The digital scatter of estimates varies so much that it is not possible to formulate an adequate picture. Therefore, in modern conditions, it seems necessary to develop an automated software product for accounting and evaluation of volunteer activity and introduce it into the information system of the university. On the one hand, this will make it possible to have an idea (statistical data) about the activities of the university in this area, make it possible to calculate its effectiveness (social and economic effects) and evaluate the contribution of volunteering to the development of the city. On the other hand, it will be possible to consider the merits of students in the score-rating system, which will be reflected in his rating and will become a positive indicator for employers (when considering a graduate when applying for a job).

Thus, the new requests of the third generation of state educational standards are aimed at the formation in universities of highly qualified specialists, professionals with an innovative, creative type of thinking, able to quickly navigate and take active action in situations with great uncertainty. (16) The formation of such personality traits falls on the period of early adulthood (that is, the period of study at the university), so the role of the university is seen in creating the conditions for the accumulation of human capital of participants in educational and scientific processes, as well as in creating a special environment conducive to the production of innovations. (13-15)

#### 4 Conclusion

The tasks of forming the necessary competencies require active action from all participants in the learning process: from the university environment, adaptation to new requests and market

requirements; from teachers, in particular, the development and application of new teaching methods, as well as the development of an adequate assessment of the effectiveness of their work; from students - activation of their scientific, intellectual potential. Therefore, there is a need for the proper organization of activities and the active use of technology for working with young people, which makes it possible to combine teaching and educational goals as much as possible, both in the educational process and beyond. We believe that the development of student self-government and, in particular, voluntary activity at a university at this stage is vital to maintaining the competitiveness of Kazakhstan's universities.

Thus, the mechanisms, tools, and methods created within the university for the formation of students' professional competencies and the accumulation of their human capital should consider world trends in education, internationalization processes and increase the competitiveness of the university, both in the educational services market and in the labor market. For this, the results of the use of these tools should be clear, transparent and comparable with foreign countries, and the results of educational and scientific activities of students should be oriented towards practical application.

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**Primary Paper Section: A**

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## PROFESSIONAL COMPETENCIES IN THE STRUCTURE OF THE PERSONALITY OF A UNIVERSITY TEACHER

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**Abstract:** Consideration of professional competencies as characteristics of the activity level of professionalism made it possible to distinguish three groups of competencies of higher education teachers - individually-personal, subject-active, and social-communicative. They are studied in conjunction with the individual personality characteristics of teachers, depending on the level of their professional success.

**Keywords:** professional competencies, levels of professionalism, teachers of higher education, individual and personal characteristics, professional success.

### 1 Introduction

The current stage of development of a post-industrial society and A necessary component of a person's professionalism is their professional competence. The study of modern approaches to professional competence in the works of domestic and foreign scientists shows that this concept does not have a sufficiently clear definition and is semantically used along with the concept of professionalism. So, from M. Christianakis, (1) professional competence is a multifactorial qualitative characteristic of the personality of a specialist, which includes a system of scientific and theoretical knowledge in the subject area and methods of their application in specific situations, value orientations of a specialist, as well as integrative indicators of his culture. F. Caena (2) defines this category, on the one hand, as the mastery of the knowledge, skills, and abilities necessary to work in a specialty while being autonomous and flexible in solving professional problems; developed cooperation with colleagues and a professional interpersonal environment, on the other hand, as readiness and ability to act expediently following the requirements of the case, methodically and independently solve the tasks set, as well as self-evaluate the results of their activities.

In our opinion, these definitions are very similar in meaning to the judgments of some authors about professionalism. For example, J. Beck and L. Weiland (3) believe that professionalism is a system of knowledge and skills that manifests itself in solving professional problems arising in practice. S. Jans and V. Awouters (4) also define professionalism as a specialist's knowledge, skills, and abilities that allow him to carry out his activities at the level of modern requirements of science and technology, as the ability to see and formulate tasks, apply the methodology and methods of special sciences to establish a diagnosis and prognosis when solving them, evaluate and choose the most suitable methods for solving.

Some researchers note the integrity of the concept of professional competence. So, K. Selvi (5) distinguishes the following types of competence: subject matter as good knowledge by a specialist of the subject of his direct activity (which is formed in the course of educational and vocational training); socio-communicative as knowledge and skills related to the implementation of social and professional contacts, and personality-individual, represented by a set of knowledge and ideas of a person about himself in the context of a professional role. A close point of view is expressed by J. Angrist and J. Guryan, (6) according to which professional competence is the level of skill achieved by a person on the path of professional

development and includes such components as need-motivational, operational-technical and self-awareness.

N. Rohmetra (7) also identifies types of professional competence - special, or active, characterizing the possession of activities at a high professional level, the availability of special knowledge and the ability to put them into practice; social, due to the possession of methods of joint activity and cooperation, accepted in the professional community, methods of professional communication; personal, including the possession of methods of self-expression and self-development, means of opposing professional deformation, the ability to plan professional activities, see a problem and make decisions independently; individual, interpreted as mastery of self-regulation techniques, readiness for professional growth, lack of professional aging, the presence of sustainable professional motivation.

Assuming that the described descriptions of professional competence are very close in content to the characteristics of the various components of professionalism and do not give a clear idea of this category of professional activity, we consider it possible to formulate our own opinion according to which professional competence can be defined as an integrative property that includes a set of professional and sociocultural knowledge, skills that allow a person at a high level of planning and carrying out professional activities to achieve socially and personally meaningful results. In this context, in our opinion, professional competence can be included in the structure of professionalism of an individual, since the concept of "professionalism" is broader than "professional competence". Professionalism is characterized by such a level of development of professional competence at which it is fully integrated into human behavior, so many actions leading to an effective result are performed on an intuitive level.

Thus, we consider professional competence as an indicator of how successfully a person has mastered professional knowledge, skills and professional culture and implements them in various situations of professional activity. At the same time, considering professional competence as a personal characteristic of a professional, we single out professional competencies as indicators of the professionalism of his activities. In our opinion, professional competencies are some criteria that are used for internal and external assessment of the quality of professional activity and are common to all specialists in one form or another of professional activity, striving for a high level of professionalism. In other words, competence is a personality trait, and competency is what a person must learn and display in an activity to be competent. It is from these positions that we consider competencies as determinants of the activity level of a person's professionalism.

### 2 Materials and Methods

A theoretical generalization on the problem of professional competence of an individual, relying on studies of the process of managing the psychological and pedagogical competencies of a higher education teacher, allowed us to distinguish three groups of core competencies in the structure of his professional activity:

1) individual and personal competencies manifested in the cognitive activity of a teacher in realizing the goals of both scientific and pedagogical activity, following individual psychological properties, the general level of intelligence and its structural features. The indicators of this group of competencies are:

- possession of special knowledge;
- research activity in the development of scientific and pedagogical problems and innovations;
- development of skills to build the educational process (modeling, designing);

- the ability to self-development, the desire to improve their special and psychological-pedagogical qualifications;

2) subject-activity competencies, including emotional-volitional management of the subject (special and pedagogical) content of the professional activity, implemented considering the level of claims and motives of the subject. The competencies of this group include:

- the formation of skills of emotional self-regulation of professional behavior and activities;
- the ability to manage cognitive activity and motivation of students, to recognize their needs and provide them with individual assistance; respond flexibly to changes in business conditions;
- the ability to create a creative attitude in the research team and training sessions;
- introspection and assessment of performance;

3) socio-communicative competencies that characterize the skills of the subject in building relationships and interactions with others in the field of a professionally determined environment. These include:

- general cultural skills and communication and interaction skills;
- the ability to persuade, understand others;
- orientation to the formation of scientific discipline, morality, ethics, worldview, attitudes towards professional and personal development among subjects of the scientific and pedagogical process;
- the formation of personal positions in the field of goals and standards of activity;
- effective communication skills with students and colleagues;
- disciplinary liability. (8)

The general integrated model of the qualities of a university teacher can be represented as a system of personality qualities, each of which is designed to implement the above areas of its activity.

The leading role in the structure of the teacher's qualities is played by his professionalism - *professional competence*. It includes six groups of qualities such as deep knowledge of the subject of training; pedagogical skill; wide scientific horizons; craving for innovation and scientific creativity; the presence of a degree, knowledge of scientific research methods; innovative mobility. Each of these groups relies on primary qualities that are quite specific in content.

*Deep knowledge of the subject of training* requires an understanding of the conceptual basis of the subject, its place in the general knowledge system and the curriculum of specialist training. The possession of such knowledge contributes to the formation of a teacher as a creative, active person and is manifested in his direct activity of teaching students.

The teacher must be a specialist in the subject taught. He must own the material, distinguish between essential and non-essential, establish relationships, draw analogies and give examples. The teacher should always be ready to keep abreast of the latest developments in his professional field, to know the advanced lines of science and practice in the field of readable disciplines.

Lack of teacher knowledge causes problems when real gaps are felt. After all, firstly, participants will notice this earlier than the teacher would like, and secondly, he will feel insecure himself, which also negatively affects the atmosphere of the lesson, and thirdly, such gaps also affect perception students of study material.

*The pedagogical skill* of the teacher is based on knowledge of psychology and pedagogy, ways of organizing learning activities, principles for developing plans and training lessons. The teacher's methodological culture is formed based on his

knowledge of pedagogical technologies, methods, forms, teaching methods, the ability to determine specific pedagogical tasks, develop a work program for the discipline-based on curricula, plan and conduct training sessions of various types (lecture, seminar, laboratory), manage the training student activities.

Imagine in the student audience at the department there is a person with deep knowledge, but his lecture does not interest students: he wonders why students do not understand what scientific conclusions he draws from, do not perceive the material he presents. What is the reason for this failure? Inability to explain, in ignorance of teaching methods, teaching methods.

Knowledge can be passed on to students and made their intellectual property, rather than ballast, only when the material studied is of keen interest, accessible, understandable, makes you think, seek your solutions.

The most important quality of a teacher is his ability to be a teacher, which is impossible without knowledge of the forms and methods of educational impact, the ability to determine the goals and objectives of education, create the necessary conditions for the implementation of education goals.

The activity of a teacher at a university also involves working with a student's asset. To do this, you need to be able to identify leaders, use their potential in educational work with students.

The pedagogical skill of the teacher, besides, the ability to master the word. The speech should be emotional, well-perceived, the teacher should have good diction, be able to speak correctly, captivate listeners with his story, be cheerful, witty, be able to master the situation and instantly rebuild if necessary. Speech incoherent, inexpressive, stamped does not contribute to high communication efficiency, does not convince and does not leave an impression in the hearts of people. (9)

In order to learn to speak well, it is necessary to learn to think clearly, and for this, it is necessary to be an erudite, educated person, be able to persuade, reflect, analyze.

*Wide scientific horizons.* Teachers of a modern university should be distinguished by high erudition and a broad scientific outlook. The decline in the general cultural level is primarily reflected in the young. A teacher who comes to the audience to students should be not only an expert on the subject taught and the corresponding field of science, but also a highly erudite person with a rich intellectual reserve. The main difference between higher education is a high level of theoretical thinking, a broad outlook for graduates, which can be provided by a teacher with knowledge covering many different areas. The absence of fear and the ability to answer questions from the audience, bring new interesting, unknown facts to listeners will satisfy the cognitive need of a young man. This need is manifested in the student's desire to receive more from the teacher than the concrete facts of the subject being taught.

It is natural for a teacher to acknowledge the fact that he does not know everything, his desire to overcome his ignorance. Scientific work, even in a narrow field, makes the teacher read a lot, comprehend what has been read, which significantly expands his horizons.

Effectively educate and educate students can be the teacher who has a broad outlook, owns the methodology, relies in teaching on modern scientific data. Besides, the wide scientific horizons of teachers serve as the basis for the constant growth of the department's potential.

Professional self-development refers to the continuous improvement of one's competence in the field of modern pedagogy (the study of new trends in the development of education in general and higher education in particular), as well as the study of new scientific and technical achievements in a specific subject area.



Cultural self-development should include, in particular, familiarization with new phenomena of cultural life that students are interested in (in sports, music, cinema, literature, and visual arts).

*Craving for innovation and scientific creativity.* The conditions of professional activity have a great influence on the personal interests of a representative of any profession. The work of a teacher of higher education involves not only and not so much the function of "transferring knowledge" as the function of "acquiring knowledge", which implies the ability to formulate a scientific problem and seek its creative solution. The peculiarity of the work of a university teacher is that he must constantly engage in scientific work, the success of which consists in obtaining a scientific degree, title. In this creative process, the teacher should be guided not only by personal interests, but also by the interests of the department, and also involve students in scientific work. (10)

Focus on scientific research and innovation is one of the key components of the model of qualities of a modern teacher of higher education. A teacher who is not engaged in science is not able to awaken creative activity in students, to teach him to think.

*Scientific research skills.* The scientific field of the teacher's activity involves the skills of research work: knowledge of research methods, collection, and processing of information, the vision of the research result, determination of the relevance and necessity of research. Research activities also include the need to

use the results of scientific research in the educational process, namely the inclusion of research results in the content of training, attracting students to research, organization of work of student scientific circles.

The teacher as a researcher should be focused on finding and revealing the truth. This search has to be carried out most often not in one's research, but in comparing the content of conflicting literary sources reflecting the concepts of various authors. For this, the teacher must have developed logical thinking, the ability to highlight the main thing in different sources and the logical connections between the objects in question. (8)

*Innovative mobility.* In modern conditions of a dynamically developing educational environment, a teacher of a higher school becomes an active organizer of the educational process, able to flexibly adapt to the changing conditions of professional-pedagogical activity and design educational situations of a new type.

A modern teacher is characterized by a high degree of creativity, which is manifested in such qualities as the flexibility of professional thinking, mobility, and adaptability to innovative situations. (11)

For the teacher, the desire in his professional activity to meet the modern requirements of the information society, skills in the field of new information technologies, understanding of their essence, skills of their application and implementation in the educational process of higher education are also important.

Table 1. Professional Competency of the Teacher

Quality groups	Primary qualities
Deep knowledge of the subject	High level of knowledge in the taught disciplines; understanding of the conceptual foundations of the subject, its place in the general knowledge system and the curriculum of specialist training (bachelor, master); possession of knowledge sufficient for analytical evaluation, selection, and implementation of educational programs, the ability to creatively use the accumulated knowledge; high mental ability; erudition; experience in teaching at the university; wide outlook, curiosity, constant desire to improve personal qualifications.
Pedagogical skill	Knowledge of psychology and pedagogy, history and methodology of the taught disciplines; teaching methods; methods of organizing students' independent work and diagnosing their knowledge; ways of organizing educational activities, principles for developing plans and abstracts of training sessions; educational technologies, methods, forms, teaching methods and educational impact; the ability to determine specific pedagogical tasks, anticipate learning outcomes, evaluate pedagogical results; plan classes following the curriculum; select and use appropriate training aids to build training technology; the ability to develop a work program for the discipline-based on curricula; skills in developing educational-methodical complexes of disciplines and processes; leadership skills in course and diploma design, training and production practices; skills in planning and conducting training sessions of various types (lecture, seminar, laboratory), student learning management; experience in educational work with student assets; ability to identify leaders, use their potential in educational work with students; the ability to objectively perceive a person in the process of communicating with him; consistency in words and actions; the ability to educate by personal example; the ability to take into account the state, mood, motives of the pupils; knowledge of methods for improving the skill of the teacher.
Wide scientific horizons	Wide intellectual horizon; possession of knowledge covering many different areas; erudition; the ability to comprehend what has been read; the desire to overcome their ignorance; interest in new things in science; ability to answer audience questions, bring new interesting facts not known to listeners.
Craving for innovation and scientific creativity	Focus on scientific research and innovation, logical thinking; desire for positive change; ability to formulate a scientific problem and seek its creative solution.
Scientific research skills	Possession of methods and techniques for obtaining and processing information; knowledge of research methods; research experience; ability to present scientific results (articles, monographs, patents, etc.); ability to make applications for contests and grants; the ability to use the results of scientific research in the educational process; skills in the application and implementation of

	information technology in scientific activities.
Innovative mobility	Knowledge of foreign language; knowledge of computer technology; willingness to share experience and adopt it; the ability to design and use information technology and their tools in professional activities; active life position; ability and desire to learn new things; ability to build the right relationships with governing bodies.

Source: Compiled by the authors.

*The moral qualities of a teacher.* Since higher education involves the formation of moral values approved by the society in students, the teacher must be the bearer and spokesman of socially approved values, have an active social position.

Ethics instructs the teacher to be fair in assessing the abilities and behavior of students and colleagues, equal in handling, principled in business, attentive, tactful and benevolent. The teacher must be distinguished by social, national, and confessional tolerance. Self-confidence, immoderate

categorization, intolerance to criticism, disrespect for the personal dignity of students, their professional authority, rudeness damages the relationship.

In the morality of a teacher, two groups of primary qualities can be distinguished: spiritual qualities and culture of behavior (Table 2).

Table 2. The Moral Qualities of a Teacher

Quality groups	Primary qualities
Spiritual qualities	Decency, honesty, good faith, nobility, modesty, independence, dignity.
Culture of behavior	Politeness, tolerance, poise, endurance, attentiveness to others, justice, benevolence, kindness, tact, friendliness, disposable appearance, neatness and elegance.

Source: Compiled by the authors.

Communicative abilities and methodological training are not enough for successful pedagogical activity. It often happens that a well-prepared abstract of a training lesson, considering all the methodological requirements, cannot be realized: students are distracted, talking, and go about their business. Why? The reason is that the teacher was unable to organize them. The development of organizational skills in the future teacher is a prerequisite for preparing for professional activities.

*Organizational skills.* This is a sphere of interaction with people. They include three subsystems of qualities: the ability to

communicate with people, the ability to organize collective activity and personal attractiveness (authority) (Table 3).

*Business qualities.* This is the area of attitude. It includes two main groups of qualities: the ability to think strategically and the dynamism of everyday activities (Table 4).

The ability to think strategically assumes the presence of high intelligence, life wisdom, a broad outlook, curiosity, judgment; ability to generate ideas, see and consider the perspective, set and formulate tasks, highlight the main thing, anticipate the consequences of decisions.

Table 3. Organizational Skills of the Teacher

Quality groups	Primary qualities
Ability to communicate with people (sociability)	Skill: to build relationships with students, colleagues, managers, other people in various situations; to enthrall the student, act not by order, memorization, but by conviction; create an atmosphere of trust, sociability.
Ability to organize collective educational and scientific activities	Skill: to select and form teams for various university programs, the ability to distribute tasks, verify performance, stimulate participation in collective activities.
Personal appeal	Ability to gain authority and trust, openness, self-confidence, a sense of humor, personal charm.

Source: Compiled by the authors.

The model of activity tactics includes such primary qualities as the desire for self-expression, business activity, efficiency, business acumen, assertiveness, determination, the ability to bring the job to the end, self-control, dissatisfaction with oneself,

initiative, flexibility, focus on the result, the presence of common sense, ability to link plans with real conditions.

Table 4. Professional Qualities of a Teacher

Quality groups	Primary qualities
Ability to think strategically (activity strategy)	General intelligence; life wisdom; curiosity; judiciousness ability to generate ideas; ability to see and consider perspective; the ability to set and formulate tasks, highlight the main thing; the ability to find the shortest solutions to the problem; innovative approach (non-standard thinking), the presence of a new sense; ability to make decisions; anticipation of the consequences of decisions.
Everyday activity tactics	The desire for self-expression, self-realization; business activity; efficiency; purposefulness; ability to complete the work begun; the ability not to lose heart from failure; self-control dissatisfaction with oneself, constant desire for self-improvement; the desire to do their job in the best way; initiative; determination; the ability to constantly consider changing living conditions; result orientation; common sense; ability to link plans with real conditions.

Source: Compiled by the authors.

*The ability to control yourself.* Such a skill is based on the personal organization of the teacher, self-discipline, knowledge of the technique of personal work, the ability to formulate and realize life goals, self-control (Table 5).

Personal organization is, first of all, the ability to design, construct, organize and analyze your pedagogical activity, the ability to value time, commitment, self-discipline, the ability to live and work on the system.

Self-discipline is the ability to control oneself, to control one's behavior. This skill is based on such qualities as commitment, ability to keep the word, self-discipline, sense of responsibility.

Knowledge of the technique of personal work involves knowledge of the rules and techniques of organizing personal work and the ability to use them, namely: the organization of the workplace, the ability to work with information, speak on the phone, and listen effectively.

Efficiency can be considered as the ability to the continuous and intense creative activity of a teacher.

On the one hand, performance relies on physiological potential: health, a trained nervous system, and the absence of bad habits.

On the other hand, the emotional-volitional complex of qualities is no less important: will, hard work, persistence in work, satisfaction with its results, dedication to work, family well-being, cheerfulness, optimism.

And finally, personal self-control. This is the ability to control the processes of one's life and its results.

The development, preservation and (or) support of the above qualities are impossible without observing certain rules, recommendations, which are a system of so-called personal management, a concept that includes advice that is uniquely valuable for any teacher, practically applied and organizing his work with the most fruitful result as a result.

The main goal of personal management is to make the best use of one's capabilities, to consciously control the course of one's life (to be able to determine one's self), to more easily overcome external circumstances both at work and in one's personal life. We are talking about how to transform a situation, which is characterized by disordered work and the fulfillment of tasks due to external circumstances, into a situation of expedient and feasible tasks. (8)

The university teacher must be familiar with the technique of self-organization, self-control, and self-government.

In order to effectively perform its functions, a modern teacher needs to master certain components of managerial skills: be able to interact with people of different levels (students, colleagues, support staff, academia, superiors, etc.), establish business and creative relationships with colleagues, be able to use verbal and written language, to influence students and achieve mutual understanding, to be able to perceive, absorb and use information, etc. Success in any professional activity depends on the degree of proficiency in professional knowledge, on abilities, on the desire to work and achieve high results, on the willingness to choose the best ways to perform work tasks. (10)

Table 5. Personal Organization, The Teacher's Ability to Manage Himself

Quality groups	Primary qualities
The ability to formulate and realize life goals	The ability to know oneself; ability to formulate your life goals; ability to make decisions; ability to plan a career; ability to adapt in a team.
Personal organization	Knowledge of the rules and techniques of organizing personal work and the ability to use them; the ability to design, construct, organize and analyze their pedagogical activity; the desire to live and work on the system; skills of planning one's activity; ability to motivate one's actions.
Self-discipline	Binding, ability to keep the word; punctuality; composure, the ability not to scatter; a sense of responsibility.
Knowledge of personal work techniques	Organization of the workplace; ability to work with information; ability to speak on the phone; ability to plan their affairs; knowledge of methods for rationalizing personal labor; ability to use modern organizational equipment; knowledge of communication technology.
Physiological potential	Good health; fitness of the nervous system; lack of bad habits (alcohol, drugs, smoking).

Emotional volitional potential	Will, industriousness, perseverance in work; enthusiasm for work (vocation); job satisfaction; cheerfulness, optimism; family well-being.
Personal self-control	The ability to control the processes of their activities; control of results; control of the day; ability to form and control your image, maintain a high reputation.

Source: Compiled by the authors.

Most university teachers have to learn a new profession for themselves in an empirical way, directly in practice, most often - contrary to the initial professional choice, not having systemic ideas from the field of professional pedagogy and psychology, but only specific subject knowledge and skills. Even the completion of graduate school, one of the tasks of which is the psychological and pedagogical training of teachers, does not guarantee a solid theoretical basis for pedagogy and psychology, but only the initial level of relevant ideas. As a result, teachers, as a rule, knowing their subject well and constantly replenishing special knowledge (for example, from the field of engineering and production technologies that are rapidly becoming obsolete) have neither the time nor the opportunity to independently master psychological and pedagogical disciplines. (9) Therefore, in their activities, they usually reproduce the teaching methods that they know from the experience of their apprenticeship, as well as pedagogical techniques that they noticed in the work of colleagues.

An integral characteristic of a person of culture, high professionalism is the need for professional self-improvement. A university teacher must keep up with the fast-moving time, measure his activity with the development of science, culture, must grow faster than his students. The highest indicator of a teacher's professional culture is a combination of his teaching and research activities. (11)

Effectively educate and educate students can be the teacher who has a broad outlook, owns the methodology, relies in teaching on modern scientific data. Besides, the wide scientific horizons of teachers serve as the basis for the constant growth of the department and scientific school.

### 3 Results and Discussion

The main condition for understanding the content of the educational process of the university environment is the real requirements put forward by the modern teacher, namely professional competence, which allows the teacher to cope with various situations, many of which are difficult to predict, and the ability to unfold for those tasks that the theoretical and practical science. Such a strategy of a higher education teacher is based on traditional competencies, such as profound skills in the subject of professional activity, innovation, information and communication technologies, creative and critical thinking. These competencies are intertwined with such semantic values as freedom, responsibility, choice. And the decision of the professional competencies of the teacher is refracted through the main thing - the preservation of the individual as the highest value of humanity. Besides, the teacher's overall culture is a factor in the professionalism of the teaching staff, and psychological culture is its core. The psychological culture of a modern teacher is considered as a specific model, which includes professional social communication, interaction, a high level of professional and moral motivation. All this ensures the success of the individual both in the profession and in the framework of the life strategy as a whole.

The modern higher school is becoming the center of new ideas and innovations, provides the formation of a professional human resource, which is necessary to advance the latest trends in education, science, and business. The driving force of the modern world economy is professional skills in the form of technologies of different modes. (17) The level of transformation of a socio-economic nature has sharply increased, goods and resources are easily moving across national borders, and new means of communication and information processing in the

programming format in computer systems are rapidly spreading. (12) The latest educational trend is to continuously replenish your knowledge throughout your professional life. Therefore, professionalism is the main strategic task of a teacher of higher education. Strategies of professional activity, the professional competence of a university teacher are formed as an integral structure. It represents an integral structure of such competencies, the totality of which is necessary to create pedagogical conditions for the implementation of the teacher's professional activities. As you know, the main areas of work of a teacher of higher education include educational, methodological, research, educational and managerial functions.

The professional competence of a university teacher is built on the knowledge, abilities, and skills that form the basis of his labor teaching activities both as a person and as a scientist and as a teacher. In general, professional competence also incorporates organizational skills, moral qualities, and business skills. The teacher's professional competencies, of course, pass through a deep knowledge of the subject of their activity, pedagogical skills, pedagogical tact, knowledge of communication and information technologies, innovations, creative and critical thinking, and also pedagogical thinking. (13) The presence of the moral qualities of a teacher is built on a culture of behavior, both speech and its many modes - social interactions. The most important components of moral consciousness and behavior are moral need and will, desire, perseverance, the ability to realize moral choice in life. Beyond moral will, there can be no moral behavior. For a teacher, moral conviction, agreement with one's conscience and strong-willed firmness are very important, which together provide the opportunity for a truly moral act, and therefore moral behavior. The moral behavior of an individual has the following sequence: life situation - the moral-sensory experience generated by her - moral understanding of the situation and motives of behavior, choice, and decision-making - volitional stimulus - act. Moral education is effectively carried out only as a holistic pedagogical process that complies with the norms of universal morality, organizes the life of students: activities, relationships, communication, considering their age and individual characteristics. The result of a holistic process is the formation of a morally integral personality in the unity of its consciousness, moral feelings, conscience, moral will, skills, habits, socially significant behavior. (14) In the process of moral education, the basic category is the definition of moral empathy, empathy, emotional state, manifested in the feelings of real interpersonal relationships, due to reality. Therefore, moral attitudes are refracted into subjective morality and are assimilated by students as a result of their emotional development.

Organizational qualities have something in common with morals when the ability to build interpersonal relationships with colleagues is transferred to students. Such interaction in the conditions of the educational process involves a logical professional space in which all its participants receive the expected results. (15-16) We call business qualities professional skills that are manifested concerning their business, work. And here I especially want to note such qualities of a teacher as responsibility, choice, freedom. These qualities are designated in the pedagogical professional literature as existential values of education. The success of the educational process, the inclusion of all its participants in the space of creative thinking, the search for scientific ideas, and innovations depends on the teacher's competencies and motivation, the ability to transform knowledge, and knowledge of information technologies.

In addition to the above competencies, a special place in their structure is occupied by creative, creative thinking. Creative thinking for the modern teacher is the most important competence that contributes to the creative search for scientific and professional methods, the development of innovative technologies and, finally, the creation of an environment in which participants in the educational process will generate new ideas. Such an approach to their professional activities will lead to the development of the uniqueness of the learning process, the so-called conscious creation, the disclosure of their resources. (7) The uniqueness of the content of teaching competence is formed against the background of the communicative space. The formation of the communicative space is not only ensured by communication between the teacher and the student but also builds communicative competence. In this regard, we come to a competency that holds together all of the above: the competency that regulates the psycho-emotional state of a teacher is self-regulation. Without professional skills to manage their mental state, it is impossible to structure the competencies of a teacher in a modern university. (18) Indeed, as already mentioned above, the socio-technological requirements for teachers of vocational education are very high, and the achievement of these requirements is built in the context of "here and now". And this applies primarily to the level of interaction "teacher-student". The teacher must be able to develop his mental abilities as quickly as the changing world itself with its professional "challenges". Therefore, it seems to us important to form autogenous, relaxation techniques that regulate the psycho-emotional state of a higher school teacher. The use of professional behavioral training for teachers reveals his mental resource, then leads to the awareness of his inner experiences, thoughts, behavior. The management of personal mental potential, the ability to properly distribute one's psychic energy allow the teacher:

- 1) implement their professional projects;
- 2) competently build social interactions not only with students but also with other participants in the educational process;
- 3) shape your existential perspective.

Along with the basic requirements of education, it is necessary to form competencies that make it possible to freely express one's opinion, backed up by real educational and practical functions. The inner freedom of the teacher opens the way to the search for new forms of comprehension of scientific thoughts, communicative freedom, translates knowledge that unfolds the development of the information field, where, in turn, a new idea is formed. (12) Freedom is closely linked to responsibility and the right to choose. A prerequisite for freedom as a value of teaching is the responsibility. A teacher who takes an active part in social interactions is aware of this opportunity, the ability to make decisions that are consistent with the goals and objectives of education. In our opinion, with an internal lack of freedom, we cannot talk about full responsibility. The teacher as a participant in the educational process of the university is responsible for his professionalism, which he demonstrates, for his professional competence, and this responsibility enables him to properly structure his professional space. To be responsible means to devote oneself to the high service of one's business, training, and education of students. Responsibility and freedom are closely linked to the right to choose. (13) For the teacher, the choice in the circle of his competencies takes a special existential sound. He always has the right to choose to realize his professional meaning, the significance of his work, the ability to choose favor of true human values and the values of professional education. The existential competencies of education reveal the features of the formation of the teacher's personality and include such values as creativity, uniqueness, and communication. These values reinforce the degree of professionalism of the teacher, activate his competencies.

The ability to independently make decisions, experience, live and rise to a new constructive level in its development and forms a mature student personality. As we think, the synthesis of professional competencies with semantic (existential) values in the context of ways of self-regulation of the psycho-emotional

state develops a new personality format of a modern university teacher.

#### 4 Conclusion

The development of professional competencies of teachers of higher education mainly depends on the structure of the conditions of activity subjectively significant for the individual, which are part of the subsystem of professionally determined properties. Individually-psychological characteristics affect the severity of competencies only in case of insufficient development of the personality processes of self-regulation of behavior and activity.

Thus, the latest educational trend is to continuously replenish our knowledge throughout our life, which means that in the rapidly changing situations associated with new forms of socio-economic activity, as well as with the latest scientific technologies, it is necessary to work mobile, it is necessary to acquire competence that makes it possible to cope with various situations, many of which are difficult to foresee. Besides, the professional model of a modern university teacher should be filled with such psychological properties as tolerance, emotional stability, lability, regulatory flexibility, social activity and a developed system of self-regulation, which leads to identification and reflection, social communication, creative self-realization in any kind of activity, search pedagogical meanings, as well as the depth and constructiveness of self-expression, self-knowledge, and self-improvement. In connection with this substantial content and the condition for a high-quality full-fledged educational process, both the traditional competencies of the teacher and the existential values, which are constructs of the educational environment, serve as the basis on which all the activities of the teacher and his students are tuned. And the fastening competence of a university teacher is the ability to self-regulate their psycho-emotional state.

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## USE OF INFORMATION TECHNOLOGY IN MATHEMATICS LESSONS

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**Abstract:** The modern social and economic environment put forward new requirements for a school graduate. To achieve them, a new quality of education is required, which is largely due to the use of information technology (hereinafter - IT). They can prepare a pupil, starting from primary school, for life in an information society and make teaching and learning more effective. The topic of this article was chosen due to the wide implementation and use of information technology in the learning process. This topic is relevant because the teaching of specific subjects is gradually computerized. New methods of learning are being introduced into the modern learning process, which revives the achievements of experimental pedagogy of the past century built on the principle of self-development and individual activeness. One of the most important methods is the implementation of information technology in the education of younger pupils and its use in such subjects as mathematics.

**Keywords:** information technology, mathematics lessons, primary schoolchildren's education, information society, educational and pedagogical activities.

### 1 Introduction

As societies become computerized and as they enter the world community, there is a growing need to teach and educate children so that they be able to live in an open society, to communicate and interact with the diversity of the real world, have a holistic view of the world and its information unity. At the same time, in the period of rapid informatization of society, the ability to collect necessary information, propose a hypothesis, draw conclusions, use new information technology to work with information acquire significance for human development. Information technology can be used when children are introduced to new material in school subjects. It can be used to consolidate and revise what they have learned. (1, 2) In mathematics lessons, in particular, information technology not only serves to diversify the lesson but also to make learning materials more visible and understandable. (3-5)

In the process of "learning and teaching", there is a constant interaction between teacher and students. Each student undergoes the learning process that has a pronounced personal connotation in different ways: one cannot demonstrate the knowledge he or she has learned, the other, on the basis of previous experience, shows phenomenal abilities, and the third has learned a certain style of attitude to the subject and persistently "does not want" to learn. One cannot deny the personal perception (or lack of perception) of the teacher by the student and vice versa that also undoubtedly has an impact on learning progress. (6, 7)

Teaching is also personal in nature. By transmitting learning information, the teacher contributes emotional and value connotation to the content of the subject. Regardless of the teacher's wishes, his/her beliefs, priorities, motivations, and life concepts are also involved in the transmission of knowledge.

Education is a future-oriented process, which is why today's schoolchildren and, above all, today's primary school children will have to manage the existing information system. In this regard, an important step towards improving primary school education will lie in computerization, or more precisely, the development of information competence among younger pupils including information culture and information literacy.

The purpose of this paper is to identify the need for the use of information technology in the teaching of mathematics to junior high school students.

The goal is realized by solving the following tasks:

- The analysis of the scientific, practical and methodological literature on the use of information technology in teaching junior high school students;
- The studies of the basis for organizing students' activities in mathematics lessons using information technology;
- The analysis of the experience of the teachers in using information technology in the teaching of mathematics to younger pupils.

The object of the paper is the use of information technology in teaching junior high school students. The subject of the study is mathematics lessons.

The implementation of students' research activity elements in pedagogical technologies allows the teacher not only and not so much to teach, but also to help pupils to study, to direct their cognitive activity. Nowadays, the project-based learning method is one of the most widespread types of schoolchildren's research work in the teaching process. (8, 9)

### 2 Studying the Theoretical Foundations of the Use of Information Technology in Mathematics Teaching

#### 2.1 Concept of Information Technology

Information processes (collection, processing, and transmission of information) have always played an important role in science, technology, and society. In the course of human evolution, there is a steady trend towards the automation of these processes, although their internal content has remained essentially unchanged.

The informatization of society is a universal implementation of the complex of measures aimed at providing full and timely use of reliable information and generalized knowledge in all socially significant kinds of human activity. (10) Information technology is a wide range of disciplines and fields of activity related to data management and processing technologies such as computing etc. (10, 11)

Information technology is a set of methods, production processes; software and hardware facilities united in a technological chain that provides collection, processing, storage, distribution and display of information in order to reduce the labor intensity of using information resources and increase their reliability and efficiency. The purpose of creation and wide distribution of information technology is to solve the problem of informatization development of society and all life activities in a given country. (12, 13)

Currently, information technology is most often understood as computing. In particular, information technology deals with the use of computers and software to store, transform, protect, process, transmit, and receive information. According to the definition adopted by UNESCO, information technology is a set of interrelated scientific, technological, and engineering disciplines studying

- Methods of effective organization of work of people engaged in the processing and storage of information;
- Computing and methods of organization and interaction of people with industrial equipment, their practical applications, as well as related social, economic and cultural problems. Information technology requires complex training, high initial costs, and knowledge-intensive equipment. Their implementation should begin with the creation of mathematical support and the formation of information flows in training systems. (14)

## 2.2 Role of Information Technology

At present, the process of "semiotization" of society is taking place, which implies the emergence and development of numerous sign systems, through which a multi-component "information field" is formed, which is a specific information environment of man. Since the possibilities of information technology are unlimited, the problem of information (communicative) adaptation of a person in society arises. Modern society has realized that the future is unthinkable without the informatization of all areas of human activity. The flow of information that a person encounters daily and hourly becomes more and more powerful. The rapidly growing flow of information leads to the fact that every year the gap between the total amount of scientific knowledge and that part of it which is assimilated in an educational institution increases. (15-17)

The modern pupil must

- Be able to adapt to different life situations;
- Obtain a system of necessary subject knowledge for solving practical problems;
- Possess the skills to overcome thinking stereotypes;
- Develop abilities for adaptation in the changing information environment;
- Be flexible, mobile, perceptive, tolerant, creatively initiative, and competitive person. (12)

In this connection, priorities regarding ways and methods of training change from the presentation of ready knowledge to training in ways of search, storage, selection, qualitative processing of the information and its use.

An informatization program is a set of measures aimed at ensuring the use of operational knowledge in all types of school activities. The purpose of modern lessons is to form imaginative thinking and clear ideas about the subject. Great opportunities for its implementation are laid down in the use of computers in primary schools. The modern education system implies the use of a variety of innovative technologies. This provides two main advantages - qualitative and quantitative. Qualitatively new opportunities are evident when comparing verbal descriptions with the audiovisual presentation. Quantitative advantages are expressed in the fact that the multimedia environment is much higher in terms of information density.

The development of new information technology in education stimulates the development of software tools and applications that implement methodological ideas related to semi-automatic or automatic access to learning information, the verification of the correctness of the received results, the evaluation of initial and ongoing training, and so on. It is possible to assert that the competent use of possibilities of modern information technology in primary school promotes

1. Enhancing cognitive activities and improving the quality of learning outcomes of students;
2. Achieving the learning objectives with the use of modern e-learning materials for use in primary school lessons;
3. Enhancing the self-education and self-control skills of younger pupils; improving the comfort of learning;
4. Reducing didactic difficulties among pupils;
5. Enhancing the activism and initiative of younger schoolchildren in the lesson; development of information thinking of schoolchildren, the formation of information and communication competence;
6. Gaining computer skills in accordance with basic security rules.

A modern specialist must have fundamental information training since with the increasing volume of scientific and technical information an educational institution is unable to provide a learner with the full amount of knowledge for his or her entire conscious life. Therefore, the "core" of professional competence is not students' knowledge but the ability to use new technologies that have public value and a huge motivational

stimulating value and the ability to solve problems in different kinds of activities. (14)

Information technology is of special importance in all kinds of human activity, especially in training. Thanks to information technology and the Internet, students have the opportunity to work together on projects (partner's localization is not important), access to information sources not only at their school or university but also to other sources in the country and abroad. They can participate in teleconferences.

The specificity of competency-based learning with the use of information technology is that students do not learn the ready knowledge offered by a teacher, but the conditions of origin of this knowledge are traced. Favorable conditions are created for the formation and development of pupils' personal qualities in the course of learning activities.

In primary schools, the use of information technology helps teachers to visualize the necessary didactic units of educational information, to increase the interest of younger pupils in mathematics, and to encourage pupils to accumulate supporting facts and methods of how to act in accordance with a model. The following significant changes in the teaching process take place with the use of information technology:

- The reorientation towards the development of thinking and imagination as the basic cognitive processes necessary for quality learning;
- The effective organization of students' cognitive and independent activities;
- The ability to cooperate, self-improve, create, etc. is demonstrated.

When using information technology, all the main stages of the lesson are still preserved. Within the framework of a traditional lesson, electronic versions of some of the teaching materials make the process of obtaining knowledge comprehensive and effective. They make it possible to speak of the formation of key schoolchildren's competencies such as

- The ability to think systematically, to act independently under conditions of uncertainty and unpredictability;
- The readiness to take responsibility for the work being done;
- The ability to solve problems independently and effectively in the process of practical activity;
- The willingness to interact and cooperate positively with classmates;
- The ability to make quick and effective decisions, to actively contribute to conflict resolution in solving problems;
- The ability to apply their knowledge and experience quickly and flexibly to practical problems;
- The willingness to acquire new knowledge and to strive for self-improvement;
- An understanding of the importance of using information technology and its mastery in the learning process;
- The ability to subjective self-esteem and reflection.

It is possible to solve a problem of the lack of visual mobility in mathematics lessons using a computer when children compare geometric shapes by means of isometry and analyze relations of sets under the direction of a teacher on a monitor screen. A computer is also the most powerful stimulus for children's creativity. A screen attracts attention, which sometimes cannot be achieved using frontal instruction. On the screen, you can quickly perform transformations in a deformed text by turning scattered sentences into a coherent text. However, in order for primary school students to be able to use a computer as a teaching aid in accordance with their wishes, it is necessary to take care of the universality of their user skills. (18) Children have the right to use modern means of work already today. Modern audiovisual media and intensive teaching methods can interest pupils in the subject and make it easier to learn. (12)

Multimedia lessons help to solve the following didactic tasks:



- Mastery of basic discipline-related knowledge;
- Systematization of the gained knowledge;
- Development of self-control skills;
- Development of motivation for learning in general and mathematics in particular;
- Providing educational and methodical assistance to students to work independently on the learning material.

Information technology provides information in various forms and thus makes the learning process more effective. On average, 30 percent of the time necessary for learning a particular material is saved, and the gained knowledge is stored in memory for much longer. When information technology is used in the learning process, this process changes significantly as follows:

- The reorientation towards the development of thinking and imagination as the basic cognitive processes necessary for quality learning;
- The effective organization of students' cognitive and independent activities;
- The ability to cooperate, self-improve, create, etc. appears.

### 2.3 Types of Information Technology Used in Mathematics Lessons

Two types of information technologies are used in mathematics lessons: presentations and slideshows. They make it possible to explain the material to children in a clear and accessible way. The presentation is the information support for frontal instruction in a classroom and consists of slideshows. The main forms of this information are text, drawings, etc. (14)

The experience of using electronic presentations made with the Microsoft PowerPoint program showed that the quality of the lesson is improving. Computer presentations are the most modern technologies for presenting information. The forms and place of use of a presentation in a lesson depend on the content of that lesson and the goal set in the lesson. When learning new materials, the use of a presentation allows illustrating the learning materials. When conducting oral exercises, the presentation allows for submitting tasks quickly. A training presentation can be a summary of the lesson. In this case, it consists of the main components of the traditional lesson such as topic, goal, a work plan for the lesson, key concepts, and homework. For math lessons, it is important to use animated drawings, when it is necessary to organize students' work with graphs and drawings to prove theorems and problems, to make a diagram, use a table, etc.

The following different kinds of electronic applications are used in lessons:

- Illustrations and demonstrations of audio and video materials;
- Applications combining both illustrative material and introducing issues in a problematic way with the subsequent check of proposed suggestions and solutions, frontal check and self-test of knowledge in the form of quiz, crosswords, and puzzles;
- The development of a series of lessons on the topic that allows for the most complete presentation of the material by drawing a picture of the holistic perception of the world, and successfully integrating different areas of knowledge in one subject;
- The development of electronic applications to the lessons using Visual Basic programming language that provide direct communication between a student and a computer (to perform by teachers who have mastered object-oriented programming).

Kinds of information technology most commonly used in the learning process can be divided into two groups such as

1. Network technologies using local networks and the Internet (electronic versions of methodological guidelines, manuals, distance-learning servers providing interactive

communication with students via the Internet including in real-time).

2. Technologies oriented to local computers (training programs, computer-made models of real processes, demonstration programs, electronic collections of mathematical problems, supervising and testing programs, and didactic materials). (14)

### 3 Results and Discussion

Information technology can be used

- To indicate the lesson topic. The theme of the lesson is presented with slides to summarize the key points of the issue at hand.
- As an accompaniment to the teacher's explanation. In the practice of teaching junior students, multimedia presentation notes created specifically for specific lessons can be used. They can contain brief texts, basic formulas, schemes, drawings, and the demonstration of the sequence of actions to perform the practical part of the work.
- As an information and learning tool. When teaching, special emphasis is placed on a child's own search and perception activities as well as on processing new knowledge. A teacher acts as the organizer of the teaching process, as the leader of the students' independent activities by providing the necessary help and support.
- For knowledge testing. The use of computer-based testing increases the efficiency of the educational process and activates schoolchildren's cognitive activities.

It is reasonable to apply information technology in the following cases:

- Diagnostic testing of the quality of learning material mastery;
- In a training mode to rehearse elementary skills and abilities after studying a topic;
- In a teaching mode;
- When working with slow learners;
- In a self-learning mode;
- In the mode of a graphic illustration of the learning material.

The method of the use of information technology implies

- The improvement of the learning management system at various stages of the lesson;
- The improvement of learning motivation;
- The improvement of the teaching and education quality;

Multimedia lessons help solve the following didactic tasks:

- The mastery of basic knowledge related to a given topic;
- The systematization of the mastered knowledge;
- The development of self-control skills;
- The development of the motivation for learning in general;
- Providing educational and methodical assistance to students to work independently on the learning material.

#### 3.1 Organization of Computer-supported Lessons

Computer-supported lessons are conducted along with usual lessons where it is possible and expedient to use computers for the solution of particular tasks in a lesson so that a child could understand more deeply, perceive a lesson subject and creatively prove himself/herself. Every computer-supported lesson is, in principle, integrated. In such a lesson, besides the subject-related tasks, the tasks related to the computer science course are also solved. (19)

The main types of computer-supported lessons are as follows:

- Combined lesson;
- Testing and correction lesson;
- Knowledge improvement lesson.

When teaching children within the framework of a special course, computer-supported lessons imply the 3 following forms of teaching:

- Frontal instruction;
- Group work;
- Solitary work.

The following conditions should be considered for the organization of the learning process:

- A teacher with computer skills should conduct the lesson.
- Computer-based tasks should be designed in accordance with the content of the subject and the methods of teaching it.
- Students should be able to handle the computer at a level required for the performance of the relevant computer-based tasks.
- Students shall study in a special lab equipped in accordance with established standards of hygiene for primary school.

For the formation and development of key competencies in the context of information culture, a primary school teacher should develop a consistent, logically completed system of learning tasks built in accordance with the rise of the level of completeness, problem, novelty, vitality, practicality. The teacher should control students' activities regarding the selection of information and its processing.

When developing computer-supported lessons, it is necessary to determine:

- Which topics should be "supported" by computer-based tasks and for which didactic objectives;
- Which software tools should be used for creating and performing computer-based tasks;
- What preliminary computer skills should be developed in children;
- What lessons it is expedient to do with computers;
- How to organize computer-supported lessons.

There are the following approaches to the creation of electronic learning materials for primary schools:

- The structure of each thematic section should be typical for a lesson at primary schools and should include an explanation of new material, initial consolidation and development of skills, and mastery testing;
- The structure of each thematic section should be relevant to a primary-school lesson. This structure includes the explanation of new material, the initial consolidation of information by highlighting the main terms and concepts of each topic;
- The volume of learning material for practice and testing tasks is determined in view of the sanitary and hygienic norms for primary school children working at the computer;
- The selection of learning material is conducted in view of the basic didactic principles;
- The management tools for the computer-based training system for any academic subject should be as simple as possible and should not distract a pupil from performing the tasks.

Let us consider the use of information technology in the primary school maths lesson using the example of an electronic presentation made with the Microsoft PowerPoint program. The presentation is entitled "Introduction to Numerical Expressions". It has a learning function. The slides are based on the content of the "Harmony" program by N.B. Istomina. The purpose of this lesson is

- To evolve the perceptions of the concepts of numeric expression, mathematical expression, the meaning of the numeric expression, and relation;

- To enhance the ability to find the meaning of any numeric expression;
- To develop attention, memory, and diligence;
- To instill interest in mathematics using information technology.

The "Introduction to Numerical Expressions" presentation is designed to visualize the system of tasks on the topic of a given lesson and to perform them together as a team. The expected length of the work with this presentation in the lesson is 12 minutes. The presentation consists of the following elements:

- The first slide. The title page, on which the title of the topic and the class designation are indicated.
- The second slide. Pupils are asked to determine which of the figures corresponds to the expression  $4 + 3$ . The images of finite sets whose elements are geometrical figures are chosen as illustrations. When working with numerical expressions, pupils rely on the quantitative theory of non-negative integers, on skills to relate a set of objects to a multiplicity and to establish a relation between a given numerical expression and an illustration. As students complete the task, they move on to the more complex task shown on slide three.
- The third slide. The completion of the task requires students to demonstrate qualities such as the ability to see and transfer a familiar situation (slide 2) to a new problem. To complete the task a student should establish a bijection between a set of mathematical (numerical) expressions and a set of illustrations that are the objective display of relative numerical expressions.
- On the fourth slide, it is required to define, to what illustration numerical equality corresponds. The completion of the task requires the actualization of the mastered knowledge such as the ability to apply the earlier gained knowledge to establish the relation between a given illustration and a numerical expression. Besides, when completing the task, pupils comprehend integer composition up to ten under the assumption of the addition of parts.
- The fifth slide. The tasks presented on it become complicated: illustrations display the series of objects of the finite sets arranged in ascending order of the number of elements in a given set and series of numerical expressions. Students must determine the relation between a series of object sets and a series of numeric expressions by setting a rule and obtaining each subsequent object set and, respectively, a number.

The other tasks are similar to the previous ones and are aimed at the enhancement of the skills of finding the values of a numeric expression, comparing numeric expressions, and establishing the relation between the elements of the considered sets and the number of elements of the finite set.

It should be noted that the mathematical definition of a numeric expression is complex and inaccessible to younger students. Therefore, according to didactic principles of evolving the perceptions, the work with numerical expressions should be organized consistently, from stage to stage, with the observance of the logic of mathematical education continuity. (12, 20, 21) The proposed system of tasks is aimed at enhancing skills and creating conditions for the performance of learning tasks at a higher level of independence. The above-described working out can be used in a mathematics lesson in the first grade of primary school in any of the existing curricula.

The experience of working in the school shows that with the didactically thought-out application of information technology in a traditional lesson, there are unlimited opportunities for the individualization and differentiation of the educational process and the development of every student's own educational trajectory in obtaining knowledge is guaranteed. With the use of information technology, favorable conditions are created for the formation and development of students' personality-related qualities in the course of educational activity.

#### 4 Conclusion

The objective of the study was to show how information technology could be used in the professional activities of primary school teachers. In order to achieve this objective, information technology and its role in the work of teachers and students were examined, and the literature on the use of information technology in mathematics lessons was analyzed.

The following objectives have been achieved:

- The analysis of the scientific, practical, and methodological literature on the use of information technology in the teaching of primary schoolchildren;
- The study of the basis for organizing students' activities in mathematics lessons using information technology;
- The analysis of teachers' experience in using information technology when teaching elementary school mathematics.
- The following conclusions can be drawn using information technology:
  - No matter how complicated and boring the topic of the lesson, it will become interesting for the student if the teaching material on the screen is presented in colors, with sound and other effects.
  - The presentation on the topic of the lesson when explaining new material allows the teacher not to make notes on the blackboard, which means that more time is saved to consolidate knowledge.

Experience shows that the use of information technology in a lesson can transform the learning process by making it more effective and attractive for students (22). Teaching with the use of information technology becomes a creative search for a child, from which one can get satisfaction and through which one can assert oneself.

The use of new information technology in traditional primary education also makes it possible to differentiate the process of teaching younger pupils in accordance with their individual characteristics, enables a creative teacher to expand the range of ways in which educational information can be presented, enables flexible management of the educational process and is socially important and relevant.

Having analyzed the experience of primary school teachers in working with information technology (23), we have drawn the following conclusions:

- There is a reorientation towards the development of thinking and imagination as the main cognitive processes necessary for quality learning;
- An effective organization of cognitive and independent activities of students is ensured;
- The ability to collaborate is developed.

Thus, the following conclusions can be drawn from everything written above: new methods of learning are being introduced into the modern learning process, which revives the achievements of experimental pedagogy of the past century built on the principle of self-development and individual activeness. One of the most important methods is the implementation of information technology in the education of younger pupils and its use in such subjects as mathematics.

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## ACTIVIZATION OF COGNITIVE ACTIVITY OF STUDENTS IN THE LEARNING PROCESS IN KAZAKHSTAN

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**Abstract:** At present, more than ever, there is a great demand for knowledgeable, business, responsible people. The modern society of information technology is interested in highly educated and competent specialists who can act independently and actively, make decisions, adapt flexibly to constantly changing living conditions. The current situation implies an increase in the educational, cultural, and professional level of each person; search for special forms of education; requires other skills and abilities; dictates the need to increase personal activity, responsibility, and enterprise. In the Republic of Kazakhstan, the content of education should be focused on ensuring the self-determination of the individual, creating conditions for its self-realization.

**Keywords:** cognitive activity, educational process, development of education, conditions for self-realization, educational standard.

### 1 Introduction

Following the content of the state educational standard, social demands for the training of professionally competent specialists have increased. In modern conditions, the process of training a young specialist does not end at the secondary vocational school (lyceum), technical school (college) or university - it becomes continuous. There is a direct link between the level of development of society and the intellectual potential of professionals: a high level of material and technical base and culture require specialists to have the appropriate knowledge and skills, as well as a constant desire to improve education and improve their skills. That is, there is an urgent need for each person in the system of continuing professional education.

The professional formation of the personality of the teacher of vocational training is part of the ontogenesis of a person from the beginning of the formation of professional intentions to the end of active professional activity. Many scientific works indicate the need for a new approach to the process of professional formation of the personality, the formation of a positive attitude to professional activity, interest in the content of the work (O.S. Anisimov, A.S. Belkin, N.S. Glukhanyuk, E.F. Zeer, A.A. Derkach, V.S. Lednev, L.E. Orban, G.M. Romantsev, V.V. Shapkin, and others). It is no coincidence that in recent decades a new science has emerged - acmeology, which reflects the problems of the formation of professional maturity of an individual. The effectiveness of the training of specialists, first of all, depends on the activities of the university in introducing students to their future profession, ensuring the formation of professional orientation in the educational process (A.B. Kaganov and others). The peculiarity of the acmeological approach consists in raising the question of the influence of moral principles and personality activity on the formation of professionally important qualities (O.S. Anisimov, A.A. Derkach, N.V. Kuzmina, A.A. Rean, and others).

During training at a vocational pedagogical university, an attitude toward engineering and pedagogical activity is being formed, which includes pedagogical, engineering, technical and production, and technological components. General engineering skills (polytechnic skills in reading and drawing drawings,

diagrams, graphs; measurement; technical diagnosis; performing design and graphic work; development of engineering documentation; determination of economic indicators of production, etc.) constitute an important part of the competence of the teacher of vocational training. In this regard, the forefront is the need to strengthen the professional orientation of the content of the courses of the engineering cycle and change the emphasis in the educational activities of students.

### 2 Materials and Methods

The methodology of teaching any academic discipline in a university needs constant improvement by the requirements of the development of pedagogy and scientific and technological progress. Therefore, the methodological support of graphic disciplines imposes ever higher requirements. Given the shortage of training time allocated for the subject, while trying to maintain common program material, the task of constructing a balanced teaching methodology for graphic disciplines that provides a high level of mastery of graphic knowledge is important and relevant.

Among the problems that are not reflected in the practice of training engineering and teaching staff is the lack of research that examines in detail the process of designing a modular technology for teaching graphic disciplines.

Requirements for the level of training of graduates of a vocational pedagogical university suggest a change in the existing approaches to organizing the process of teaching graphic disciplines, focusing on creating conditions for the formation of the personality of a specialist and ensuring the professional orientation of the educational process. (1) Thus, the strategic direction of the development of the system of continuing professional education is to solve the problem of personality-oriented education, in which the student's personality is in the focus of the teacher's attention, and the teaching activity is an active cognitive activity. Moreover, the most important trend in the development of education, including engineering and pedagogical, is the revision of the very concept of the organization of cognitive activity of students and pedagogical guidance.

The relevance of the problem of enhancing the cognitive activity of students is evidenced by the numerous works of psychologists (K.A. Abulkhanova-Slavskaya, B.P. Esipov, P.I. Pidkasisty, N.A. Polovnikova, M.N. Skatkin, I.F. Kharlamov, T.I. Shamova, G.I. Shchukin, A.F. Esaulov, and others). For example, K.A. Abulkhanova-Slavskaya, (2) considering this problem through the prism of personality psychology, says that activity is a generalized, valuable way of reflecting, expressing, and fulfilling her vital needs, typical of a given personality; it is a functional-dynamic quality of personality that integrates and regulates in dynamics its entire personality structure. This position is reflected in the work of many other researchers. Other scientists define the activation of cognitive activity of students as the ability and desire to creatively approach the surrounding reality, which ensures success and gives the educational work of students the character of an independent and creative search for truth (I.Ya. Lerner, P.I. Pidkasisty, N.A. Polovnikova, and others). In particular, M.N. Skatkin (3) in his writings emphasizes, "The activation of cognitive activity is necessary not only for the successful solution of educational but also educational tasks: it instills mental abilities ..., fosters love, respect and the habit of serious work, arouses curiosity". Highlighted areas reflect a humanistic approach to education, the hallmark of which is the individuality of a person, his personality.

Person-oriented learning according to M.Yu. Bukharkina, M.V. Moiseeva, A.E. Petrova, E.S. Polat, G.K. Selevko, N.E. Erganova and others suggest a differentiated approach to learning, considering the level of the intellectual development of

the student, his abilities and the level of preparation for a specific (in our case, graphic) discipline. The new education paradigm predetermines a change of priorities - from the traditional assimilation of ready-made knowledge during lecture and seminar classes to the independent active cognitive activity of each student. Moreover, the student's involvement in the active cognitive process should be accompanied by the assimilation of knowledge and a clear understanding of it, where, how, and for what purposes this knowledge can be applied in future professional activities. With such an organization of the educational process, the teacher is given the role of a competent consultant, manager of independent active cognitive activity of students. (4)

The problem of enhancing the cognitive activity of future "vocational training teachers seems to us especially relevant in connection with the fact that over the past decades, information technologies based on technical achievements, such as personal computers, multimedia equipment, and global telecommunication networks, have penetrated the educational process more and more deeply. Internet. Computer telecommunications contribute to the creation of a cognitive environment used to solve various didactic problems (cognitive, informational, etc.). The main feature of this environment is that it is suitable for both mass and individual learning and self-study, which opens up the possibility for distance learning.

The pedagogical experiment was attended by 237 students of a vocational pedagogical university. Characterizing the contingent of the study, it should be noted that the first-year students aged 17-19 years, which is sometimes called "student age", took part in the experiment. Following the age periodization of E.F. Zeera, this contingent refers to the period of early adulthood at the stage of youth.

When preparing the experiment, it was considered that the leading activity in youth is vocational education, the full implementation of which contributes to the professional formation of the individual. And psychological neoplasms of the personality at this stage of formation should be a professional orientation, independence, generalized methods of professional and cognitive activity, social and professional competence, social maturity. (5)

When forming the contingent of students to study the problem, we considered that youth is characterized by unevenness and accelerated pace in the development of the intellectual and cognitive sphere of personality. At the student age, the development of cognitive processes (verbal-logical ways of thinking, sustained attention, involuntary memorization, self-esteem, self-knowledge, etc.) occurs. In this regard, when developing an electronic training course, we considered the peculiarity and nature of the training material to be assimilated in the process of studying descriptive geometry.

Preparing students for the profession of a teacher of vocational training requires solving problems such as ensuring a high level of assimilation by students of knowledge and arming them with modern teaching technologies. That is why the theoretical aspects of the problem of enhancing cognitive activity using modern information technologies were considered in the dissertation. In the process of theoretical understanding of the problem, we put forward some assumptions that require experimental verification.

For experimental pedagogical research, control groups (114 students) were identified, in which training was carried out using traditional techniques of teaching descriptive geometry, and experimental groups (123 students), in which training was conducted by the developed hypothesis. Moreover, groups of students with approximately the same level of initial training in graphic disciplines were taken for analysis. The purpose of the experiment was to compare the learning outcomes in the experimental and control groups of students.

The resolution of urgent problems of vocational education depends on the competent use of pedagogical and information

technologies. It is practically impossible to separate one from the other since only the widespread introduction of new pedagogical technologies will make it possible to change the paradigm of education, and only new information technologies will most effectively realize the possibilities of these pedagogical technologies.

Thus, *contradictions* are revealed:

- between the increased demands of society on the quality of training and the conservatism of the existing system of vocational education;
- between the need to enhance the cognitive activity of students and the traditional education system, which does not consider the individual creative nature of student activity, facts, and trends in the informatization of the educational process;
- between the increased role of self-education in the professional activities of a vocational education teacher and the lack of modern adaptive didactic tools aimed at self-education;
- between the needs of the individual in varied, personality-oriented teaching technologies, interconnected with new information technologies, and the objective difficulties of their implementation in the practice of teaching graphic disciplines.

In connection with the foregoing, the research *problem* is to search for teaching technologies that contribute to the activation of cognitive activity of students and the formation of their professional orientation in the process of teaching graphic disciplines.

*The purpose of the study* is to develop pedagogical conditions for enhancing the cognitive activity of students in the process of teaching graphic disciplines based on the capabilities of modern information technologies and principles of acmeology.

*The object of study* - the process of teaching graphic disciplines in a professional-pedagogical university.

*The subject of the study* is the pedagogical conditions for enhancing the cognitive activity of students in the process of teaching graphic disciplines.

The basis of the study was the following *hypothesis*: the activation of cognitive activity of students in the process of teaching graphic disciplines is possible, with the complex fulfillment of the following pedagogical conditions:

- personality-oriented approach to learning;
- the formation of the professional orientation of students through the use of acmeology principles;
- educational and methodological support based on the capabilities of modern information technologies, including an electronic training course.

Following the purpose and hypothesis of the study, the following *tasks* were formulated:

1. To study the state of the problem under study in pedagogical theory and practice.
2. To justify the pedagogical conditions that contribute to the activation of the cognitive activity of students in the process of teaching graphic disciplines.
3. To clarify the principles of acmeology, contributing to the formation of the professional orientation of the student's personality.
4. To develop the content and educational and methodological support of the electronic training course in graphic disciplines.
5. Experimentally verify the effectiveness of the application of the complex of educational and methodological support for graphic disciplines.

In the study, we introduced a *limitation*: developing a set of educational and methodological support for teaching graphic disciplines at a professional-pedagogical university, we limited

ourselves to studying the problem within the discipline "Engineering Graphics: Descriptive Geometry" for students of engineering specialties.

The methodological basis of the study was the provisions in the field of philosophy of education and methodology of the learning process (V.I. Zagvyazinsky, V.I. Kagan, V.V. Kraevsky, V.S. Lednev, I.Ya. Lerner, M.N. Skatkin, I.A. Sychenikov, and others).

The study is based on the theory of the activity approach in cognition and learning (P.L. Halperin, A.N. Leontyev, S.L. Rubinstein, and others); as well as educational and developing training (L.S. Vygotsky, V.V. Davydov, D. B. Elkonin, and others).

The starting points were the theoretical provisions on the management of educational and cognitive activities (S.I. Arkhangelsky, A.M. Novikov, M.U. Piskunov, N.F. Talyzina, T.I. Shamova, G.I. Schukin, etc.); individualization of educational activities (A.A. Kirsanov, I.E. Unt and others); independence in learning (P.I. Pidkasty, I.G. Pustilnik, etc.); and also used work in the field of pedagogical theory V.P. Bepalko, V.I. Zhuravleva, M.I. Makhmutova, M.V. Clarina, which allow identifying ways and means of forming a creative personality in various activities.

The integrated approach to the study of the activation of cognitive activity in the process of teaching graphic disciplines in the preparation of a specialist is based on the works of scientists considering the following problems: personality, and its structure; professional training of specialists; professional orientation in training; laws and principles of professional development of the personality; training in graphic disciplines; design of pedagogical technologies; the use of computer technology in the learning process.

The following research methods were used to achieve the objectives: a retrospective analysis of philosophical, psychological, pedagogical and methodological literature on the topic of the dissertation, normative-programmatic and educational-planning documentation, teaching and learning aids; generalization of advanced pedagogical experience; comparison; abstraction; modeling; targeted monitoring of students in the process of educational and cognitive activities; diagnostic methods (testing, questioning, interviewing, conversation, etc.); expert assessment method; pedagogical experiment *u* (ascertaining and formative); generalization of data obtained as a result of pedagogical research; processing results by methods of *h*, mathematical statistics.

*The scientific novelty* of our study is as follows:

- The pedagogical conditions for enhancing the cognitive activity of students in teaching graphic disciplines were identified;
- a set of educational and methodological support for teaching graphic disciplines based on the use of information technologies was developed and scientifically substantiated, which contributes to the activation of students' independent cognitive activity;
- a set of acmeological principles has been identified and adapted to the educational process of the university that contributes to the formation of the professional orientation of the student's personality. (6)

*The scientific validity and reliability* of the research results are ensured by the research logic, its compliance with theoretical and methodological principles, the widespread use of complementary research methods, the use of system and factor analysis methods, protocol registration of the results of a pedagogical experiment, their mathematical and statistical processing, the correspondence of the results to existing scientific ideas and patterns in the system of psychological and pedagogical disciplines.

*The theoretical significance* of the study lies in the justification of the pedagogical conditions for the activation of cognitive activity of students using modern information technologies, and acmeological principles that contribute to the formation of a professional personality.

*The practical significance* of the work lies in the fact that pedagogical conditions have been identified that contribute to the activation of the student's cognitive activity, and the formation of professional orientation personalities.

The results of the study are a set of educational and methodological support for descriptive geometry, developed and implemented by us in the educational process of the university, including an electronic training course and the manual "Engineering Graphics: Descriptive Geometry".

The results of the study can be recommended for implementation in higher educational institutions.

*Testing and implementation of the research results* were carried out based on higher educational institutions of Kazakhstan. The main results of the study are embedded in the educational process. Pedagogical conditions for the activation of cognitive activity of students in the study of graphic disciplines, involving the use of pedagogical and information technologies, and contributing to the formation of professional orientation of the student's personality.

Organization of cognitive activity of students, providing for the use of a complex of educational and methodological support for descriptive geometry, including an electronic training course, subject to the choice as the basis for systematization, an increase in the degree of activity and independence of learning.

A set of adapted principles of acmeology, contributing to the formation of the professional orientation of the personality of a student teacher, starting with the first courses of study at a university.

*Research stages:*

*The first stage* – the search and theoretical – consisted of theoretical justification of the problem, a retrospective analysis of the psychological and pedagogical literature to identify the main theoretical and methodological concepts of the study, based on which his hypothesis, problem, and objectives were formulated.

At this stage, the possibilities and features of activating the cognitive activity of students in the process of teaching graphic disciplines were determined. The development of the program and organization of the pedagogical experiment.

*The second stage* – the experimental – consisted of a pedagogical experimental study, which was conducted with first-year students of engineering specialties.

At this stage, experimentally, the content, training technologies were clarified, as well as the adjustment of the curriculum in descriptive geometry, which contributes to the activation of the cognitive activity of students and the formation of professional orientation. The necessary information was collected to summarize the pedagogical experiment.

*The third stage* – the final – was devoted to the analysis and generalization of the results of a pedagogical experiment, statistical data processing, formulation of conclusions, design of dissertation research, preparation for its defense.

Enhancing the cognitive activity of students is an important and eternal problem of pedagogy, the solution of which is aimed at improving the effectiveness and quality of training. It is no accident that the study of this problem is carried out in various directions:

- the development and organization of cognitive activity of students, a necessary condition for improving the quality of

- knowledge (L.P. Aristova, E.V. Korotaeva, I.F. Kharlamov, T.I. Shamova, I.S. Yakimanskaya, and others);
- organization of creative search and cognitive activities of students (V.G. Razumovsky, A.V. Usova, M.I. Makhmutov, and others);
  - the formation of cognitive interests of students in the general didactic aspect (R.Sh. Akhtyamova, K.A. Rajapov, G.I. Shchukin, and others);
  - organization of independent cognitive activity of students (B.P. Esipov, R.V. Oleinik, P.I. Pidkasisty, N.A. Polovnikova, and others).

Based on the study of psychological and pedagogical work, we identified some scientific problems associated with the study of cognitive activity.

A retrospective analysis of the scientific literature indicates the existence of numerous definitions of the concepts of "cognitive activity" and "activation of cognitive activity". Moreover, in many cases, the definitions given by various authors to these concepts diverge both in volume and in content. An ambiguous understanding of the content of these concepts indicates not only the existence of various approaches to their study but also the complexity of the concepts themselves.

In the dictionary S.I. Ozhegov, (7) the concept of "activation" is defined as the strengthening of activities. In English, the Russian word "activity" is translated by the term "activity, and any type of practical or cognitive activity of a person is defined by this concept, that is, activity is expressed in actions that constitute activity. The encyclopedic dictionary also interprets activity as "enhanced activity". In the philosophical literature, human activity is considered concerning activities that create new forms and properties of social reality.

The pedagogical dictionary defines activity in learning as a "didactic principle that requires the teacher to set up the learning process that fosters the initiative and independence of students, strong and profound assimilation of knowledge, the development of necessary skills, the development of observation, thinking and speech, memory and creative imagination. The principle of activity is in close connection... with the principles of consciousness".

In the psychological and pedagogical literature, with all the versatility of studies of cognitive activity, two main areas can be distinguished:

- cognitive activity as an activity;
- cognitive activity as a trait, personality quality.

The peculiarity of vocational and pedagogical education is that students of engineering specializations are preparing to teach several subjects of the general technical cycle in secondary vocational schools. General technical disciplines, which include graphic disciplines, are the general theoretical basis of special technical knowledge and form an important part of the professional training of a teacher of vocational training. The specifics of the content and teaching of general technical disciplines are considered in the works of V.A. Hervera, T.V. Kudryavtseva, V.A. Skakuna, N.E. Erganova, I.S. Yakimanskaya, and others.

### 3 Results and Discussion

Teaching students in technical disciplines is focused on the acquisition of professional knowledge of a technical nature and the formation of a scientific and technical outlook. Therefore, when studying technical disciplines, students need graphic activity (reading and executing graphs, diagrams, drawings, technical drawings, etc.), which ensures the application of the acquired knowledge and thereby completes the process of their assimilation. The content, goals and teaching methods of graphic activity are disclosed in detail by A.D. Botvinnikov and B.F. Lomov (8) in the book "The Scientific Foundations of the Formation of Graphic Knowledge, Skills of Schoolchildren". At the same time, considerable attention is paid to issues of

polytechnicism and intersubject communications in the process of teaching graphic disciplines. In their content, graphic disciplines occupy an intermediate place between general educational and special disciplines and make it possible to combine theoretical and practical knowledge, i.e. abstractness and concreteness.

An important feature of graphic disciplines is that students are trained in drawing construction, i.e. modeling. In training, models perform a visual function. The principle of visibility in the learning process is considered in the works of V.V. Davydova, D.A. Oshanina, N.G. Salmina, E.G. Serebryany, L.M. Friedman, V.A. Stoff, and others. Drawing as a graphic model can be attributed to materialized visualization. Solving graphic problems using a drawing is a model transformation, which leads to a change in the visual image.

In the process of teaching graphic disciplines, a variety of forms of information are used:

- verbal, which is carried out in the form of text and speech;
- visual, which is presented in the form of a material model (parts, layouts, etc.) and a materialized model (drawings, drawings, etc.).

In the study of graphic disciplines, information and visual aids serve as the basis for creating a geometric object. At the same time, a visual image serves as a means of "transcoding" information from one form to another and also connects various types of visibility and information related to the same object.

When constructing a drawing of a geometric object, the student, using the rules of projecting, independently creates a visual aid, materializing the existing mental visual image. Thus, when studying graphic disciplines, students develop the ability to carry out reversible translations from one "language" of presenting information to another.

The graphic activity of students, regardless of the nature of the task, is based on the search for its solution and a graphic display of the results. Therefore, an integral part of training at a vocational pedagogical university is graphic education.

Graphic education is an integral part of engineering training of students and involves the development of certain knowledge, competences, and skills in reading and executing drawings by existing state standards. In the scientific and methodological literature, the importance of graphic education is considered mainly in three interrelated areas such as general education, polytechnic and professional.

The general educational value of graphic disciplines consists in the students mastering one of the means of understanding the world around them, in developing their personality qualities such as accuracy, attentiveness, independence, aesthetics, planning in work, accuracy, and clarity of movements, etc. Besides, when studying graphic disciplines, students form cognitive experience, the criterion of which is competence. (9)

The importance of graphic education in polytechnic training lies in the ability of students to navigate in the main areas of technological progress, in the ability to understand the techniques and technologies of modern production, to understand the design of technical devices, the spatial relationship of objects.

Graphic disciplines are the basis of professional training of students, and because they contribute to the development of logical and spatial thinking and the development of students' techniques and methods of reading information of a production nature. (10-11)

The objectives of the pedagogical experiment were as follows:

- to check the effectiveness of the use of the pedagogical conditions developed by us to enhance the cognitive activity of students, including the electronic training course in descriptive geometry;

- to determine the content and dynamics of the levels of cognitive activity of students in the study of graphic disciplines;
- to obtain data on the formation of professional orientation in the process of teaching descriptive geometry;
- to identify the relationship of professional orientation with the cognitive activity of the individual in training and with the levels of mastery of graphic knowledge. (12)

#### 4 Conclusion

The system of continuing professional education is designed to contribute to the implementation of the main tasks of the socio-economic and cultural development of society since it is the institutions of primary, secondary and higher professional education, as well as post-graduate education, that prepares a person for active work and full work. It is these needs of a society that dictate the need for serious reform of the education system. (13-15) However, at the present stage, the education system is far from perfect both in terms of the forms and methods of its organization and in terms of its motivation and stimulation. Therefore, the definition of strategic directions for the development of the system of continuing professional education for the future is of great importance. A 21st-century specialist must possess certain personality traits necessary for him to be competitive in the labor market. The following skills can be considered such qualities:

- flexibly adapt to rapidly changing life situations;
- integrate professional knowledge and skillfully apply them to obtain new ones;
- independently think critically and rationally solve various problems using modern technologies;
- have creative thinking;
- competently work with information (to collect, analyze, put forward hypotheses for solving problems, summarize, identify patterns, make reasoned conclusions);
- be sociable;
- independently work on the continuous development of their own educational, cultural and moral level. (16)

A professional-pedagogical university is a leading link in continuing professional education since the socially set goal of the professional activity of graduates of this university is to train qualified workers. Therefore, the university's ability to respond flexibly to the needs of society, while maintaining the accumulated positive experience, is important for the entire system of vocational education.

In the course of pedagogical research, we determined pedagogical conditions that ensure the possibility of the successful formation of a person's professional orientation in the first year of study at a vocational pedagogical university, which contributes to the activation of the student's cognitive activity. For this, in the process of teaching descriptive geometry, it is necessary to improve the graphic knowledge, skills acquired by students even before studying at a university; develop spatial and logical thinking; to cultivate diligence, attentiveness, and accuracy; to achieve high-quality graphic work; as well as the skills of independent work with educational and reference literature, GOST.

An experimental pedagogical study was conducted to verify the hypotheses put forward in the work, including assessing the

effectiveness of the application of the developed electronic training course in descriptive geometry.

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## INTERACTIVE COGNITIVE TECHNOLOGIES AS A FACTOR IN THE ACTIVATION OF COGNITIVE ACTIVITY OF STUDENTS

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**Abstract:** The article discusses the problems of enhancing the cognitive activity of students. The analysis of the correlation of the concepts of "cognitive activity", "independence" and "activity" is presented. The authors emphasize that the main factor in enhancing the cognitive activity of schoolchildren is subject-practical activity. The practical examples show the role of interactive methods in the development of students' independence and creativity. Didactic, educational and developmental goals of using interactive methods in enhancing the cognitive activity of students are highlighted. The authors conclude that interactive technologies activate the cognitive activity of students, while the student is more likely to become a subject of educational activity, is actively involved in the cognitive process, performing problematic, search and creative tasks.

**Keywords:** interactive methods, cognitive activity, activation of cognitive activity, cognitive interest.

### 1 Introduction

In the modern education system, information technologies are increasingly used. The attitude of teachers towards new phenomena of educational reality is ambiguous, but most teachers believe that the systematic conduct of multimedia lessons, including lessons using interactive technologies, is quite effective.

In the present period of development of society, the technical equipment of the educational process comes to the fore. Schools are actively equipped with computers and interactive whiteboards; even remote and small schools are connected to the Internet.

The most accessible type of training automation is the use of computer potential in the learning process, including at the stages of processing and systematizing the results of tests, tests, frontal and individual interviews with students. Creating visual teaching aids seems more convenient when working with a computer, peripheral devices, as well as with a package of graphic editors and programs. In the conditions of the new information society and the informatization of education, independent continuous replenishment of knowledge and its application becomes a human need throughout his life.

### 2 Materials and Methods

The formation of personality in the school years occurs mainly in educational activities, where cognition takes an important place. As the researchers emphasize, not only the productivity of his knowledge but also the intensity of development of his personality depends on what place a student occupies in it. The formation and development of a person's personality are inseparable from the activity of the form of his existence in which he creates himself. (1)

Based on the research of leading psychologists and educators, we believe that using a computer in the lesson allows the teacher to create an information environment that stimulates the interest and activity of students.

The desire for an effective result determines the choice of certain teaching methods. The application by students of the knowledge

gained in practice, the ability to operate it, deepen and develop it testifies to the degree of learning productivity, which, in turn, largely depends on the level of cognitive activity of the student in the learning process.

The stronger the stimulus the student receives in the classroom, the more actively the thought-based and practical educational-cognitive process proceeds, and, consequently, the more stable its results. That is why the activation of the educational and cognitive activities of students in the learning process is so important.

An analysis of the literature showed that there are various approaches to the definition of the concept of cognitive activity: cognitive activity is the conscious, purposeful performance of mental or physical work necessary to master knowledge, skills, and abilities (B.P. Osipov); cognitive activity is an initiative, effective attitude of students to the acquisition of knowledge, as well as a manifestation of interest, independence, volitional efforts in learning.

As the researchers V.D. Shadrikov, D.I. Feldstein, in the activity, not only manifests itself, but also forms the psyche, and it is an activity that acts as a constant substrate for the development of personality. The following components of the functional system of activity are distinguished such as motives, goals, program, information basis, decision making, subsystem of activity-important qualities. (2)

It is emphasized that this division is conditional since all of these blocks are interconnected and interpenetrating.

G.P. Shchedrovitsky, based on a generalization of many studies, identifies five components of activity: tasks; objects to which the activity is directed; process; facilities; activity products. (3)

As the analysis of the literature shows, the activity in which the mastery of the content of academic subjects and the necessary ways or abilities, skills with which the student gets an education is mastered is a cognitive activity.

The process of the formation of cognitive activity is impossible without the development of such a personality quality as a cognitive activity. In the dictionaries, the concept of "activity" is considered as an active, energetic activity. Along with cognitive activity and cognitive activity, the concept of "cognitive independence" is in one row.

Independence is the ability for independent actions, judgments, possession of initiative, determination. Providing the student with cognitive independence leads to cognitive activity automatically. It should be noted that in this case the activity is carried out based on achievement motivation, and therefore it is always accompanied by a positive emotional background.

Cognitive independence can be manifested in the choice of elements of cognizable content or their sequence, the selection of methods of cognition, the determination of the pace of one's progress, cooperation with other subjects of cognitive activity. (4-5)

A variety of types and forms of hardware and software, as well as methods of using interactive tools in the lessons, allow us to select the content, tools, and methods of using interactive resources in teaching. Regardless of what resources we select for lessons, it's important to follow general didactic principles. (5, p87)

Let us dwell in more detail on the most important principle of learning - visibility. It is based on this teaching principle that interactive teaching aids function.

Visual teaching methods include technical and illustrative methods, the use of which in the classroom improves the quality

of learning material. By definition, L.M. Zelmanova, (2, p22) visual aids - these are teaching aids that allow you to rely on visual, auditory and visual-auditory perception. In the lessons, it is important to use visual methods not separately, but in close connection with practical and verbal teaching methods. Visual materials can be presented in the form of a symbolic image using a variety of spectra, reproductions, drawings, graphs, charts, diagrams, etc. In a modern school, screen technology is actively used for this purpose: multimedia projector, screen, interactive whiteboard.

In training, various types of visual aids are used. We outline the main groups used in the lessons at school:

- natural material models (real objects, photographs, etc.);
- conditional graphic images (drawings, sketches, diagrams, graphs, plans, diagrams, etc.);
- dynamic visual models (film and television films, transparencies, cartoons, etc.). (3, p82)

Using the full range of visual aids that the teaching methodology at school currently has allows us to provide a more complete picture of the image or concept, which leads to more solid assimilation of the material. With the help of visual aids, students develop an emotional and evaluative attitude to acquired knowledge, to their native language, and cognitive activity in the learning process is activated.

When developing and using visual aids in the learning process, it is necessary to rely on some general principles. We indicate the main ones:

- used visual aids must be appropriate for the age of the students;
- visual aids should be used in moderation, applied in stages and consistent with the specific content of each stage of the lesson;
- it is necessary to create such conditions for demonstrating the object so that none of the students is uncomfortable observing the demonstrated object;
- using visual aids, it is necessary to correctly place accents, to designate the main elements when showing illustrations;
- the demonstration of visual aids should be accompanied by their clear, concise, relevant explanations and comments;
- students should not act as a passive audience, but take part in a joint search for the necessary information in a visual aid.

The process of enhancing the cognitive activity of students in the lessons using interactive technologies will be more effective if it is based on the basic principles of enhancing the cognitive activity of students in the process of systemic learning using interactive technologies. (4, p53) We name the main of them.

1. The principle of problematity. The basis of the activation of the cognitive activity of students is the principle of problematity. Consider its main provisions. Students are assigned a series of tasks or questions that are gradually and gradually becoming more complex. The teacher needs to create a problem situation in the student's thinking, to get out of which he will need to acquire new knowledge, therefore, he will have to actively form new knowledge on his own with the help of the teacher and with the participation of other students, rely on his own or someone else's experience, logic. Thus, the student receives knowledge, not in the finished form, but the course and result of his active cognitive activity. Based on this principle, training should be aimed at solving the corresponding didactic tasks: the destruction of speech patterns and stamps, the formation of progressive representations.

The implementation of the principle of visualization in the process of teaching requires special forms of conducting classes, pedagogical techniques and methods. (5, p114) The main content of the problematic material must consider the interests of students; therefore, it should be selected considering these features.

The formation and improvement of knowledge, skills are one of the primary tasks of training, it includes the ability to apply new knowledge in practice.

2. The principle of ensuring the adequacy of educational and cognitive activities to the nature of the practical task. By this principle, educational and cognitive activity should be as adequate as possible to the nature of the practical task that students face. The essence of this principle is that the organization of educational and cognitive activity of students in its structure and properties is as close as possible to reality and activity. All this will help ensure a transition from a theoretical level of understanding new knowledge to its practical application. In this case, it is necessary to rely on the principle of problem education.

3. The principle of mutual learning. One of the important principles of the organization of educational and cognitive activity of students is the principle of mutual learning. Practice shows that not only the teacher but also other students can act as a knowledge translator. Indeed, in the learning process, students can contribute to each other's learning, share and exchange knowledge. In addition to theoretical training, effective self-education also requires the ability to analyze, compare and generalize the phenomena, facts, and information studied; the ability to creatively interpret and use the knowledge gained, analyze one's and others' mistakes, the ability to activate, develop one's knowledge, skills.

4. The principle of scientific research of the studied problem. Educational and cognitive activities of students should be creative, heuristic in nature and, if possible, include fragments of analysis and generalization. The study of certain phenomena or problems should be researched, exploratory.

5. The principle of individualization. Individualization is understood as a form of work that considers the individual psychophysical characteristics and capabilities of the student.

We list the main ones: the composition of the class, adaptability to the educational process, the ability to interpret new information, etc.

It is required to apply such forms and teaching methods that could consider the individual psychophysical characteristics of each student.

6. The principle of self-education. The implementation of the principle of self-learning as the basis for the formation and functioning of the mechanisms of self-control and self-regulation seems to be an equally important principle of enhancing the cognitive activity of students. This principle helps to maximize the individualization of educational and cognitive activities of students, based on their personal, active desire to replenish and improve personal knowledge and skills by independently studying additional literature.

7. The principle of motivation. The stimulus is the main condition for both independent and collective activity, therefore, the active educational and cognitive activity of students is possible only with the involvement of effective incentives. That is why among the general principles of revitalization, not the least place belongs to motivation in educational and cognitive activity. The desire to comprehend the new, solve the problem, learn new facts and phenomena of reality should be higher than the forced activity.

In addition to the basic principles and methods that activate the cognitive activity of students, some factors arouse the activity of students, i.e. the teacher's motives or incentives that he uses to energize students.

After analyzing the basic principles of enhancing the cognitive activity of students, we consider the main factors that encourage students to be active.

As the main motive for enhancing the cognitive activity of students in the lesson, one can single out interest. In preparing

the teaching material, the teacher must take this factor into account. Students rarely show interest in a particular situation if it does not correlate with reality, and will not actively participate in the discussion of a problem that is not directly related to them. On the contrary, the interest of students can increase sharply if the material presented contains such problems that students have to face in everyday life. (4, p93) In this case, his cognitive activity will be based on an interest in researching a specific problem.

Perceiving educational and cognitive activity as a creative process, students stimulate themselves to cognition. The research nature of educational and cognitive activities helps to awaken students' creative interest, which leads them to active individual and collective acquisition of new knowledge. Among other factors of activation of the cognitive activity of students, we call competitiveness. It acts as one of the main and powerful incentives that activate students in the acquisition and application of new knowledge. The competitiveness factor is especially pronounced in classes conducted in a game, competitive form.

The playful nature of the classes includes both an interest factor and a competitive factor, but regardless of this, it is a process that allows students to motivate their mental activity. A properly organized game session should contribute to self-development. Any game prompts its participant to action.

Given these factors, the teacher can competently organize the cognitive activities of students.

Working on independent tasks, students can verify the reality of those processes and phenomena that they learn about in the classroom. This, in turn, allows the child to verify the truth of the information received, which will help lead to awareness and the strength of knowledge. Visual aids increase interest in knowledge, make it easier to assimilate, and support the child's attention.

For the successful implementation of the principles and factors considered, it is important to use interactive tools to enhance the cognitive activity of students. We list the main ones.

Multimedia presentations. The presentation can take various forms, the application of which depends on the form of the lesson. The most effective use of the presentation is when conducting a lecture, practical training, laboratory work, independent work, testing. The use of multimedia presentations is consistent with the principles of problematic, self-learning, mutual learning. The presentation can be made in Microsoft PowerPoint, as well as in the Macromedia Flash software environment. (5, p41)

Flipcharts. An interactive training complex for working on an interactive whiteboard can include interactive simulators, mobile circuits, and tables, sound, as well as video support for both the entire lesson and its parts. Training flipcharts can be created in Smart Notebook 10 software as well as in ActivInspire software environment.

The use of flipcharts in the lessons is related to the principles:

- Learning problems: students gain new knowledge, not in ready-made teacher formulations, but as a result of their own active practical cognitive activity;
- ensuring the maximum possible adequacy of educational and cognitive activities to the nature of practical tasks: when working with an interactive whiteboard, students have more opportunities to apply their knowledge to certain language phenomena in practice;
- self-education and mutual learning: assignments can be used by students in preparation for lessons as additional material;
- individualization: the proposed tasks have a differentiated level of complexity;

- motivation: the use of ICT technology allows you to maximize interest and motivate the student to independently accumulate and replenish knowledge.

### 3 Results and Discussion

Analysis of research allows us to believe that cognitive activity reflects a certain interest of students in obtaining new knowledge, skills, internal determination and the constant need to use different methods of action to fill knowledge, expand knowledge.

G.I. Schukina (6) notes that cognitive activity is a personality trait that includes the person's desire for knowledge, expresses an intellectual response to the process of cognition. The quality of personality, the cognitive activity becomes a steady manifestation of the desire for knowledge. This is a structure of personal quality, where needs and interests indicate a meaningful characteristic, and the will represents the form. Among the motives of educational activity, the most effective is the cognitive interest that arose in the learning process.

This aims teachers to solve the problem of how to use innovative methods in educational activities with students. The most effective in the formation of cognitive interest were interactive methods and techniques, methods and forms. With active learning, different technologies are used such as gaming, training, design, etc. Interactive include such educational and personality-developing intensive technologies for achieving the goals of a specially organized group and intergroup activities, feedback between all its participants to achieve mutual understanding and correction of the educational and developing process, individual communication style, reflective analysis. (4) Interactive learning is based on the students' own experience, their direct interaction. In the classroom using games, pieces of training, solving situations, working in small groups, students are encouraged to engage in activities that require an independent search for information, making decisions. (7-8)

According to the researchers, any interactive technology "provokes" the physical, social and cognitive activity of students, and each of them is significant to achieve the planned results by the set educational and development goals. The didactic goal of using interactive methods is: broadening one's horizons; application of knowledge, skills in practical activities; the formation of cognitive motivation and interest in the studied subject. (9-10) Educational goals: fostering independence, will, the formation of approaches, attitudes, moral, aesthetic, worldviews, fostering cooperation, collectivism, sociability. Developing goals: development of thinking, memory, attention, speech, ability to compare, contrast, analyze; development of creative abilities, reflection, motivation for learning activities.

An analysis of practical experience showed that they use various ways of enhancing the cognitive activity of high school students. In social studies, the greatest effect in enhancing cognitive activity is the use of situation analysis technology. The specificity of this technology is that when conducting classes in the form of a situational exercise, you can achieve the predicted result. (11) It is work in a small group, according to a situation analysis, that allows students to acquire knowledge and acquire skills and abilities to practically solve difficult situations, develop analysis and critical thinking skills; communicative skills are worked out, learning to learn - to independently find the necessary knowledge to solve a situation, show activity, unmotivated involvement in activities and increased interest.

For example, solving a situation in a social science lesson (grade 11), while studying the topic: "Deviant behavior and social control". The task is related to the analysis of the situation of hooligan football fans after the team's failure, when they organize pogroms, fights, vandalism in the subway, etc. Question for students: What do you think are the reasons for these events? What needs to be done to prevent such phenomena? The work is carried out in small groups. At the end of the discussion, the representatives of the groups explain their answer: students offer behavior that would allow them to remain

fans of the football team, but would not violate the laws and rules adopted in society; students should understand that what is important is not the outward manifestation of their emotions, the successes, and failures of idols, but the understanding of the meaning of what they are doing; what are the consequences of their actions. (12-13)

When solving such situations, the interactive activity of schoolchildren in the lesson is activated, analytical and communication skills are developed; they develop the ability to clearly and accurately state their point of view, to defend their position reasonably; develop the ability to establish causal relationships. (14-15)

#### 4 Conclusion

The integration of a modern school into the world education system requires new approaches to training and education, as well as the redistribution of benchmarks in the field of the computer information environment. (16-17) Over the past decades, the growth of information has become large-scale, with large information flows penetrating all spheres of human life, including education. In this regard, the issue of new forms and methods of training in modern information and educational space is becoming particularly relevant. (18-19)

Interactive technologies activate the cognitive activity of students, while the student is more likely to become a subject of educational activity, is actively involved in the cognitive process, performing problematic, search and creative tasks.

Using traditional visual aids in combination with interactive teaching aids allows you to implement the basic principles of enhancing students' cognitive activity. Based on the principles and factors of enhancing the cognitive activity of students, it is possible to create an effective teaching methodology using interactive visual aids.

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**Primary Paper Section: A**

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## INFORMATION TECHNOLOGY IN THE DEVELOPMENT OF THE ECONOMY AND SOCIETY

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**Abstract:** Today, information technology plays a big role in the development of the modern economy. Now quite often you can hear concepts such as virtual or information economy. This is since information technology and the economy are two fairly closely related areas that together give a positive economic effect, as well as a positive production result. Without the use of the latest IT, the modern economy will not be able to develop dynamically and quickly, and the state will be on the list of lagging ones. Nowadays, modern information technologies are used in the economy with the goal of effective and efficient computer processing of information resources, their transfer to any distances in the shortest possible time. The relevance of choosing a topic is since information and communication technologies in the development of the economy and society are a key tool in business management. They determine all the activities of the company in the long run. Not only the financial performance of the enterprise, its competitiveness but also the very fact of its existence depends on effective information and communication technologies. This problem is especially acute in the context of economic modernization when many enterprises suffer losses largely due to the inefficient use of information and communication technologies.

**Keywords:** Internet technologies, information technologies, website, information society.

### 1 Introduction

The development of the economy is closely connected with the development of any society because it is impossible to consider any economic tasks and problems outside of society. In any society, many different technologies are simultaneously created and used. At the same time, social processes include technologies such as economic, social, political, spiritual, environmental, demographic, information, and others.

Information technology can exist independently. In most cases, they are associated with various processes carried out in society. In these processes, information technology plays a role. So, for example, information technology plays a role in the economy related to government and business management.

Information technologies are used in e-commerce, provide access to financial markets; contribute to solving problems associated with increased employment, the influx of investment, especially in small and medium-sized businesses; with a rise in productivity, expand the capabilities of all sectors of society; find application in distance education and telemedicine, in environmental management and monitoring, to prevent and eliminate disasters, etc.

Information technology is a strategically important industry that affects all aspects of the life of any modern society (state). Experts note that their main goal is to make people anywhere in the world better off.

In government administration, the use of information technology primarily helps government agencies control the collection of taxes and expenditures, collect statistics and perform other functions aimed at strengthening the state.

In business, information technology is the main tool for managing a company, controlling costs, a way to increase labor productivity and income. They provide tools for analyzing financial and production activities, evaluating business performance, marketing, managing production, and customer

relationships, storing information, training and monitoring knowledge, and collecting and analyzing various statistics.

The UN is developing projects that will accelerate economic growth and raising the living standards of the population in different countries using information and communication technologies (ICT). Representatives of some states, members of the international community, claim that information and communication technologies are becoming the basis (base) for creating a global knowledge-based economy. In their opinion, ICTs can make an important contribution to accelerating economic growth and ensuring the sustainable development of various countries, contribute to the eradication of poverty and the effective integration of states into the global economy.

The implementation of these projects will allow us to effectively develop international cooperation, jointly solve economic, environmental, military, legal and other problems, including in education, tourism, and culture. The result will be the integration of state and banking, public structures, industries, and other entities.

### 2 Materials and Methods

Key elements of the global economy (financial globalization, globalization of markets for goods and services) rely on information resources located in global networks such as the Internet. Their integration (integration) is carried out as a result of the widespread use of world telecommunications, for example, space communications (communication satellites).

Experts say that modern business is unthinkable without its information support via the Internet. At the same time, the global world economy works as a single whole in real-time, forming a single global information space. This technology contributes to a sharp increase in the volume of information products and services, the use of electronic commerce in business.

The use of information and communication technologies opens up great opportunities for economic growth and social development of states, but at the same time creates problems and risks, and creates deepening interstate and intrastate inequality. In particular, we are talking about the unequal opportunities of people to create and use available electronic information resources, especially on the Internet. (1)

If access to the use of these technologies is not expanded, a significant part of the population of developing countries will not benefit from them. The enormous potential of information and communication technologies is not sufficiently applied. This led to the emergence of a "digital divide", "virtual barrier" to trade. Such a barrier can isolate manufacturers, organizations and states that do not have access to new technologies from the markets.

There are seven main areas in which information technology has a direct impact on the development of the economy and society:

- according to the purpose and nature of use, information technologies are divided into supporting and functional;
- according to the user interface, information technology is divided into packet, interactive and network;
- according to the method of organizing network interaction, information technologies are divided into local, multi-level and distributed;
- according to the principle of construction, information technologies are divided into function-oriented and object-oriented;
- according to the degree of coverage of management tasks, information technologies are divided into information technologies for data processing, information management technologies, information technologies for office automation, information technologies for decision support, information technologies for expert systems;

- according to the nature of the participation of technical means in a dialogue with an IT user, they are divided into information and reference and information-consulting;
- according to the method of industrial production technology management, information technologies are divided into decentralized, centralized, centralized dispersed, hierarchical.

Speaking about the development of information and communication technology systems, it is especially worth noting the strategically important importance that the development of the high-tech telecommunications industry has for us. Today it is inconceivable to imagine life without computer equipment, information technology, the Internet, and cellular telephone communications. (2)

It is noteworthy that the information economy has changed the function of money, which at the present stage act as a means of settlement. Today, thanks to the development of information technologies, virtual banking, and payment systems have appeared, which play a significant role in the development of the modern economic activity of states.

Besides, information technology in the economy is a set of actions that are carried out on economic information using computers and other equipment to obtain a positive optimal result.

In economics, information technologies are needed for effective processing, sorting, and selection of data, in order to implement the most efficient process of human-computer interaction to satisfy information needs, as well as for operational interaction.

Also, information technologies serve as an effective tool in making economically important decisions and participate in the process of effective management in any area of human activity. Modern models of information technology provide additional opportunities for miscalculation and forecasting of an economically important result so that on its basis a right and balanced management decision is already made. Also, these models make it possible to calculate the total economic effect, risks, and flexibility of system indicators. (3-4)

Properties of information technology:

1. Information technology allows you to activate and effectively use the information resources of society, which today are the most important strategic factor in its development.
2. Information technologies make it possible to optimize and, in many cases, automate information processes, which in recent years have occupied an increasing place in the life of human society.
3. Information processes are important elements of other more complex production or social processes.

The formation of the information society in the country is inextricably linked with education in this society.

It is social specialists who must be the first to respond to these changes in society. Social educators and social workers as specialists of various social services complement and develop the multifaceted activities of educational institutions, health care, culture, sports, public organizations, interact with them, performing an integrative function in the relationship of state and public structures with the family and personality. The emergence of such specialties as "social pedagogy" and "social work" allows us to solve several interrelated tasks: the formation of a worldview that is adequate to this stage of the social and economic development of our country and the world as a whole, each person's awareness of his place in life, including professional self-determination; implementation of social adaptation based on the ability to make decisions in conditions of uncertainty; development of communication skills and abilities to build their relationships with various social structures. A social educator has to work with a wide variety of categories of the population: children, disabled people, the

elderly, which makes high demands on his professional training. Significant help can be provided by modern information technologies without which a specialist simply cannot do it today. And the earlier the social teacher and computer "make friends", the more effective it will be his pedagogical activity.

The ability to apply modern information technologies in their activities is becoming one of the main components of the professional training of any specialist, including a specialist in the social sphere. (5)

Information technology has entered all areas of our lives. The computer is a means of increasing the effectiveness of the learning process, participates in all types of human activity, is indispensable for the social sphere.

The present is characterized by an unprecedented increase in the volume of information flows. This applies to almost any field of human activity. The largest increase in the volume of information is observed in industry, trade, financial, banking and educational fields. For example, in industry, the growth in the volume of information is due to an increase in the volume of production, the complication of products, materials used, technological equipment, expansion of external and internal relations of economic objects as a result of concentration and specialization of production. (6)

Information is one of the main, decisive factors that determine the development of technology and resources in general. In this regard, it is very important to understand not only the relationship of the development of the information industry, computerization, information technology with the informatization process, but also the determination of the level and degree of influence of the informatization process on the sphere of management and intellectual activity of a person.

The problems of information in general and management as an information process receive a lot of attention due to the following objective processes:

- humanity is experiencing an information explosion. The growth of information circulating and stored in society came into conflict with the individual capabilities of a person to assimilate it;
- development of mass communication processes;
- the need to develop a general theory of information;
- development of cybernetics as a management science;
- research in the field of natural sciences confirms the role of information in the processes of self-organization of animate and inanimate nature;
- the actualization of the problem of sustainable development, the formation of the information economy, the main driving force of which is the information potential, information resources;
- the problem of the prospects for the development of mankind as integrity makes it necessary to raise the question of the criteria of progress in modern conditions.

An important place in the understanding of such a concept as "information" and the mechanism of information processes in society and its institutions is occupied by the concept of the information environment, which is, on the one hand, a conductor, converter and distributor of information, and on the other hand, a source of motivating reasons for people's activities. In the process of his activity, a person actively interacts with the information environment, getting new personal knowledge from it, generating new knowledge and presenting it in the form of information that it places in the information environment. (7) Any business entity is characterized by a certain information environment in which it is immersed. This information environment reflects the level of development of an economic entity and defines certain principles of the information behavior of people in communication with each other.

It should also be noted that the exclusive role of information in modern scientific and technological progress has led to the understanding of information as a resource, as necessary and

important as energy, raw materials, financial and other resources. The information has become the subject of purchase and sale, that is, an information product that, along with information constituting the public domain, forms the information resource of the company. (8-9)

Currently, the dissemination of information in the information sector of the economy cannot be imagined without the use of new information technologies. The moment has already passed when new information technologies were developed mainly for the internal needs of an organization. Now information technology has become an independent and rather profitable type of business, which is aimed at meeting the diverse information needs of a wide range of users. (10)

The use of modern information technologies provides an almost instant connection to any electronic information arrays (such as databases, electronic directories, and encyclopedias, various operational reports, analytical reviews, legislative and regulatory acts, etc.) coming from international, regional and national information systems and their use in the interests of a successful business.

### 3 Results and Discussion

Information technologies play an important strategic role since their application allowed us to present in a formalized form suitable for practical use, a concentrated expression of scientific knowledge and practical experience for the implementation and organization of social processes. This led to the saving of labor costs, time, energy, material resources necessary for the implementation of these processes. The role of information technology is growing rapidly, due to a number of their properties: (11-12)

- IT allows you to activate and efficiently use the information resources of society, which saves other types of resources such as raw materials, energy, minerals, materials and equipment, human resources, social time.
- IT used to be a means of increasing the personal productivity of employees, and today it is becoming a force that helps companies gain and maintain competitive advantages.
- IT implements the most important, intelligent functions of social processes.
- IT affects not only the functioning of individual companies but also the economy as a whole. They turn into a social phenomenon that determines how society looks on a global scale.
- IT provides informational interaction of people, which contributes to the dissemination of media. They are quickly assimilated by the culture of society, remove many social, domestic and industrial problems, expand domestic and international economic and cultural ties, affect the migration of the population on the planet. (13)

General characteristics of information technology:

- IT occupies a central place in the process of intellectualization of society, in the development of the education system, culture, new (screen) art forms, in the popularization of masterpieces of world culture, the history of human development. (14-15)
- IT plays a key role in the processes of obtaining, accumulating, disseminating new knowledge.
- IT allows you to implement methods of information modeling of global processes, which provides the ability to predict many natural situations, environmental disasters, major technological accidents, increased social and political tension. (16)
- Professional knowledge is integrated through IT in high technology products and sold in the global market. There is a trade-in an invisible product such as knowledge, culture. A stereotype of behavior is imposed. That is why in the information society, information, knowledge, creativity become strategic resources. (17-18)

- Information technology has a huge impact by way of distance learning, computer games, computer videos, etc.
- The social impact of information technology will be a synthesis of Western and Eastern thought.

Information technology provides the user with:

- increasing personal productivity;
- informational interaction with other people;
- development of creative abilities;
- time-saving;
- obtaining and disseminating knowledge.

Information technology provides companies with:

- improving the efficiency of the enterprise;
- obtaining and maintaining competitive advantages;
- expansion of domestic and international economic relations;
- forecasting market behavior;
- search for ways out of their crisis.

### 4 Conclusion

The socio-economic importance of IT lies in the following interrelated points:

- they connect not individual workers, but entire collectives, spatially remote from each other and working in various fields of activity. This means the emergence of peculiar socio-technical systems designed to process knowledge;
- bring subjects together immediately (unlike vehicles), which leads to a sharp reduction in the cost of time, energy and material resources;
- improve such important production factors as the quality of work, the effectiveness of collective work and teamwork, facilitate communication and communication between different departments of the enterprise, increase the responsibility of employees for their decisions.

Thus, IT maximally broadens the horizons of intra- and intercompany cooperation, reduces its costs and thereby contributes to the development of global business.

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**Primary Paper Section: A**

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## FORMATION OF COMMUNICATIVE COMPETENCE OF STUDENTS IN THE INFORMATION EDUCATIONAL ENVIRONMENT OF AN URBAN SCHOOL

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Abstract: The article discusses the development of the scientific concept of communicative competence, the methods of its formation in the information educational environment, defines the characteristics of communication of students with the use of information technology.

Keywords: communicative competence, educational environment, education.

### 1 Introduction

The globalization of social processes, the rapid changes in the information and communication infrastructure have led to the fact that society today imposes new requirements on the ways of acquiring and transmitting knowledge and the role that a person plays in these processes. One of the urgent directions of reforming the modern education system is the systemic integration of information technology in the educational process itself. The task of a fundamentally new design of the content and organization of educational material, the pedagogical activity of the teacher and the educational work of the student in the computer environment comes to the fore. As an analysis of research and conference materials on the problems of informatization of education shows, there are some author's interpretations of the learning environment based on computer technologies. This is largely due to the unstable, dynamically developing a terminological base of computer training technologies.

Modern educational processes cannot take place without the inclusion of a wide range of information resources in the learning process, without the development of information processing and presentation skills. An analysis of the work allows us to conclude that most researchers consider the educational information environment in the context of solving the problems of improving didactic theory and practice in relation to new educational conditions and describe the model of the educational process, which uses the capabilities of information technology to effectively organize individual and collective work of teachers and students, as well as integrate various forms and strategies of mastering knowledge on the subject, aimed at development of independent educational activities.

### 2 Materials and Methods

At the present stage, the main thing is to educate a person who seeks the maximum realization of his capabilities, open to the perception of new experience, capable of conscious and responsible choice in various life situations. To educate such a person, first of all, it is necessary to teach the child to solve various communicative tasks in various spheres and communication situations, i.e. form his communicative competence. At present, in the conditions of the information environment, teachers have a new question: how to form the student's communicative competence in such an environment? In order to try to answer this question, it is necessary to consider the concept of "communicative competence" to identify its components.

This term must be distinguished from concepts such as "language competence", "speech competence". According to N. Chomsky, (1, p93) linguistic competence is "... perfect knowledge, based on which a native speaker is able to "continue" grammatically correct sentences in a given language and judge whether the utterance belongs to his language".

Speech competence implies mainly skills, abilities "using language tools to carry out the mental activity, ... speech skills characterize the level of language skills and, accordingly, the ability to use language tools at the optimum level of perfection". (2, p35) Thus, it is possible to build a certain hierarchy of competencies that are formed in a person throughout life: Language competence, Speech competence, Communicative competence.

The highest level of human linguistic activity is communication, that is, the ability to communicate productively with others. To do this, you need to correctly assess the communicative situation characteristic of a particular type of communication, correctly choose the language of communication. It is necessary to distinguish between the concepts of "communicative competence" and "communicative adequacy". These terms are found more and more often in literature and documents and, unfortunately, are often used without distinguishing between them. Meanwhile, they differ significantly from each other. In a scientific language, the word "competence" means a wide range of knowledge and authority in a certain field, while the word "adequacy" is a circle of issues in which a certain person has knowledge, experience. (3, p.317) 1. The term "communicative competence" arose as the development of N. Chomsky's idea of linguistic competence - a limited set of grammatical rules that allow generating an unlimited number of correct sentences.

D. Haims, analyzing the concept of N. Chomsky, wrote that "linguistic theory should expand the concept of competence beyond grammatical knowledge". (2, p38) Without this, he believed, "the term "competence" promises more than it encompasses". (2, p42) In 1970, the researcher defined communicative competence as a combination of the speaker's knowledge and skills of using the language, which can be considered one of the first attempts to remove the barriers between linguistics, psychology, and sociology in the approach to the study of speech. The idea turned out to be attractive for scientists working in the field of language testing since linguistic competence could be fairly accurately assessed using available means of pedagogical measurements (tests). Since linguistic competence significantly limited the object of language testing in the context of communicative language learning, ideas arose of expanding this construct, which was called "communicative competence".

Communicative competence is a demonstrated area(s) of successful communicative activity based on the acquired means and strategies of verbal communication, supported by language and speech skills. Its components: linguistic (vocabulary, grammar, phonetics, spelling), discursive (building oral and

written texts), pragmatic (successful achievement of a communicative goal), strategic (overcoming communication difficulties), sociocultural (compliance with sociocultural norms). (4) In contrast to communicative competence, communicative competence is defined in modern science as "an integrative personal resource that ensures the success of communicative activity". (5, p16) This resource includes not only the components measured by language testing but also other components.

Thus, if communicative competence is an area of successful communicative activity, then communicative competence is a more global entity called a personal resource. Speaking about the student's communicative competence, based on the foregoing, it is possible to give the following definition: communicative competence is the willingness to set the goals of oral and written communication: to receive the necessary information; represent and civilize to defend their point of view in dialogue and public speaking based on recognition of the diversity of position and respect for the values of other people - and the ability to achieve them.

Returning to the question of the formation of communicative competence, it is necessary to turn to researchers in this area to identify effective technologies for its formation among schoolchildren in the information educational environment of the city school. For the first time, the problem of modeling the communicative competence of students was posed by C. Osgood. (6) It should be noted that to construct a model of communication competence, he needed a specific mechanism that allowed him to most fully, clearly and dynamically describe the processes of speech transmission and perception: a level approach to their analysis.

Such a communication model is also characteristic for communication in an information environment. C. Osgood (6) identified four levels of linguistic ability (as he called communicative competence) and the corresponding types of "psycholinguistic" units: the first level is motivational, his unit for the speaker and listener is the sentence; the second level is semantic, its unit for the speaker is syntagma, and for the listener, the unit is less than the syntagma, which he called "nucleus"; the third level is the level of sequences, its unit for the speaker and the listener is the word; the fourth level is integration, its unit for the speaker will be a syllable, for the listener - a phoneme. E.D. Nelunova (7, p74) examines the theory of communication models studied by researchers of computer linguistics. "This is a theory reflecting the communicative nature of language and linguistic phenomena. She earned her name by the fact that a special activity called "communication" is taken as the object of research, and the general scientific method of modeling (in particular, computer modeling) is used as the main method. The essence of the method is to build some kind of artificial education, an artificial mechanism, for example, in the form of a system of rules so that this system reflects, explains, imitates the studied activity". Along with the theory of computer modeling of speech communication, E.D. Nelunova (7) identifies three main problems of the theory of communication models: the problem of understanding, the problem of knowledge and the problem of communicative failures, "It is these aspects of human-machine communication that attract the most attention of scientists and specialists abroad.

In working models, a degree of "understanding" a human by computer is achieved. In practical activities, a computer responds to a person's needs with some action or expresses its knowledge in some kind of artificial language". (5, p74) Equally important and urgent is the task of organizing and presenting knowledge. In particular, the purpose of forming developer messages is the clarity and clarity of his requirements and information. The practice has shown that communicative failures are a constant companion to the understanding process. For example, J. Carbonell and F. Hayes believe that failures related to spelling errors occur when there are missing or incorrect

letters, a permutation of letters, or extra letters in the recognized word. In this regard, the theory of communicative reliability.

According to B.Yu. Gorodetsky, (5, p17) "the essence of the nature of the dialogue between man and the computer lies in the "all-pervasive" nature of the language, its fundamental value, which requires linguistic support in the creation of any artificial formations. In this case, it is especially necessary to emphasize the need to consider the meaning of the word in the construction of knowledge representation languages, which helps to eliminate communicative failures and optimizes the communication between a person and a machine".

### 3 Results and Discussion

Analysis of studies on the modeling of communicative competence in an environment using information technology tools allows us to make some important conclusions that must be considered when forming students' communication competence in the information educational environment:

1. In communication, subjects cannot protect themselves from communicative failure, since each of them has certain natural inclinations (way of thinking, character, temperament, and so on), social stereotypes (upbringing, position, etc.). Therefore, in our opinion, it is impossible to apply the concept of "dialogue" in the interaction of a person and a computer. The computer is not a full-fledged subject of communication, and the possibility of communicative failure is just a consequence of the subjective nature of the participants in communication. In this sense, failure in communication between people emphasizes the complexity of the act of communication and is a positive factor, as it ultimately contributes to the development of communicative competence of the subjects of communication. But this factor is absent or significantly weakened in the communication "man – computer".
2. The communicative situation in the modern information environment forms a certain communication style, language and speech competence: students can choose any social role, use Internet slang, express their emotions with the help of signs and symbols, and also break off the communicative act at any time. This leads to impoverished speech, inability to communicate productively in a "live" environment due to fear of communicative failure.
3. It is impossible to talk about the computer as the addressee of communication since it is only a means of communication between people. However, in modern school society, the perception of the computer as a partner in a communicative act is firmly established. As a result, more and more schoolchildren are ready to limit themselves to such communication that allows not to consider the personality of the addressee of speech.

For secondary education, the task of using the capabilities of a computer in modeling research and cognitive activity, which helps to shape communication competence, is of paramount importance. The process of its formation is considered in the context of creating such pedagogical technologies that would ensure the transition from a formal-disciplinary to a problem-active type of training. (4,8) In our opinion, the main role should be given to technology of activity-based learning, (9) which will be implemented in the information and educational environment both in the Russian language lessons and in extracurricular activities (in our opinion, it is legitimate to talk about school scientific societies, circles, groups whose purpose is to develop the research qualities of the student's personality). In the lessons of the Russian language, communicative competence, in our opinion, is effectively formed using the technology of programmed instruction based on the theory of interiorization P.Ya. Galperin, (9) the essence of which is the gradual formation of skills among schoolchildren.

Programmed training includes the following stages: motivational (the student is motivated to form a specific skill); indicative basis of action (the student develops a method of obtaining knowledge and fulfills it); working out a new skill (the student

performs tasks aimed at the formation of the skill); transfer (the student is invited to complete tasks that turn a new skill into a skill acquired by experience). Speaking about the use of computer programs in the formation of communicative competence, it should be noted that today most of them are programs for developing a new skill and controlling its formation. (10) But for the successful formation of communicative competence, it is necessary to include in the student's work such programs that would contain the stage of the indicative basis of action and the transfer phase - training programs. In our opinion, only a program that includes all stages of programmed training will help in the formation of the language, speech, and, therefore, communicative competence of the student. (11)

In school scientific societies, circles, groups, work in the first place should be based on modeling computer communication using the following principles:

1. The student develops the good and fights the bad in speech;
2. The student seeks to resolve conflicts productively;
3. The student acquires the ability to correlate the purpose of communication with the interlocutor's features in the Internet space through (a) work to identify speech imperfections using Internet slang, with symbols denoting emotions; (b) role-playing and plot games using the resources of the information environment (creating invitations, booklets, presentations, business correspondence, etc.); (c) the diagnosis of personal communicative qualities and the level of the student's language in the information environment; (d) work to correct identified deficiencies in communication; (e) acquaintance with dictionaries, encyclopedias, reference literature; acquaintance with media resources; (f) the formation of the ability to search for the necessary information on the Internet, not only from the resources of the global network but also by establishing contacts with other people; (g) acquaintance with information technologies and programs that help him in independent research activities. (12)

For the formation and development of communicative competence in the information educational environment, in our opinion, it is advisable to apply different teaching methods, defining them as "a system of consistent interconnected actions of the teacher and the student, ensuring the assimilation of the content of education, the development of mental forces and abilities of students, their mastery of self-education and self-learning. Teaching methods indicate the purpose of learning, the method of assimilation and the nature of the interaction of subjects. (13-14)

One of the leading ones is the method of personality-oriented learning, in which the student himself determines the object and form of activity, the ways of presenting the information received.

No less important is the method of pedagogical stimulation and the development of communicative activity or the stimulative-motivational method, that is, a set of tools and techniques that encourage specific actions. The design and research method, undoubtedly, based on the two above-mentioned methods, can be widely used in extracurricular activities of schoolchildren using information technology. (15) Based on this method, any research work of students in a computerized educational environment is built. This method involves the formation and development of many speech skills: planning activities, collecting material using electronic correspondence and online consultation, searching for material from literary sources on the Internet, searching for material in archival sources of the global network, selecting and organizing Internet material, writing scientific and journalistic texts character, editing and improvement of texts, preparation of abstracts and reports (processing of previously created texts), public performance in various audits barrier - with the use of multimedia technology, the answers to questions of opponents. (16-17)

According to the number of participants, by a personality-oriented method, student activities can be either individual or group. Besides, information technology must be used as a form of illustrative method and to create an independent electronic product. (18-19) In the first case, students have the opportunity to comment on what they saw, make comments and make additions, and with independent preparation of presentations, such speech skills as understanding the text, highlighting the main, planning, etc. develop. The creation of an independent product is more complicated work, requiring a lot of technical skills and a variety of communication skills for collecting material, systematization, and presentation. It is carried out based on the design and research method. (20-21)

#### 4 Conclusion

In conclusion, it is necessary to say that the question of ways of forming the communicative competence of students in the context of the computerization of the educational process is relevant today, the identified conditions for the formation of communicative competence of students, specific technologies and methods can successfully develop this competency in the conditions of information educational environments.

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**Primary Paper Section: A**

**Secondary Paper Section: AM**

## PSYCHOLOGICAL COMPETENCE MODEL OF FUTURE PSYCHOLOGICAL TEACHERS

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Abstract: This article notes that psychological competence is considered as a system of skills, knowledge, and abilities that provide the future pedagogue-psychologist not only with psychological and pedagogical preparedness but also with a high level of professional self-awareness, the ability to manage their mental states.

Keywords: competence, adequacy, competency-based approach.

### 1 Introduction

The relevance of the problem of competence, competency-based approach in education is associated with the orientation of society towards solving the problems of modernizing the content of higher and general secondary education to increase the level of education of students. Competence (professional and pedagogical) is an integral professional and personal characteristic of a teacher, which determines his willingness and ability to perform professional and pedagogical functions by the norms and standards currently adopted in society. Competence is possession, possession by a person of relevant competence, including his attitude to it and the subject of activity. A competency-based approach is an approach in education, for which the priority goal of the educational process is the formation of competencies. Competence (from the Latin "competentia") is a range of issues in which a person is knowledgeable, has knowledge and experience. It includes a set of interconnected personality traits (knowledge, skills, and methods of activity), defined concerning a certain range of objects and processes and necessary for high-quality productive activities concerning them.

Modern requirements for a graduate are influenced by the situation on the labor market and processes such as accelerating the pace of development of society and the widespread informatization of the environment. In this regard, the authoritarian-reproductive system of education is outdated. Knowledge-oriented education currently means focusing on the past. In a changing world, the education system should shape such new qualities of a graduate as initiative, innovation, mobility, flexibility, dynamism, and constructiveness. A future professional should have a desire for self-education throughout his life, possess new technologies and understand the possibilities of their use, be able to make independent decisions, adapt in the social and future professional sphere, solve problems and work in a team, be prepared for overloads, stressful situations and be able to get out of them quickly.

The upbringing of such a socially and professionally active personality requires teachers of the modern school to apply completely new methods, techniques, and forms of work. To form a competent graduate in all potentially significant areas of professional education and life itself, it is necessary to apply active teaching methods, technologies that develop, first of all, the cognitive, communicative and personal activity of today's students.

One of the promising areas in terms of solving this problem is the implementation of a competency-based approach.

An analysis of world educational practice in recent years suggests that the concept of "key competencies" is central to the scientific and methodological foundations of modernization, has an integrative nature, combines knowledge, skills and intellectual components of education. At the same time, the concept of a competency-based approach is based on the ideology of interpreting the content of education formed from the "result".

The term "competence" has, as you know, two meanings: the terms of reference of a person; and the range of issues in which this person has knowledge, experience. Concerning the educational field, it is the second meaning of this term that makes sense. To have the experience, the ability to act in situations of uncertainty - these are the qualities that make it possible to form a graduate competency-based approach implemented in the lesson by the teacher.

Competitive learning is also promising because, with this approach, learning activity acquires research and practice-oriented character, and becomes an object of assimilation itself. As noted by V.A. Bolotov, V.V. Serikov, "competence, acting as a result of training, does not directly follow from it, but is a consequence of the individual's self-development, generalization of personal and activity experience". (1)

The following key competencies are identified in UNESCO documents:

- teach to gain knowledge (learn to learn);
- teach to live (doctrine for being);
- teach to work and earn money (learning for work);
- teach to live together (learning for living together).

The core competencies that were highlighted at the Key Competencies for Europe Symposium in 1996 in Bern, marked the global trend of updating the resulting units of the educational process. These are currently well-known political and social competencies related to life in a multicultural society, competencies related to fluency in more than one language, information and communication competencies, and the ability to learn throughout life. According to A. V. Khutorsky, (2) the concept of educational competence includes a set of semantic orientations, knowledge, skills, experience of student activity. And their introduction into the practice of teaching will just allow us to solve a problem typical of a Russian school, when a student, having mastered a set of theoretical knowledge, experiences difficulties in their implementation in solving specific problems or problem situations. Educational competence involves the mastery of students by a comprehensive procedure in which for each highlighted area an appropriate set of educational components is defined.

Simply "competencies" should be distinguished from "educational competencies". Competence for the student is an image of his future, a guideline for mastering.

### 2 Materials and Methods

Key educational competencies (according to A.V. Khutorsky): (2)

In accordance with the division of the content of education into a general meta-subject (for all subjects), intersubject (for a cycle of subjects or educational areas) and subject (for each academic subject) a three-level hierarchy of competencies is proposed:

- Key - refer to the general (meta-subject) content of education;
- All-objective - relate to a certain circle of subjects and educational areas;

- Objective - private concerning key and general subject competencies, having a specific description and the possibility of forming within the framework of educational subjects.

Key educational competencies (according to A.V. Khutorsky): (2)

- value-semantic;
- general cultural;
- educational-cognitive;
- informative;
- communicative;
- social and labor;
- competence of personal self-improvement.

Value-semantic competence is competence in the worldview, associated with:

- value representations of the student;
- his ability to see and understand the world around him, to navigate in it, to realize his role and mission;
- ability to choose goals and meanings for their actions and actions, make decisions;
- provides a student self-determination mechanism;
- determines the individual educational trajectory of the student and the program of his life as a whole.

General cultural competence is a range of issues in which the student must be knowledgeable, possess knowledge and experience such as:

- spiritual and moral foundations of human life and humanity, of individual peoples;
- culturological foundations of family, social phenomena and traditions;
- features of national and universal culture;
- the role of science and religion in human life, their impact on the world;
- competencies in the domestic and cultural-leisure sphere.

Educational-cognitive competence is a set of student competencies in the field of independent cognitive activity, including elements of logical, methodological, general educational activity correlated with real cognitive objects.

- Knowledge and skills of goal-setting, planning, analysis, reflection, self-assessment of educational and cognitive activities.
- Creative skills of productive activities: obtaining knowledge directly from reality, mastering the methods of action in non-standard situations, heuristic methods for solving problems.
- The requirements of the corresponding functional literacy are defined within the framework of this competency: the ability to distinguish facts from speculation, the possession of measuring skills, the use of probabilistic, statistical and other methods of cognition.

### Informative competence

- Formation of the ability to independently search, analyze and select the necessary information, organize, convert, save and transmit it using real objects (TV, tape recorder, telephone, fax, computer, printer, modem, copier) and information technology (audio and video recording, Email, Media, Internet).
- This competency provides student activity skills with the information contained in academic subjects and educational fields, as well as in the surrounding world.

**Communicative competence** includes:

- knowledge of the necessary languages;
- knowledge of how to interact with surrounding and distant people and events;
- possession of various social roles in the team.

The student must be able to introduce himself, write a letter, questionnaire, application, resume, ask a question, lead a discussion, etc. Communicative competence is formed within the framework of each subject studied. (3-5)

### Social and labor competence

Knowledge and experience in:

- civil society activities (playing the role of a citizen, observer, voter, representative);
- social and labor sphere (consumer, buyer, client rights);
- professional self-determination;
- issues of economics and law;
- areas of family relationships and responsibilities.

The competence of personal self-improvement is the development of methods of physical, spiritual and intellectual self-development, emotional self-regulation and self-support. The real object is the student, mastering the methods of activity in their interests and opportunities. The competency of personal self-improvement includes:

- culture of thinking;
- culture of behavior;
- the basics of safe life;
- rules of personal hygiene;
- care for their health;
- sexual literacy;
- internal ecological culture. (6-7)

### Competence's structure

Competencies have an important feature: in contrast to knowledge, skills that are always "stored" in a ready-to-use form, competency "gathers" only at the time of its implementation, i.e. in response to the situation. Schematically, this can be represented as follows (Figure 1):

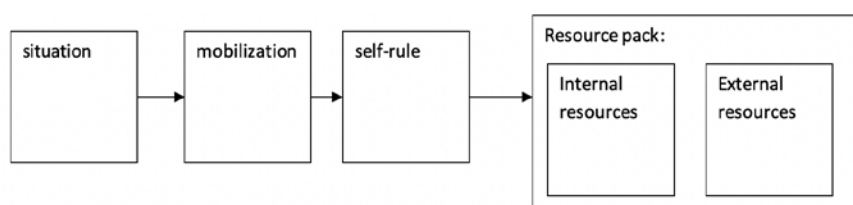


Figure 1. Competence

The rest of the time, the competence's elements are stored in a disassembled form, and the competence itself exists only

potentially (Table 1).

Table 1. Competence's elements

Mobilization readiness	Capacity for self-rule	Internal resources	External resources
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### 3 Results and Discussion

What is each core competency component?

**Internal resources** are KSAs - knowledge, skills, abilities, - of an objective, interdisciplinary and vital nature.

**External resources** are all that a person can attract to solve a problem that has arisen before him:

- information resources - reference books, encyclopedias, the Internet, experts (living carriers of special information), etc.;
- human resources - service delivery organizations, specialists in necessary fields, assistants;
- financial, material and technical and other resources.

**Self-management** - targeted management of the resource package. Self-government is formed in the learning process, based on the experience of resolving a wide variety of problematic situations, educational and life. This is one of the fundamentally new elements that the competency-based approach brings to the learning process.

**Mobilization** is the "launch" of competence in response to a problem situation. Mobilization is closely related to motivation. The formation of a student's mobilization and his readiness for activity is another new moment that introduces a competency-based approach to the educational process. This moment directly connects education with mentoring. (8)

We have shown that all these concepts are interconnected. But we are interested in psychological competence.

Psychological competence in research N.V. Kuzmina and G.I. Metelsky is considered as a system of skills, knowledge, and abilities that provide the future pedagogue-psychologist not only with psychological and pedagogical preparedness but also with a high level of professional self-awareness and the ability to manage their mental states. Of considerable interest is the study of N.V. Andronova. Based on the analysis of numerous sources, the author forms a principled position, which consists in the following statements. (9)

Psychological competence:

- 1) is necessary for specialists working in the field of "Human-Human";
- 2) is always mediated by the content of the specialist;
- 3) is part of the psychological and pedagogical culture of a specialist and an element of his professionalism;
- 4) it is a kind of personal toolkit of a specialist, ensuring the effective implementation of his professional activity;
- 5) contains two blocks: intellectual (cognitive-psychological knowledge and psychological thinking) and practical (effective psychological skills) (10-11)

Defining the components of the model of psychological and pedagogical competence, we determined the specific components: diagnostic competence, communicative competence, personal self-improvement competence, psychological and counseling competency. (12-13)

The model of psychological competence can be constructed in the form of equations:

- diagnostic competence:

$$\Psi K 1 = 1,3U + 0,76A, \quad (1)$$

where U – ability to diagnose and use diagnostic material,

A – the ability to analyze and guide the student's mental development.

- communicative competence:

$$\Psi K 2 = P O\text{Б} + 43K H, \quad (2)$$

where P OБ – pedagogical communication skills,

K H – communication skills, abilities.

- self-improvement competence:

$$\Psi K 3 = 0,1H + 0,76K K + OK \quad (3)$$

where H – value-semantic component,

K K – cognitive component,

OK – operational component,

- psychological-counseling competence:

$$\Psi K 4 = 0,75D O\text{Б} + 2,4U K + 0,75V KPM \quad (4)$$

where DOБ – dialogue skills,

UK – ability to conduct psychological and pedagogical consultation,

VKPM – proficiency in correctional rehabilitation methods.

To study the competence of a teacher-psychologist, you can also use the following methods such as the FPI personality questionnaire; questionnaire of value orientations of Rokich; methodology of express diagnostics of pedagogical orientation (MEDPO); psychological competency level diagnostic questionnaire. (14)

### 4 Conclusion

*Responsibilities of a teacher-psychologist in professional activities:*

1. "The first duty is to sympathize with students".
2. "The second duty of the teacher-psychologist is to follow the example, he should not wait for a reward for his work, should not accept any pay or gratitude".
3. "The teacher-psychologist should never deny the student advice and should not allow him to work at any level until he is ready for this".
4. "By discouraging students from the evil paths, the teacher-psychologist should act rather as a hint than directly, and with sympathy, rather than gross reproaches..."
5. "A teacher-psychologist who teaches a certain science should not neglect other sciences.

The educational psychologist is not primarily a source of information, but a living example of the effectiveness of learning.

*Commandments of a modern psychologist:*

1. Accept all that is in the student as natural, consistent with his nature.
2. Accompany his positive self-realization by accepting all manifestations, both positive and negative.
3. Try not to teach anything directly. Learn by yourself.
4. Seek the truth with them.
5. Sincerely admire all the beauty that you see around.

The teacher-psychologist will become a professional if he has a complex of abilities and competencies, taking responsibility for the results of his work.

The professional formation of future teachers of psychologists in the process of training at Atyrau University reaches a completely new level, which allows to successfully implement programs to develop the personality of the future teacher-psychologist, psycho-pedagogization of the educational environment, the development of psychological competence.

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**Primary Paper Section: A**

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## INFORMATION TECHNOLOGIES AS A DETERMINING FACTOR OF DEVELOPMENT OF OBJECTS OF SOCIAL-INFRASTRUCTURAL CENTERS OF THE REGION

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**Abstract:** The article defines the concept of "social-infrastructure center", considers the place and role of information technology in the development and functioning of its facilities. The basic principles of the new information technology (integration, flexibility and information content) are highlighted, as well as its characteristic features and features are discussed. The ways of implementation are determined and specific features of the main areas of activity of the objects of social and infrastructure centers in the Internet environment are described.

**Keywords:** Internet technologies, social infrastructure center, information technology, web site, region.

### 1 Introduction

The stability of the social-economic system of the region involves the formation of a special adapted mechanism that allows you to quickly respond to changes in various factors and adjust movement in a given direction. Operational and complete information support is of fundamental importance and is one of the main elements of the mechanism for managing sustainable development of the regional economic system. (1) In this regard, there is a need for an information-analytical system that determines the actual state of the facility and provides feedback to the authorities and structural units of the region's administration to adjust the processes.

The main objectives of the regional policy to increase the sustainability of the functioning of social-economic systems cannot be solved without appropriate information support and the use of the most modern information technologies, with the help of which the regional management process becomes more effective. Improving management processes at all levels should be based on an ordered, strictly organized system of information support, which allows integrating information resources of the region.

World experience in the implementation of information technologies (IT) in various spheres of economic activity makes it possible to talk about the great potential for the long-term development and functioning of business entities of various organizational and legal forms and infrastructural territorial entities, which include social-infrastructure centers.

Under the social-infrastructure centers (SIC) it should be understood the place of concentration in the region of new forms of infrastructural objects of different types of activity, the functioning of which is aimed at meeting the social, social and spiritual needs of the population. Such formations are entirely new structural elements of the region's economic space, therefore, in our opinion, they should be called innovative social and infrastructure centers. (2-3)

SIC must be distinguished by the degree of complexity of the structure and the number of types of activity as multifunctional and monofunctional. The objects of such centers are hypermarkets, shopping and entertainment centers, wholesale markets for agricultural products, specialized shopping centers, festival centers, power centers, shopping and social centers, strip centers, discount centers, fashion shopping centers, outlet centers.

A special place here is given to trading activities, around which other types of activities necessary to meet the social needs of the population are concentrated in the SIC.

### 2 Materials and Methods

In a general sense, information technology (IT) is a purposeful organized set of information processes using computer technology that provides high-speed data processing, quick information retrieval, data dispersal, access to information sources regardless of their location. (4) According to the definition adopted by UNESCO, information technology is a complex of interdependent, scientific, technological, engineering disciplines that study the methods of effective organization of work of people involved in the processing and storage of information; computer technology and methods of organizing and interacting with people and industrial equipment, their practical applications, as well as social, economic and cultural problems associated with all this. (5, p4) The main features of modern IT are the computer processing of information, the storage of large amounts of the information on computer media and the transmission of information at any distance in the shortest possible time.

With the advent and widespread introduction of computers and peripheral technology, the era of computer information technology has come, which is also called the new, modern, paperless. The basic principles of the new information technology (NIT) are integration, flexibility and information content. For her characteristic such features: (6, p7-9)

- user work in data manipulation mode (rather than programming);
- complete information support at all stages of information passing based on an integrated database, which provides for one unified form of presentation, storage, retrieval, display, recovery, and protection of data;
- paperless document processing, when only its final version is recorded on paper, and the intermediate versions and the necessary data recorded on machine media come to the user through a computer display screen;
- interactive (conversational) task-solving mode, which enables users to actively influence this process;
- the possibility of collective (group) cooperation for the preparation of documents and tasks based on several personal computers combined using communication;
- the possibility of adaptive restructuring of the forms and methods of presenting information in the process of solving the problem.

Given that the concept of "information technology" applies to all areas of human activity, since information that is transformed into data, knowledge, information and software products, technological inventions is an integral part of the present, it is advisable to consider information technology as a determining

factor in the development of objects social and infrastructural centers of the region.

The following five areas of application of modern IT in the activities of SIC facilities can be distinguished:

1. Automation of management, which includes accounting for personnel involved in the work of the SIC, electronic document management between the SIC facilities, decision-making support for future development, business management.
2. Automation of accounting, which involves the use of a variety of software, in particular, accounting programs, programs for calculating prices for goods and services, programs for making payments via the Internet.
3. Communications, with the help of which information about SIC objects is posted on web pages, communication is carried out using e-mail, Skype and ICQ.
4. Advertising SIC facilities and their services on the Internet, earning revenue from advertising on their web pages.
5. Internet sales organization system.

SIC objects, like any other company that uses IT, in particular the Internet, for their work, encounter some features that are not characteristic of their traditional activities, because, as I.A. Strelets: (7, p55-61)

- the boundaries of activity are changing, as interaction and cooperation with other partners is becoming a faster and less expensive process, it is possible to draw up agreements and transactions with geographically remote counterparties;
- the level of activity transparency increases (pricing becomes transparent, the process of fulfilling orders is more controlled);
- there is a reduction in the time of intra-company transactions, which leads to an acceleration of the production process, and the reaction rate of the company is a measure of its competitiveness, increases the degree of adaptability to ongoing economic processes;
- rules of conduct on the Internet are standardized, which helps reduce operating costs, helps reduce the costs associated with the assessment of consumer behavior.

A special place in the development of objects of social infrastructure centers is given to such a type of IT as Internet technology, due to which various information resources are created and maintained on the Internet computer network.

We agree with the opinion of N.V. Matsedonska, (8) that the main advantages of Internet technologies for doing business are:

1. New economic system: the development of the Internet has created a new type of economy, the growth rate of which is so enormous that it has already managed to change the most traditional concept of doing business.
2. The Internet is an ideal environment for doing business since all its users can act as potential customers
3. Creating and maintaining an image through a website
4. Cost minimization.
5. Availability of information. Thanks to the Internet, it is possible to convey information to the consumer in a few hours by publishing it on the window of their website.
6. Ability to work 24 hours a day.
7. The expansion of opportunities for the client, first of all, is providing him with the necessary information.
8. Minimum initial investment: to create a web site there is no need for large financial investments. Costs are significantly lower compared to opening a regular store.
9. The possibility of globalization: the combination of technologies and capabilities of the Internet and advertising opens up great opportunities for online advertising.

This list can be supplemented with such advantages as:

1. Permanent and operational access to obtaining and searching for business information.

2. The possibility of simultaneous centralization and decentralization of management of the business entity.
3. Providing interactive contact with potential partners and consumers.
4. The possibility of distance learning to build the professional competence of managers, management personnel.

The capabilities of the Internet to ensure the development and operation of SIC facilities can be used in the following areas:

1. Market monitoring, which provides for the study of consumer needs and the study of competitors through Internet tools such as search engines, forums, thematic and special sites, and portals, catalogs, your website, E-mail.
2. Marketing activities, which include advertising about goods and services, advertising the organization itself, sales promotion, direct marketing through its website, banner advertising, cross-references, E-mail.
3. Obtaining professional information by the personnel of CIS facilities through search engines, forums, chats, sites and portals, catalogs, conferences, mailing lists.
4. Support business contacts through our websites, e-mail.
5. Service in the "Internet banking" system, which embodies the latest achievements in the field of Internet technologies and opens up new opportunities in the field of services that are provided by the bank, in particular: (7, p55-61)
  - mobility - access to the system is possible from any computer that is connected to the Internet, without the need to install additional software;
  - efficiency - the client's access to his banking financial resources and the receipt of relevant information is possible 24 hours and on any day of the week;
  - usability of the system.
6. Starting a new business or creating business units within the company (online stores).

In turn, G.V. Berezhnov (9, p57-63) emphasizes that no matter how paradoxical changes would occur in the field of IT, they have not yet changed the relationship of controllability and spontaneity, stability and spontaneity in economic processes, order and chaos as characteristics that are constantly associated with development. Although new ideas, concepts, and management tools are often considered only as positive, i.e. not creating new problems.

### 3 Results and Discussion

The stability of the socio-economic system of the region involves the formation of the special adapted mechanism that allows you to quickly respond to changes in various factors and adjust movement in a given direction. Operational and complete information support is of fundamental importance and is one of the main elements of the mechanism for managing sustainable development of the regional economic system. In this regard, there is a need for an information-analytical system that determines the actual state of the facility and provides feedback to the authorities and structural units of the region's administration to adjust the processes.

The main objectives of the regional policy to increase the sustainability of the functioning of socio-economic systems cannot be solved without appropriate information support and the use of the most modern information technologies, with the help of which the regional management process becomes more effective. Improving management processes at all levels should be based on an ordered, strictly organized system of information support, which allows integrating information resources of the region.

For effective resource management, development planning and operational management of all aspects of the region's economic life, it is necessary to organize in its administration (Government) a system for collecting, storing, processing

geographically “linked” information about all management objects.

Analyzing the state of the problem under consideration, we can conclude that all the information necessary for making managerial decisions in the region is practically available, but it is scattered across sectoral and municipal systems, systematized in the interests of the departmental vertical and sometimes unavailable for analysis in the interests of the region. The reason is that the state concept of informatization developed at the level of technical solutions for a long time was not. Therefore, heterogeneous computer systems are widely used, not always modern software and database management systems. Many organizations, on their own and with their understanding of the problems, are building their computer networks in the regions, overloading communication channels. (10)

To eliminate this situation during the study, the fundamental requirements for the formation of an information-analytical system are formulated by the need to ensure the dynamic stability of the region’s economy:

- the system should be based on the domestic software base and the latest technologies, technological solutions and system architecture should exclude the revision of design decisions in the foreseeable future;
- the system must be adaptive, evolving, integrating and integrable, i.e. during its design, it should be provided that this system is a component of a top-level system, part of single information space of the federal district.

The system should not tie the user to a specific workplace (Internet - technology), be expensive and not very effective in terms of price-opportunity and affordable for depressed regions.

Considering the principles formulated, an information-analytical system of the socio-economic development of the region should be introduced in the regional administration. It is built based on a set of tools for automation decision support, which includes a unit for collecting information from departmental and municipal systems in a single data warehouse, it’s sophisticated analytical processing, and maintenance technology for this warehouse. (11) Based on the complex, solutions were generated to create integrated data warehouses based on indicators of the socio-economic development of the region, a unified register of property objects and others. (12) As a result of the information and analytical support of the civil service, qualitatively new opportunities have been created for managing the development of the region, transferring all of its most important subsystems to a mode of sustainable functioning.

#### 4 Conclusion

Thus, social-infrastructure centers are an important element in the mechanism for ensuring the social-economic development of the region. They determine the prerequisites for the economic development of the region by creating new jobs, activating the influx of investments into the region, increasing tax revenues to the budget, developing the infrastructure of the territories adjacent to them, and creating a new system of territorial organization of production. The use of modern IT, in particular Internet technologies, is one of the conditions for their successful functioning and future development. (13-14) Indeed, the Internet provides the ability to transfer information from SIC facilities to their potential customers, disseminate an electronic presentation about them themselves, as well as about the goods and services that they sell, and conduct cash settlements.

Within the framework of the created infrastructure, it is possible to deploy a single mechanism of electronic commerce, educational space, and other infrastructure units at the district level. (11)

Thus, the process of informatization and the formation of information resources has moved from the formation phase to the phase of active development, which is accompanied by a significant increase in the volume of processed information, the expansion of the list of registers, registers and databases, the commissioning of fundamentally new subsystems of the information system of the Central Federal District authorities, and the introduction of new analytical technology.

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**Primary Paper Section: A**

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## STUDENTS' READINESS FOR THE FORMATION OF PRIMARY SCHOOLCHILDREN'S ARGUMENTATIVE SKILL WHILE IDENTIFYING THE REAL MOTIVE OF THE ACTION

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**Abstract:** The article deals with the problem of the future teachers training for the formation of argumentation junior pupils' skills identifying the true motive of an act as an intellectual activity. The specifics of the future teachers' training in higher education institutions are analyzed; the peculiarities of the process of development of argumentation skills are determined. The prospects for preparing for the formation of junior school students' argumentation skills in higher educational institutions are outlined. The problem of developing the professional competence of future teachers in the training of junior schoolchildren is substantiated. Their reasoning is grounded because of the argumentation of their behavior and the motive for its implementation. The emphasis is placed on the fact that the readiness of students-future teachers to develop skills of junior pupils' argumentation is impossible without argumentative competence which is a set of intellectual and communicative skills, and is formed in the process of communication, performing functions of explanation of the statement of assertion or conviction of the interlocutor, and is carried out on the principle's objectivity, rationality, and dialogue. It has been experimentally proved that argumentative competence as the basis of readiness to develop younger students' skills of argumentation in identifying the true motive of an act enables the mastery of the relevant techniques and positively affects the professional and personal qualities of the future teacher.

**Keywords:** argumentation, argumentative and debatable skills, argumentative competence.

### 1 Introduction

The development of personality is a rather complicated process that starts in childhood and is realized in communication with adults and peers. The success of the personality's social adaptation depends on the level of development of his or her communicative skills, which promote active interaction with the social environment, and the latter, in its turn, requires the ability to solve conflicts and controversial situations that arise in the process of communication. In this regard, one of the most important tasks of modern education is to create favorable conditions for the formation of culture of interpersonal relations, to develop each child's potential for the interpersonal relations with himself or herself, other children, adults and the world around, as well as to master a language as a means of communication and culture. Therefore, it is out of the question that it is very important to develop a person's communicative and argumentative skills.

Various aspects of argumentation are researched by O. Ivin, A. Alekseev, V. Brushkin, H. Gadamer, H. Jonston, M. Natanson, Ch. Perelman, T. Kruizez, A. Cattani, and others. The ideas about the essence of argumentative language can be found in the scientific works of N. Kuzina, T. Ladyzhenska, M. Makhnovska, O. Ushakova, L. Shadrina, V. Shuritenkova, V. Yashina, and others. The role of argumentation within the socio-cognitive approach to understanding personality's intellectual development was studied by J. Piaget, George Herbert Mead, L. Vygotsky, within the framework of the interactivistic approach – by V. Douase, G. Muni, T. Zitton, N. Muller, A. Perret-Clermont, and others. From the standpoint of the non-rhetoric approach, the issue of argumentation and argumentative activity is researched by H. Perelman, O. Volkov, T. Anisimova, E. Gimpelson, and others. Dialogical aspects of argumentation are studied by S. Lehesvuori, M. Hikiöniemi, K. Jokiranta, P. Nieminen, J. Hiltunen, J. Viiri. The fundamentals of dialogical pedagogy are developed by A. Segal, I. Pollak, A. Lefstein.

However, despite a wide variety of scientific works on the issue of argumentation, it is worth noting that widespread pedagogical

practice and a lack of systematic work in this educational area actualize the need to look for the most effective forms and methods for organizing pedagogical work on the formation of argumentative skills, in particular for the school-age children. Therefore, it is quite logical to assume that overcoming mentioned above concerns requires the solution of one more important task – enhancement of the argumentative competence of a teacher, who has special skills and abilities, which are necessary for teaching argumentation to a child.

This point of view is supported by the research works of N. Muller-Mirza and A. Perret-Clermont, who believe that argumentative skills have to be formed in the process of a child's development. In order to carry out this kind of activity and to master methods of assessing such skills, teachers must have special social skills and special pedagogical training. (1)

All mentioned above provided the rationale for the aim of our research – to identify the main approaches to the formation of primary schoolchildren's argumentative skill, to ascertain the level of future teachers' readiness for its development, to design an experimental method of teaching argumentation and to assess its results while using interactive methods in practical classes in the process of development of argumentative and discussion skills. The moral norms of argumentation and such spiritual and moral values as tolerance, active listening skill, and others laid the foundation for the experimental methodology.

To fulfill mentioned above tasks a complex of modern scientific methods has been used: theoretical methods – analysis, synthesis, generalization; empirical methods – observation (direct and indirect); diagnostics (expert interviews, conversations); methods of experimental-theoretical level; methods of mathematical statistics, used to process the data obtained and study the quantitative relationships between the phenomena and processes under analysis.

### 2 Materials and Methods

The solution of main research tasks requires analysis of the professional standard "Teacher of primary school of general secondary education establishments" (Professional Standard), which describes the main work duties, professional competences, knowledge, skills, and abilities of a modern primary school teacher. The conducted analytical work has shown that among above-mentioned requirements there are skills which, in our opinion, can be a sort of confirmation of the necessity of argumentative competence formation, in particular, "to assess the truth or falsity of the schoolchildren's statements and conclusions from systems of theoretical knowledge in the educational fields, identified by the State Standard of Primary Education" (skills and abilities of B3U2), "to analyze, evaluate, and summarize information on the dynamics and results of the educational process" (skills and abilities of G4U1), "to analyze and evaluate one's own level of professional competencies" (skills and abilities of G5U1), "to analyze and highlight main ideas, generalize the approaches, offered by different authors, compare them, draw conclusions" (skills and abilities of D2U2), "to prove one's own opinion..." (skills and abilities of Zh2U3). At the same time, we did not find in the standard the term "argumentative competence" or "argumentative skills and abilities". We believe that it is not the evidence of its uselessness, but is a confirmation of its universality, since one way or another its content components are contained in all blocks of competences and skills.

Correspondently, all mentioned above facts, require an analysis of the essence and content of argumentative competence. An attempt to find in the scientific literature the definition of this term has resulted in a very limited number of such studies. Thus, in particular, only a small number of scientists paid attention to the study of metacognitive, gnoseological and social aspects of argumentative competence development, emphasizing the fact

that it is the skill of argumentation that promotes the solution of many educational challenges, in particular, the issues related to the acquisition of professional knowledge. (2)

At the same time, scientists are interested in the concept of "argumentative ability" and "ability to provide argumentation". Consequently, to our point of view, it is necessary to start the research of the argumentative competence content from the analysis of argumentative skill as one of the most strategic logical actions, without which the scientific cognition of any object of the surrounding reality becomes impossible. Therefore, it is necessary to pay attention to the main aspects that reveal the essence of the mentioned above action.

It should be noted that in modern literature the concept of "argumentation" is quite ambiguous and is usually used in the meaning of "argument or proof", "discussion or exchange of ideas", "dispute on various problems", "method of logical reasoning" and "special kind of human activity". At the same time, while analyzing scientific works on the theory of argumentation, we've noticed the domination of the last meaning. (3-5) For example, V. Brushinkin, based on cognitive approach, concludes that argumentation is a process of "providing logically interconnected evidence (arguments) to objectively prove a certain statement (thesis) in the process of communication considering the psychological characteristics of the participants of argumentative activity process". (3)

An encyclopedic interpretation of this concept is usually focused on the rational component of the logic-communicative process, based on justification or belief:

- argumentation is a method of persuasion, which is used for providing a rationale for any statement with the help of other statements, but at the same time it can't be used to prove its truth; (6)
- argumentation (from Latin "argumentatio" - argumentation) is a way of setting the grounds for any opinion or action (their justification) with the purpose of their public defense, creation of a certain opinion about them for the sake of their recognition or clarification; a method of convincing anyone using meaningful arguments; (7-9)
- in this meaning, the argumentation is always dialogical and is broader than the logical proof (which is essentially an impersonal and monological one), since it assimilates not only "technique of thinking" (actually logic), but "technique of persuasion" (the art of manipulation of people's thoughts, feelings and will); (10)
- argumentation (from Latin "argumentation") is the concept, which means a logical-communicative process, aimed at the justification of a particular point of view with the purpose of its perception, understanding and (or) acceptance by an individual or collective recipient. (11)

The analysis of the content of these definitions provides the foundation for the consideration of personality's argumentative activity as an intellectual and linguistic activity, which is aimed at another person with an argumentative purpose. In particular, the speaker has to consider the possibilities, to accept a new statement, to convince an opponent, to provide the rationale for

the thesis with the help of other arguments, etc. Such argumentative activity becomes possible under the condition of providing evidence, exchanging opinions, finding truths for various problems and rationalizing one's thoughts. These factors confirm the impossibility of its consideration without considering its meaning as "argument or proof", "discussion or exchange of ideas", "dispute on various problems", "method of logical reasoning", which have been mentioned before.

The confirmation of these ideas is found in the New Philosophical Dictionary, which states that structural and functional analysis of scientific argumentation requires a clear differentiation of the concepts of "argumentation", "substantiation", "proof", which are often used as synonyms. Thus, in particular, the substantiation is a logical frame of argumentation. Differentiation of the concepts of substantiation and argumentation should be carried out in two directions – logical and linguistic. The argumentation is not a purely logical substantiation, it is both a logical and a communicative process, which is aimed at an adequate perception of the point of view, which is advocated; it is also aimed at its subjective-semantic identification, understanding, and inclusion into the culture. (11)

As for the analogy of argumentation with proof, it is worth paying attention to the fact that, depending on the specifics of the subject area under research, in the process of scientific argumentation different types of substantiation are used. Based on the specifics of the thesis, arguments used, as well as the way of their connection, we can single out the following types of substantiation: proof, disproof, confirmation, explanation, interpretation, definition, justification, etc. In the literal sense of the word, the proof is a logical process, which provides a rationale for the truth of a certain statement through other statements, which have already been proved before. According to it, the use of the concept of proof in the broad sense of the word (as any substantiation) is an inaccurate one. (11)

The above-mentioned ideas enhance the definition of "argumentative competence" content, which can be defined some intellectual and communicative skills, which corresponds to the structure of the argumentation (thesis, proof, conclusion). These skills are formed in the process of communication, performing the functions of statement explanation or persuasion of the interlocutor based on the following principles such as objectivity, rationality, and dialogue. In our opinion, it should be emphasized that argumentative competence is an integral part of the majority of professional competences of a primary school teacher in the establishment of general secondary education. Thanks to this competence all other professional competencies can be fully realized, in particular, readiness for the formation of primary schoolchildren's argumentative skill while identifying the real motive of the action. In this regard, there arises a logical question – how we can identify the level of this readiness. An attempt to answer this question encouraged us to create a theoretical model of such readiness (Figure 1). This model reflects all necessary basic argumentative competence skills and abilities, which provide the ground for the readiness of a student (future teacher) for the formation of primary schoolchildren's argumentative skills.

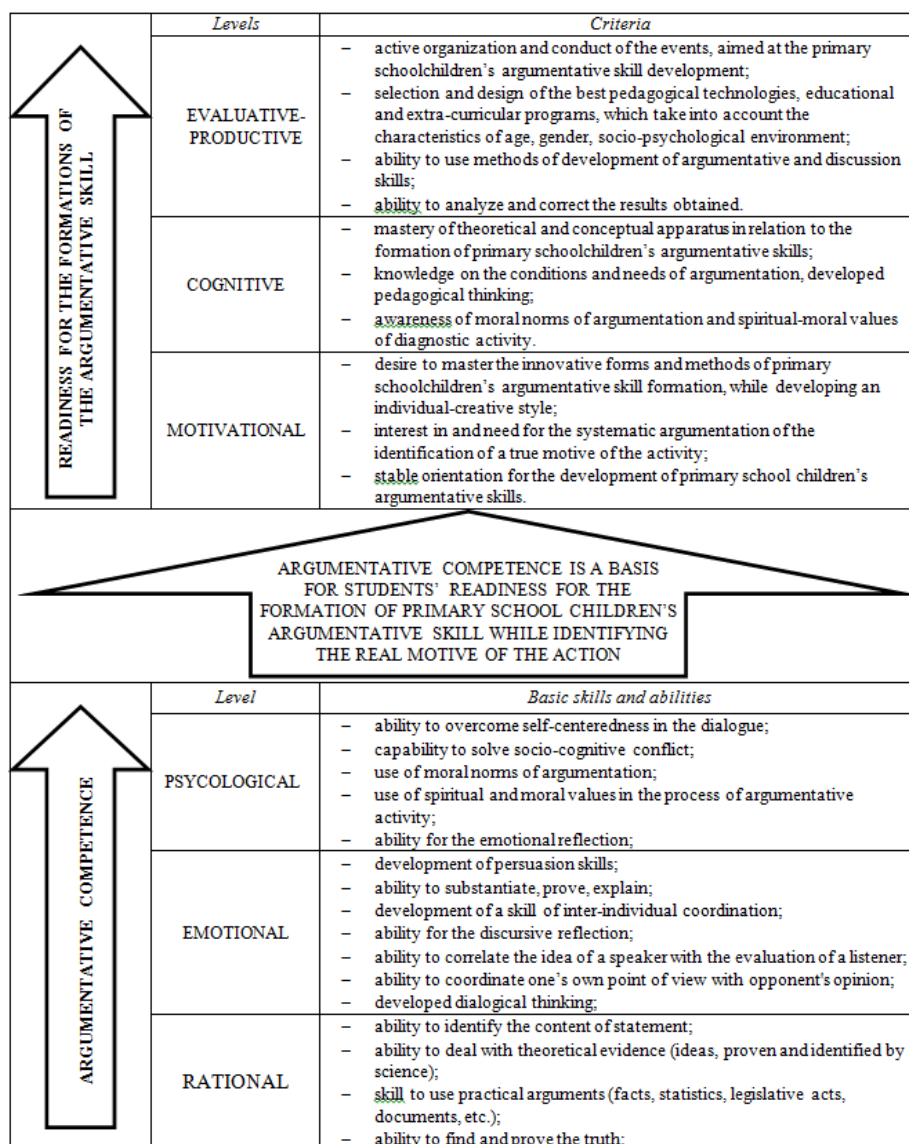


Figure 1. Model of Students' Readiness for the Formation of Primary School Children's Argumentative Skill While Identifying the Real Motive of the Action

According to the theoretical model, argumentative competence is a complex process of acquiring some skills and abilities, which have to be developed throughout the study at a higher education establishment. It should be noted that in the Curriculum there isn't any separate discipline, which is responsible for acquiring these skills. However, in our opinion, we should not neglect such disciplines as "Logic" and "Rhetoric", which form basic skills and abilities at all stages of rational and emotional levels of the argumentative competence. The inseparable parts are, undoubtedly, psychological and spiritual-moral components of pedagogical education, which enable acquisition of skills and abilities, characteristic for emotional and psychological levels of argumentative competence.

At the same time, we have to emphasize that such a subdivision into levels and stages is a rather conditional one since acquisition of these or those skills and abilities can't be planned within a framework of one particular discipline, they are the result of a complex and systematic formation of the teacher's personality and are acquired within all types of educational, scientific and up-bringing activities. Argumentative competence is the basis for the formation of primary schoolchildren's argumentative skill while identifying the real motive of the action. It is manifested at three levels – motivational, cognitive, and evaluative-productive. It is also important to mention that such

readiness is a relevant one, has specific manifestations and proves a teacher's professional competence.

Consequently, as we can see, argumentative competence, on the one hand, is an important part of general professional competence of primary school teacher of the establishment of general secondary education, on the other – it provides the grounds for the development of readiness for the formation of primary schoolchildren's argumentative skill while identifying the real motive of the action. The importance and necessity of this skill formation are out of the question, as the modern concept of education is focused on the creation of a discussion environment in institutions of secondary education, where regularly arise the situations, in which the child feels the need to prove his or her point of view. It requires a child to have a developed ability to correlate his or her point of view with the opinion of another person, thus, the child has to look for the proof of a statement.

It has to be noted that at the present stage, the concept of argumentative skills is considered to be a rhetorical phenomenon, which underlies intellectual and communicative activity. N. Makhnovska (12) has researched this concept in detail and she defines "argumentative skill" as person's capability to use the ways of implementing intellectual and

communicative actions, which are aimed at the explanation and proof of one or another point of view and, as a result, the persuasion of the interlocutor. Based on the activistic approach, the researcher identifies not only the types of argumentative skills but also describes their qualitative characteristics without reference to the subjects of communication: purposefulness, dynamism, productivity, integrity, autonomy, hierarchy. (12)

According to T. Ladyzhenska and N. Makhnovska, (13) such skills are the basis of the activity of creating an argumentative text; they correlate with the thesis, arguments, methods of proof and conclusion. Such activity requires the work of thinking, understanding the characteristics of the addressee, considering the communicative situation.

The basis of the formation of primary schoolchildren's argumentative skills is, above all, the dialogue with peers and adults, as it is the primary and natural form of communication and education of primary schoolchildren. Also, it should be added that speaking and listening are dominant types of speech activity in the preschool and primary school age, the level of their development influences academic achievements and success of interaction with other people.

The works of O. Ushakova (14) and A. Arushanova (15) prove this point of view. The scholars emphasize that the main type of child's communication with adults and peers is a dialogue, which combines different forms of speech and types of statements. The dialogue also provides meaningful communication, understanding one's experience and realizing the opportunity to prove the child's point of view.

We support the idea of O. Ushakova (14) that it is important to develop children's speech activity from their first days in a kindergarten. But it is worth adding that it is important to continue this work in primary school, teaching children to talk to each other and adults, to explain, reason and prove. The ability of primary schoolchildren to actively argue, to convince directly depends on those skills, which children received in preschool establishments and this work should be continued in primary school.

P. Galperin (16) and D. Elkonin (17) emphasize the necessity of teaching children to algorithms of mental actions, in particular, the algorithm of conclusion, since the argumentative skill by its nature is closely related to the development of thinking, the child's intellectual, cognitive and linguistic abilities. The dialogue is the very sphere, where the child uses expanded and meaningful answers. As he or she begins to prove and explain, foundations of monologue speech are being laid.

It is worth noting that by the end of the preschool age, children master the basic ways of processing information, which play an important role in argumentation – this is analysis, synthesis, comparison of objects, their decomposition, abstraction, specification, and generalization. Accordingly, the argumentative skills of primary schoolchildren can be described as a sequence of elements, which traditionally reflects the structure of argumentation and reasoning: thesis (hypothesis) – proof (arguments) – conclusion. However, according to A. Filipova's opinion, (18) there can also be another variant of constructing the argument: proof of thesis, and then the conclusion (or several conclusions), which subsequently become the main thesis. According to the researcher, the composition can be saved and undergo various changes depending on the subject-thematic content of the statement, functional style, genre, individual manner of the author. Each structural component of argumentation (thesis, proof, conclusion) requires the formation of an appropriate set of skills, which allows the child to obtain a single semantic whole of the argumentative statement (for example, the ability to formulate thesis, select appropriate arguments on order to prove this thesis and the ability to conclude). (18)

Consequently, the argumentative skill, as an important component of communicative and dialogic skills, has a general speech mechanism, which has a complex structure of the

creation of the linguistic statement. According to O. Leontiev, (19) linguistic activity is always purposeful and motivated and is realized using speech. For children, this motive of argumentative skills, manifested in communication with peers and adults, is the need to understand the relationships of people, causes of their actions, relationships, behavior, desire to convince others in the correctness of his or her beliefs. It is also a need to explain the contradictory processes, which can be observed in the surrounding world.

While identifying the true motive of the action the teacher must consider the fact that, according to O. Leontiev's theory of motivation, the source of motivation is a need to show the true desire for anything external, meeting with which makes this subject a true one, which, in its turn, transforms the subject into the motive of the purposeful action. The motive, according to O. Leontiev, (20) is the result, that is, the subject, which causes the activity, the field, where it is specified. However, the most difficult thing for a teacher's in the process of identifying the true motive of the action is probably the identification of this very motive, as, by this theory, human activity is polymotivated, and therefore, each action may be subject of several needs to some extent.

Although the motive in a certain sense is the "beginning" of human activity and determines what the individual needs at this very moment, it can't provide activity with a certain direction without having a purpose (anticipated result), and the action itself needs this purpose, (20) thus, it leads to the final result of the action. Accordingly, the purpose allows finding out what the person longs for, while the motive gives the idea of why the person needs it.

This means that it is extremely important for a teacher not only to correctly identify the purpose and motive of the schoolchild's activity as a result of the analysis of their argumentation but also to have argumentative skills, which are the components of argumentative competence. The argumentative skill of primary schoolchildren is a complex psychological issue, which includes linguistic mechanisms of programming, planning, realizing and monitoring speech. Besides, the structure and content of argumentative skills are directly related to the structure of the argumentation itself (thesis, proof, conclusion) and are aimed at the formation of the ability to formulate the thesis, select arguments and methods of proving this thesis, to make the corresponding conclusion.

All mentioned above prove that primary schoolchildren's argumentative skill can be interpreted as intellectual and communicative skill, which corresponds to the structure of argumentation (thesis, proof, conclusion) and is formed in the process of communication with adults and peers, performing the functions of explaining the statement or convincing the interlocutor.

At the same time the qualitative characteristics of primary schoolchildren's argumentative skill: purposefulness, which is manifested in the ability to monitor speech activity, aimed at the creation of an argumentative statement or its fragments in accordance with the plan. It also provides the ability to be aware of the subject of the statement, to keep it in the process of communication with interlocutors, to include the argumentation into everyday communication according to its functional purpose. One more characteristic is dynamism, which regulates the speed and flexibility of finding necessary arguments and ways, in which they are presented in the statement. Integrity is also an important characteristic of the argumentative skill, as it presupposes that a child can integrate verbal and nonverbal skills, communicative skills, and skills of using speech etiquette, etc. This characteristic is manifested in the ability to include the elements of description, narration, and reasoning into the statement. Independence, as one of the characteristics, can be seen in the ability to use different genres of communication with and without a help of a teacher, as well as with the involvement of visual accompaniment or without it.

### 3 Results and Discussion

The formation of primary schoolchildren's argumentative skill provides the need for communication, desire for getting to know and evaluating other people, self-knowledge and self-assessment. The formation of primary schoolchildren's argumentative skill requires the readiness of a student (future teacher) for the formation of primary schoolchildren's argumentative skill while identifying the real motive of the action. The basis for such readiness is the development of teacher's argumentative skill, which in turn enables the implementation of the specified readiness at three main levels: motivational, cognitive and evaluative-productive, which are characterized by certain criteria of the formation of such readiness. Such subdivision is a conditional one and it is based on the acquisition of basic skills of readiness for the formation of primary schoolchildren's argumentative skills.

In particular, at a motivational level, the most important features are the student's desire to master the innovative forms and methods of primary schoolchildren's argumentative skill development. At this very level, the students should be able to develop an individual-creative style, be interested in this activity, need the systematic argumentation of the identification of a true motive of the activity and be oriented at the development of primary schoolchildren's argumentative skills.

The cognitive level is manifested in the mastery of theoretical and conceptual apparatus concerning the formation of primary schoolchildren's argumentative skills, knowledge on the conditions and needs of argumentation, developed pedagogical thinking, moral norms of argumentation and spiritual-moral values of diagnostic activity.

The evaluative-productive level requires the student to be active in organizing and conducting events, aimed at primary schoolchildren's argumentative skill development. At this level, the students should be able to select and design the best pedagogical technologies, educational and extra-curricular programs, which consider the characteristics of age, gender, socio-psychological environment. At the evaluative-productive level, the students (future teachers) should be able to use methods of development of argumentation and discussion skills and have the ability to analyze and correct the results.

To formulate the argumentative competence of students (future primary school teachers), we have arranged and conducted a pedagogical experiment, which was characterized by the active use of techniques and technologies for the development of argumentative readiness. These techniques and technologies were used in one group (experimental) during extra-curriculum training on the methodology of teaching special disciplines in primary school. In the other group (control) there was so-called passive work, which did not have the purpose of conducting additional classes but was based on the students' self-study of the methods and ways of argumentative activity of students (future teachers of primary school).

Every week during the academic year the students of the experimental group attended additional training sessions, workshops, and lectures. The students thoroughly studied the structure, rules and basic constructions of argumentation and evaluated the tactics and methods of argumentation, in particular:

- the fundamental method, which presupposes a direct contact with the interlocutor, who is familiar with the facts, which provide the basis of the proof; while using this method a student must be a skillful user of statistic data;
- method of contradiction, which is based on the revealing contradictions in the statement and paying specific attention to the arguments of the interlocutor;
- method of comparison, which is very effective and of exceptional importance under conditions of appropriately chosen comparisons; it empowers the initiator of communication with exceptional brightness and great power

of persuasion, representing a special form of the method of "extracting conclusions";

- method "yes, but ...", which can be most effectively used when the interlocutor is biased against the topic of conversation;
- method of "pieces", which involves deconstruction of the interlocutor's monologue into some parts: "definitely", "doubtfully", "there is a great variety of points of view here", "it is a mistake"; this method is based on the thesis: "in any situation, and especially in the conclusion, one can always find something inaccurate, false or exaggerated, then for sure the so-called "attack" allows partly "ease" situation, even the most complex one";
- method of "boomerang", which does not have the power of proof, but it has a huge impact on the audience, under the condition of using a bit of wit; it also allows to use interlocutor's "weapon" against himself or herself;
- method of "ignoring", which is most often used in conversations, disputes, discussions, and involves ignoring the fact, provided by the interlocutor and this fact can't be refuted;
- method of "conclusions", which is based on the gradual subjective change of the point of conversation;
- method of "visible support", which requires very thorough preparation and for the opponent this method is the most appropriate in the discussion. (21-23)

Within methodological work, we have also conducted a questionnaire among the students of the control and experimental groups. The questionnaire aimed to identify the degree of students' readiness for the formation of primary schoolchildren's argumentative skill while identifying the real motive of the action.

Students of both groups were proposed a questionnaire, the questions of which were drawn up in such a way as to reveal the degree of readiness to develop the skills of junior pupils' argumentation in identifying the true motive of the act on a motivational, cognitive and appraisal-performance level.

At the motivational level, students had to show how they are ready to apply the individual-creative style, how they are of interest and who feel the need for systematic argumentation to identify the true motive of the act, how stable their focus is on the development of the argumentative skills of junior pupils.

At the cognitive level, students had to demonstrate the degree of mastering the theoretical and conceptual apparatus for developing the skills of argumentation in junior pupils and knowledge of the conditions and needs of the argument, developed pedagogical thinking, mastery of moral norms of reasoning and spiritual and moral values of diagnostic activity.

At the appraisal and performance level, students had to show the readiness to organize and conduct activities aimed at developing junior pupils' skills for argumentation in identifying the true motive of the act, selecting and developing the best pedagogical technologies, educational and extra-curricular programs that take into account peculiarities of age, sex, socio-psychological environment, as well as to show the degree of mastering the methods of development of argumentative and discussion skills and the ability to analyze and correct the results. (24)

In connection with the tasks, the questionnaire contained several blocks of questions of varying complexity. The block of questions for the definition of basic concepts characterized the cognitive component of readiness to develop the skills of junior pupils' argumentation, their understanding of the key issues and the essence of the argument, and on the other - showed their level of awareness of readiness to form the skill and the degree of motivation to the relevant activity. So, in particular, if the student agreed with one or two statements, this indicated a low level of awareness, since the proposed statements do not fully characterize the concept, but only partially, which gives grounds for identifying a low level of readiness; if all the statements were marked - it was a higher degree of awareness and average readiness; if the student formulated a personal definition - this



indicated a high level of readiness to formulate the junior pupils' argumentation skills.

The block of questions on the definition of methodological readiness characterized the evaluative-productive component of readiness to formulate the junior pupils' argumentation skills and showed the readiness of students for creative work on the formation of this skill. So, in particular, if a student offered one or two traditional methods, this indicated a low level of awareness; if several methods, non-standard solutions and unconventional ways of solving the proposed pedagogical situations were offered, this showed a higher degree of awareness and average readiness; if the student showed a creative approach, offering his ideas and a variety of ways to implement them - this indicated a high level of readiness to formulate the junior pupils' argumentation skills.

The general results of the questionnaire showed that in the control group, the majority of students (64%) showed the average level of theoretical training and low level of creativity. In the experimental group, the majority (78%) showed a high level of theoretical training and an average or high level of creativity in developing skills for argumentation among junior pupils. The above suggests that additional weekly pieces of trainings non-rhetoric, workshops, and lectures on the formation of argumentative competence as the basis for readiness to formulate the junior pupils' argumentation skills gave the highest result for qualitative indicators in the experimental group, compared with the control, which confirms their effectiveness in a certain direction of work.

Consequently, the consideration of the problem of preparing future teachers for developing skills of argumentation among junior pupils in identifying the true motive of an act as an intellectual activity enabled the following conclusions.

The importance and necessity of forming the skills of reasoning is a requirement of nowadays, in particular, the orientation of the modern concept of education to the creation of a discussion environment in institutions of secondary education, in the context of which the child regularly finds himself in a situation of need to prove his point of view, which requires her ability to correlate another person and find the grounds for the proof of a statement, that is, argumentative skills. The argumentative skill, which is an intellectual and communicative skill that corresponds to the structure of the argumentation (thesis, proof, conclusion) and is formed in the process of communication with adults and peers, performing the functions of explaining the statement made or the conviction of the interlocutor makes it possible for the person to carry out a full-fledged argumentative activity, which is in content intellectually-speech, directed to another person with an argumentative purpose, namely to consider, if possible, to adopt a new statement, to persuade the opponent, to substantiate, to substantiate the thesis using other arguments, etc.

#### 4 Conclusion

It is extremely important for the teacher not only to correctly identify the purpose and motive of the activity of the students as a result of the analysis of their arguments but also to possess the skills of forming the argumentative skills which provides for argumentative competence, since the argumentative ability of children of junior school age is a complex psychological entity that includes speech programming mechanisms, the planning, implementation, and control of speech expression, and its structure and content are directly related to the structure of the argumentation (thesis, evidence, conclusion) and is aimed at mastering the abilities to formulate the thesis, to carry out the selection of arguments and methods of proof of the thesis, to make statements to the conclusion.

Formation of the argumentation skills of junior pupils in identifying the true motive of an act as intellectual activity requires the acquisition of the argumentative competence by the teacher which is an important component of the general professional competences of the teacher of the elementary school

of the institution of general secondary education and the grounds for the readiness to develop skills of argumentation in junior pupils in revealing the true motive of the act. It is realized on three main levels: motivational, cognitive and evaluative-productive, having corresponding formation criteria.

According to the results of the experiment, comparing the level of readiness of future teachers to prepare the junior pupils' argumentation skills in identifying the true motive of an act in the experimental and control groups, it can be noted that the qualitative characteristics of mastering the methods of development of argumentative and discussion skills in the experimental group are significantly higher than in control one. The indicated confirms the conclusion that gaining argumentative competence increases the level of readiness and enables the mastering of methods of forming skills of argumentation in junior pupils in revealing the true motive of the act which positively influences the professional and personal qualities of the future teacher.

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**Primary Paper Section: A**

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## EMOTIONAL BURNING OF PRESCHOOL TEACHERS: FACTORS OF DEVELOPMENT, DIAGNOSTICS, PREVENTION OF ART THERAPY AND SELF-IDENTIFICATION

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**Abstract:** The article examines the actual aspect of health in the profession of preschool teacher. The authors have shown that the day-to-day psychological work of a caregiver requires the development of effective methods of preventing occupational stress in order to preserve the psychological health of the caregiver's personality and to find ways to overcome emotional burnout. The factors of the development of teachers' emotional burnout in modern preschool institutions have been established. The essence of the concepts of «emotional burnout» and «professional burnout» has been clarified. With the help of diagnostic methods of research the indicators of emotional burnout levels, strong-willed self-regulation, manifestations of anxiety, resistance self-esteem to stress were revealed. The methods of mathematical and statistical processing were applied: Pearson's morning correlation coefficient was used to establish a correlation between the level of emotional burnout, anxiety, stress resistance and the level of volitional self-regulation of the specialist's personality; Mann-Whitney U-test for comparison of two independent samples (tutors with different work experience (from 1 to 10 years) and (more than 10 years); Wilcoxon T-test to confirm the effectiveness of preventive work. The results of the statistical analysis of the data showed that the risk of developing symptoms of emotional burnout does not depend on the age or length of caregivers' work, and it is proved that there is a relationship between the level of willful self-regulation of the caregiver's personality, his anxiety, stress, and risk of emotional burnout, namely, the higher the level of anxiety of the specialist with excessive control of the manifestation of their own emotions and insufficient level of stress resistance, the higher the risk of forming symptoms of emotional burnout. Valuable in the work is the developed and implemented preventive comprehensive program «Emotional Recovery» to prevent the development of emotional burnout syndrome and includes the following blocks: diagnostic, educational, corrective, monitoring unit of results. Within the framework of the program implementation, developmental and correction training was tested, in which the main means of influence on the educators were techniques from different directions of art therapy (iso-therapy, sand therapy, fairy-tale therapy, music therapy, make-up therapy, body art therapy, and metaphors) methods of self-knowledge and perception. As a result of the testing, the developed programs have brought about positive changes in the system of emotional state of the caregivers: emotional stability, initiative, creativity in business, ability to conduct dialogue, to predict the results of activity, etc.

**Keywords:** emotional burnout, professional burnout, emotional burnout syndrome, stress, exhaustion, preschool educators, art therapy.

### 1 Introduction

The present state of our society, which is determined by externally objective factors – crises and problems in different spheres of social life and characterized as transitional, cannot but affect the subjective experiences of the situation by society members, which eventually transform into an objective factor – rapid deterioration of human health. Today, the list of professions whose representatives are exposed to this danger is greatly expanded. For example, studies conducted in different countries show that a particular «at-risk» group, together with representatives of the extreme professions, is also representatives of the assisting professions, which include pedagogical workers and educators of pre-school education institutions (hereinafter PEI). The caregiver's profession is fraught with many stressors, including social assessment, uncertainty, daily strenuous psychological work (working with young children, high responsibility for their lives and health), demand for them from the community, high demands from parents of pupils and so on.

It should be noted that quite often caregivers, not only those who have a long enough working experience, but also young professionals who have been working for 3–5 years, determine the presence of such mental states that destabilize their professional activity: sadness, frustration, depression, laziness, frustration, chronic fatigue. Due to such activities as high dynamism, lack of time, workload, complexity of pedagogical situations that arise, role ambiguity, social assessment, the need for frequent and close contacts, interaction with different social

groups. Unfortunately, very little attention is paid to preventing these negative states and finding the most effective means of overcoming them.

Theoretical aspects of the study of the problem are related to the definition of the of «emotional burnout» concept, basic approaches to the analysis of its components and stages, personal and social conditionality of the risk of the formation of this syndrome, diagnostic methods, as well as methods of prevention and implementation of a preventive program. In modern psychological and pedagogical science, the question remains, what is the main cause of emotional burnout specifically in educators: personal traits, characteristics of the activity, features of interpersonal interaction or factors of the working environment? The solution to this problem is important, first of all, for the development of preventing occupational stress methods in order to preserve the psychological health of the caregiver's personality and to find effective ways to overcome this syndrome.

The desire to find ways to restore the psychological state of caregivers identified the problem of the study. In theory, it is a problem to justify the psychological and pedagogical conditions that provide the caregiver to overcome the emotional burnout syndrome. In practical terms—questions of development and approbation of psychological and pedagogical technologies that help prevent the emergence of emotional burnout syndrome in caregivers.

Aims of the research work are to activate the solution of the problem of timely diagnosis of emotional burnout of preschool teachers and to confirm the effectiveness of a comprehensive prevention program.

The purpose of its clarification of concepts is «emotional burnout» and «professional burnout»; identify and characterize the main causes of emotional burnout in caregivers in the course of professional activity; to present the results of the implementation of a preventive program aimed at preventing the formation of emotional burnout syndrome in pre-school teachers.

### 2 Materials and Methods

The study was conducted on the basis of pre-school educational institutions № 14 «Teremok», № 24 «Lastivka», № 36 «Berizka» of the combined type of Melitopol City Council of Zaporizhzhia region, Municipal Institution of Education «Educational Complex №72 School I – III degrees – preschool school (kindergarten)» Dniprovka city council. The study involved 66 pedagogical staff of pre-school institutions aged 24 to 58 years. In accordance with the stated purpose, the analysis of psychological and pedagogical scientific literature was applied in order to determine the essence of the concept of «emotional burnout», «professional burnout» and to analyze the main causes, stages, symptoms of its manifestation. Diagnostic techniques were applied («Methodology for diagnosing the level of emotional burnout» (V. Boyko), «Methodology for the study of volitional self-regulation» (A. Zverkov–E. Eidman test questionnaire), «Anxiety display» (J. Taylor), «Self-assessment of resistance to stress») in order to identify the level of formation of emotional burnout syndrome in caregivers and determine the role in this process of personality and psychological characteristics of professionals. Mathematical and statistical data processing methods were used to analyze the results of the study using SPSS Statistics (version 21.0). The Pearson rank correlation coefficient was applied (to identify the relationship between anxiety, stress, and volitional regulation with emotional burnout in caregivers). For comparison of two independent samples (tutors with different work experience – 1 group (from 1 to 10 years), 2 group (more than 10 years) we used Mann-Whitney U-test, and to confirm the effectiveness of preventive work – T-test Wilcoxon.

### 3 Results and Discussion

The experimental study was conducted during 2017–2019 in three stages (ascertaining, forming and controlling) on the basis of four PEI. In the first stage, a diagnostic examination of caregivers was conducted to determine the level of emotional burnout formation. The level of anxiety, stress resistance, and volitional self-regulation were further investigated to determine their influence on the process of emotional burnout formation.

The results of our research showed that for one-third of caregivers (31,8%) the phase of development of stress «stress» is at the stage «formed», in 43,9% this phase is not formed yet, and for 24,3% it is at the stage of formation. 36,4% of educators have a phase of development of stress «resistance» at the stage «formed», in 25,7% this phase is not formed yet, and for 37,9% it is at the stage of formation. Also, for a third of caregivers (33,4%), the stage of development of the stress of «exhaustion» is at the stage «formed», in 34,8% this phase is not formed yet, and for 31,8% it is at the stage of formation. Therefore, we can say that all these symptoms were found in the milestones of the respondents, but with different percentages. It is advisable to emphasize that a third of caregivers have high rates of these symptoms.

For a deeper analysis of the results of the study of the level of «emotional burnout» of caregivers, we further analyzed the results of symptoms on all stages of stress. Thus, in 21,2% of the educators, the symptom of «experiencing psycho-traumatic circumstances» is already dominant, and for 13,6% of the respondents, this symptom is already complete. The «dissatisfaction with self» symptom is dominant in 9,1% of caregivers and the prevailing symptom in 15,2%. Symptoms of «caged» and «anxiety and depression» for 13,6% are already complete, and 18,2% are dominant.

With regard to the symptoms of the «resistance» stress phase, this phase is represented by the following symptoms: «inadequate selective emotional response», «emotional-ethical disorientation», «expansion of the sphere of saving emotions», «reduction of professional responsibilities». Analyzing the levels of manifestation of symptoms, we can say that the most pronounced symptoms in the pre-school children of our sample are the following: «inadequate selective emotional response» (for 24,3% of caregivers already formed a symptom, for 36,4% it is dominant), «expanding the sphere of saving emotions» (for 21,2% of pre-school teachers it is already a symptom, and for 19,7% it is dominant), «reduction of professional responsibilities» (for 18,2% of pre-school teachers it is already a formed symptom, for 27,3% it is dominant). The most pronounced symptoms in the phase of development of stress «exhaustion» of pre-school teachers according to the results of our survey are the following: «emotional deficit» (for 27,3% of pre-school teachers it is already a formed symptom, and for 18,2% it is dominant), «emotional alienation» (for 15,2% of caregivers it is already a symptom, and for 13,6% it is dominant), a symptom of «personal alienation (depersonalization)» in 10,6% of caregivers is a symptom already formed, and for 12,1% it is a dominant symptom.

We note that the symptom of «psychosomatic and psycho-autonomic disorders» is not manifested in most caregivers (59,1%), but there is a certain proportion of respondents who have already formed this symptom (12,1%) and are dominant (also 10,6%).

In our study, we were interested in determining whether the length of pre-school teachers' work influences the level of emotional burnout syndrome, that is, whether the risk of this syndrome increases over time, or whether it is independent of experience. For this purpose, we divided the tutors into two groups – the first group included tutors with work experience of up to 10 years, and the second – with work experience of more than 10 years. Subsequently, a statistical analysis of the data was performed using the Mann-Whitney U test. According to the results of the statistical analysis of the data using the Mann-Whitney U-test when comparing group 1 (caregivers with work

experience up to 10 years) and group 2 (pre-school teachers with work experience over 10 years), according to which the empirical values that would be in the area of significance (differences at  $p \leq 0,05$ ) and confirm the presence of differences between these groups, were not isolated: so we obtained the following indicators for all symptoms of emotional burnout: «experiencing psycho-traumatic circumstances» ( $U=230,5$ ;  $g=0,794$ ), «dissatisfaction with yourself» ( $U=233,0$ ;  $p=0,839$ ), «caged» ( $U=229,5$ ;  $p=0,774$ ), «anxiety and depression» ( $U=221,0$ ;  $p=0,624$ ), «inadequate selective emotional response» ( $U=203,5$ ;  $p=0,366$ ), «emotional and ethical disorientation» ( $U=219,5$ ;  $p=0,602$ ), «expanding the sphere of saving emotions» ( $U=241,0$ ;  $p=0,990$ ), «reduction of professional responsibilities» ( $U=228,0$ ;  $p=0,748$ ), «emotional deficit» ( $U=204,5$ ;  $p=0,377$ ), «emotional estrangement» ( $U=228,0$ ;  $p=0,749$ ), «personal alienation (depersonalization)» ( $U=226,0$ ;  $p=0,714$ ), and «psychosomatic and psycho-autonomic disorders» ( $U=222,5$ ;  $p=0,652$ ). Thus, the results of the statistical analysis of the data showed that the risk of forming symptoms of emotional burnout does not depend on age or length of service.

Within the framework of the study, we assumed that the level of emotional burnout of caregivers is influenced by the following characteristics: the level of volitional self-regulation of the personality of specialists, the level of anxiety and emotional stability. In order to confirm this assumption, we were diagnosed with caregivers using the following techniques: «Methodology of the volitional self-regulation study», «Manifestation study of anxiety» (J. Taylor scale), «Self-assessment of resistance to stress»). Pearson's linear correlation coefficient was used to determine the correlation relationships available. Thus, the analysis of the data made it possible to distinguish between the symptoms of emotional burnout and the level of volitional self-regulation, anxiety and stress resistance, namely:

- Between «experiencing psycho-traumatic circumstances» and anxiety ( $r=0,512$ ;  $p \leq 0,01$ ) and stress resistance ( $r=0,384$ ;  $p \leq 0,05$ ), the higher the level of anxiety and the lower the level of personality stress, the stronger the impact on the caregiver psycho-traumatic situation;

- Between «dissatisfaction with self» and persistence ( $r=0,345$ ;  $p \leq 0,05$ ), which means that the more the educator is dissatisfied with himself, the higher his persistence level;
- Between «driven into a cell» and anxiety ( $r=0,405$ ;  $p \leq 0,01$ ) and stress resistance ( $r=0,339$ ;  $p \leq 0,05$ ), the higher the caregiver experiences anxiety and the less stress he has, the greater the risk find yourself in an intellectual and emotional stuck;
- Between anxiety and depression ( $r=0,900$ ,  $p \leq 0,01$ ), which confirms the reliability of the results obtained;
- Between «inadequate selective emotional response» and persistence ( $r=0,658$ ,  $p \leq 0,01$ ) and stress resistance ( $r=0,685$ ,  $p \leq 0,01$ ), the more often the caregiver shows persistence and, to a lesser degree, can resist stress, more often he resorts to inadequate electoral emotional response;
- Between «emotional and ethical disorientation» and general self-regulation ( $r=0,412$ ,  $p \leq 0,01$ ), self-control ( $r=0,553$ ,  $p \leq 0,01$ ) anxiety ( $r=0,361$ ,  $p \leq 0,05$ ) and stress resistance ( $r=0,574$ ,  $p \leq 0,01$ ), the more the teacher controls his behavior, he is anxious and has low levels of stress resistance, the more often he has inadequate reactions to others;
- Between «expanding the sphere of emotion savings» and persistence ( $r=0,695$ ,  $p \leq 0,01$ ) and stress resistance ( $r=0,530$ ,  $p \leq 0,01$ ), if the pre-school teacher is overly self-persistent and has low levels of stress resistance, «to save emotions» outside of their professional sphere – in communication with relatives and loved ones. Thus, the teachers, who restrain his emotions at work in dealing with the pupils and colleagues, often either «breaks» at home with loved ones, showing aggression and inflammation, or, conversely, closes, becomes silent and excessively restrained;
- Between «reduction of professional responsibilities» and general self-regulation ( $r=0,607$ ,  $p \leq 0,01$ ), self-control ( $r=$

0,551,  $p \leq 0,01$ ) anxiety ( $r = 0,449$ ,  $p \leq 0,01$ ) and stress resistance ( $r = 0,631$ ,  $p \leq 0,01$ ), that is, the higher the level of control in the pre-school of his behavior, the higher the level of anxiety and the lower the level of stress resistance, the higher his desire to reduce and ease his professional responsibilities;

- Between «emotional deficit» and persistence ( $r = 0,824$ ,  $p \leq 0,01$ ) and stress resistance ( $r = 0,522$ ,  $p \leq 0,01$ ) the more persistent the educator is to himself and the lower his stress level, the higher the risk depersonalization (the pre-school increasingly shows positive emotions, and more often – negative ones), the person becomes more harsh, rude, irritable and so on;
- Between «estranged estrangement» and self-control ( $r = 0,318$ ,  $p \leq 0,05$ ), the more the caregiver controls his own emotions and his behavior, the more he excludes emotions from his own professional activity;
- Between «personal alienation» and perseverance ( $r = 0,463$ ,  $p \leq 0,01$ ), the more persistent the teacher is, the less interesting the pedagogical activity becomes to him, he ceases to be fun and less social for the educator's value;
- Between «psychosomatic and psycho-vegetative disorders» and persistence ( $r = 0,482$ ,  $p \leq 0,01$ ), which means that the more a caregiver demands from himself, the higher his risk of psychomatic and psycho-vegetative disorders;

Summarizing all of the above, it can be argued that there is indeed a relationship between the level of willful self-regulation of the teacher's personality, his anxiety and stress resistance, and the level of emotional burnout, that is, the more anxious specialist who is excessively trying to restrain his own emotions (high levels of volitional self-regulation) with an insufficient level of stress resistance, the higher his risk of forming most of the symptoms of emotional burnout.

The results of the control phase of the study led to the development and implementation of preventive measures aimed at preventing the emotional burnout of caregivers. But before describing a prophylactic program and presenting the results of its testing, it is necessary to consider the concept of «emotional burnout» and to reveal the main causes of its development, stages of formation, symptoms of manifestation.

The first stage research study of this phenomenon was conducted in 1974. It was this year that the term «burnout» was introduced by the American psychiatrist H. Freudenberg. (1) The term was used by the researcher to characterize the psychological state of fatigue, exhaustion with a sense of self-need for healthier individuals who are in intense and close communication with others in an emotionally charged atmosphere. H. Freudenberg, who at the beginning of his research used the term «emotional burning», under the term «emotional burnout» understood the complex of certain psychological problems that arise in a specialist in connection with his professional activity. (2)

The most famous definition of «emotional burnout» was given by K. Maslach, who understood it as a syndrome of emotional exhaustion, depersonalization and personal achievement, which may occur first of all among specialists engaged in various types of assisting professions. (2) B. Perlman and B. Hartman are interpreted as burnout in response to chronic emotional distress, which includes the following three components: emotional and/or physical exhaustion; decrease in working productivity; depersonalization (or dehumanization) of interpersonal relationships. (3) Among modern scholars involved in the study of this phenomenon, it is worth mentioning A. Lange. He calls emotional burnout a state of exhaustion that leads to paralysis of forces, feelings and is accompanied by loss of joy in relation to life. (4)

Emotional burnout of a professional as a result of stress and exhaustion at work has a methodological basis of stress, the first reference to which is dated back to 1944. (5) Thus, it can be argued that the source of the concept of «emotional burnout» is stress, or rather, occupational stress. This term has become widespread thanks to the works of G. Selye (6), which stressed all the cases of disadaptation or negative changes in human life

and R. Lazarus (7), according to which psychological stress should be considered as a complex reaction of a person to the peculiarities of interaction between personality and personality the surrounding reality.

The classical course of stress as a dynamic phenomenon has a three-phase structure. Thus, the researchers distinguish three main phases (or stages) of the development of a stressful condition in humans: rising tensions; inherent stress; reduction of internal tension. (8) H. Sellier (9) distinguished the following three stages of stress: the phase of shock (the stage of anxiety or mobilization, during which the level of resistance of the organism initially decreases), the phase of resistance (there is an activation of the protective mechanisms) and the phase of exhaustion (manifests the inability of the protective mechanisms and increases the disturbance of the weather). Among the many reasons that can cause stress in the work of J. Luria and A. Torgman (10) are the lack of positive personality traits, such as diversity, independence, and initiative.

There is also a widespread view in the scientific literature (A. Shirome (11) and E. Grunfeld (6)) that burnout in the workplace is a separate aspect of stress as a result of being defined and investigated as a response to a chronic working stress, with the focus on interpersonal relationships. In this case, the components of emotional burnout according to scientists (emotional exhaustion, depersonalization, and reduction of personal achievements) are the result of various work stressors that exceed the adaptive capacity of a human to overcome stress. Here, one should refer to the definition of «professional burnout», which means stress syndrome, a set of symptoms that adversely affect the performance, well-being and interpersonal relationships of the subject of professional activity. (12)

According to B. Perlman and E. Hartman (3), the state of emotional burnout systematically affects all the structural elements of man as a system, namely physiological (physical exhaustion), affective-cognitive (emotional exhaustion and depersonalization) and behavioral (symptomatic types of behavior, diminishing work productivity) areas of the individual. The result of the process of emotional burnout is a system of emotions – emotional exhaustion (experiencing desolation and powerlessness), depersonalization (manifestation of callousness, heartlessness, cynicism and brutality), reduction of personal achievements (understatement of one's own achievements, loss of meaning and desire to invest in one's own personal life), which develops over time and is called emotional burnout syndrome (SEB).

Studies of the phenomenon of emotional burnout are being conducted within a humanistic and cultural approach as a process of transforming the content of one's own consciousness into a subject. Representatives of humanistic psychology such as A. Maslow, K. Rogers, and E. Fromm treat the individual as a unique holistic system capable of self-actualization. The life (existence) of the personality crisis is regarded by them as a set of person's specific experiences of the world and themselves in it as the basic mental reality. This approach sees in emotional burnout not only a threat to the self-actualization of an individual but also identified constructive opportunities for the growth of self-awareness. The difference lies in the level of maladaptive disorders, when their «critical mass» is determined, after which it is possible to speak about a qualitatively new state of the biopsychosocial system of the specialist: assessment of the level of symptoms of a syndrome in the continuum «formed/not formed» or «low/high».

How does each stage of emotional burnout, suggested by A. Lange, manifest itself in caregivers? In light of emotional burnout, caregivers find themselves showing signs of exhaustion when they are experiencing heavy workloads, such as when they need a great deal of exertion to perform their professional duties or some crisis situations arise. In this case, the following symptoms occur: irritability, lack of desire, sleep disorders (or insomnia, or, conversely, excessively long duration of sleep), decreased motivation, feelings of discomfort, and even some depressive symptoms are possible. A. Lange calls this variant of

burnout simple, because it is at the level of reactions, that is, it is the appropriate physiological and psychological reaction of the caregiver to the excessive stress that arises in his personal life and professional sphere. In this case, all the symptoms disappear on their own if the situation that caused the negative emotions and anxiety is complete. That is, with a slight emotional burnout the internal resources of the tutor allow him to replenish his energy and restore strength (sleep, rest, vacation, playing sports, yoga, meditation, etc.).

Within the existential-analytical understanding of emotional burnout and determining the most effective ways of preventing it, scientific research was carried out by A. Lange, who identifies two types of emotional burnout – mild (psychological reaction to excessive stress, but when resolving the symptoms quickly disappear) and chronic, when the same «emotional burnout syndrome» occurs as a result of emotional exhaustion due to overload or too high demands. Exhaustion, according to the scientist, is the cause of impoverishment, formalization of relations and loss of trust in the specialist to himself, which are associated with the decrease in the efficiency of activity. (4)

However, if the specialist does not have time for rest, is constantly in tension, or his internal reserves are devastated and he can't resist the impact of negative mental states (he systematically experiences pressure from management, feels fear and anxiety, thinks that he is being overstated, it's concerned about some issue, difficult situation or unresolved conflict, etc.) – this leads to the development of chronic burnout, that is, we can already talk about the formed CEB. In chronic burnout, according to A. Längle (13), we can say that the CEB goes to the level of disorder. That is, in this case, the caregiver will have the following symptoms: emotional exhaustion, chronic fatigue, weakness, signs of psychosomatic disorders, dehumanization, deterioration of relationships with others, even to complete isolation, reducing the motivation for professional activity and its productivity. That is, chronic burnout is already a syndrome, when the tension becomes constant and the symptoms that were characteristic of the mild form are significantly increased.

It is worth noting that preventive work to prevent the development of syndrome educators is effective in the mildest form of emotional burnout, when the specialist still has the resources to recover. This kind of preventive program «The emotional recovery» was developed by us to prevent the development of syndrome in health care providers and was introduced into work with two groups of specialists (total number of 20 people). «The emotional recovery» is a comprehensive program that includes 4 blocks: diagnostic, training, developmental and correction and monitoring unit of results. The diagnostic unit is a set of diagnostic tools that can be used to comprehensively determine the state of pre-school teachers' emotional burnout. Educational unit is a set of educational activities (roundtables, workshops, seminars, lectures, etc.) aimed at expanding the knowledge of specialists about the features of emotional burnout, the main causes that provoke its development, the symptoms that allow it to be identified in time.

The most valuable, in our opinion, is the development and correction block, which is represented by a complex of training sessions aimed at removing the emotional and psychophysical stress from the caregivers, reducing anxiety, increasing the level of stress resistance, developing self-regulation skills, psycho-emotional state and self-development. Corrective-developmental influence on specialists within the training was carried out mainly by means of art-therapeutic means, namely: art-therapy; bibliotherapy, fairytale therapy; music therapy; mandalotherapy; phototherapy; sand therapy; tissue therapy; makeup therapy; cinema; body art therapy and more. Additionally, metaphorical associative cards (MAC) were used in the work – a projective, diagnostic and stimulating tool, with the help of which the educators' imagination was activated and contact was made with them (they can be used both in individual and in group work). The following classic cards were used: «OH» and «Saga» (M. Egetmeyer), «Semen» (O. Tararina), for the personal

development and self-motivation of the educators, «This is all in me» (A. Kolendo-Smirnova), which allow clearly define the purpose of the work and analyze the internal state of health, etc.

In addition, special psychological games were held at the beginning, middle and end of the class. So, at the beginning of the training, we conducted a transformational psychological game «Crying» (A. Kolendo-Smirnova), which allows us to work with mental pain (loss, grief, insult, disappointment, betrayal, etc.). In the middle of the training sessions, it was suggested that the tutors play a game of «Collisions» (A. Kolendo-Smirnova), which is aimed at resolving interpersonal and intrapersonal conflicts. At the final stage of corrective work, experts were invited to the social-communicative game Complaints-Compliments (I. Doroshenko) in order to improve their communication skills and to train their constructive communication skills.

In order to check the effectiveness of the developed preventive program aimed at preventing the development of CEB caregivers, a re-cut was performed using the «Methodology of diagnostics of the level of emotional burnout» (V. Boyko). To confirm the positive changes in the experimental group, which confirms the effectiveness of preventive work, we performed a statistical analysis of the data using Wilcoxon's T-test. Thus, the results of the statistical analysis showed that the empirical value for all symptoms of emotional burnout is less than the critical value for  $p < 0,05$ , which indicates the presence of significant differences, namely: «experiencing psycho-traumatic circumstances» ( $p = 0,002$ ), «dissatisfaction with oneself» ( $p = 0,001$ ), «caged» ( $p = 0,002$ ), «anxiety and depression» ( $p = 0,002$ ), «inadequate selective emotional response» ( $p = 0,001$ ), «emotional and ethical disorientation» ( $p = 0,002$ ), «Expanding the sphere of saving emotions» ( $p = 0,001$ ), «reducing professional responsibilities» ( $p = 0,002$ ), «emotional deficit» ( $p = 0,001$ ), «Emotional alienation» ( $p = 0,001$ ), «personal alienation (depersonalization)» ( $p = 0,002$ ), «psychosomatic and psycho-autonomic disorders» ( $p = 0,002$ ).

#### 4 Conclusion

Emotional burnout is a dynamic process that occurs in stages and in full accordance with the mechanism of stress development when all three phases of stress are observed: nervous tension, resistance, and exhaustion. Emotional burnout is a complex of psychological and physiological disorders that arise as a result of excessive emotional overload, in particular in the professional activity course, on the other hand, this syndrome can be a mechanism of individual psychological protection, which manifests complete or partial exclusion of emotions in response to traumatic trauma.

The statistical analysis of the data using the Pearson linear correlation coefficient confirmed the hypothesis that there is indeed a relationship between emotional burnout, anxiety, stress resistance, and volitional self-regulation. Thus, it has been found that pre-school teachers who have high levels of anxiety and low levels of resilience experience greater negative impact from various psychotraumatic situations, are more prone to depression and are at risk of falling into a state of intellectual and emotional stupor. And educators who have excessively high demands on themselves with insufficient levels of stress resistance have the risk of depersonalization (the caregiver increasingly shows positive emotions, and more often – negative), they become more harsh, rude, irritable, more likely to respond inappropriately and «to save emotions» outside of their professional sphere – in communication with relatives and loved ones.

Theoretical analysis of the problem and the empirical study of the level of development of emotional burnout of the educators, which showed that almost all specialists are at risk of its formation, conditioned the development and implementation in work with teachers of the complex preventive program «The emotional recovery». The implementation of the program involved the use of the following forms of work: seminars, workshops, roundtables, lectures, individual talks, counseling,

developmental and corrective training, and psychological games. The most valuable in the program was the development and correction unit, represented by the use of various art-therapeutic techniques for the purpose of self-recognition and acceptance by specialists themselves.

The effectiveness of the implemented prevention program was confirmed during the control phase of the study. Thus, after repeated examination of the caregivers of the experimental group, a positive dynamic was observed for all symptoms of emotional burnout. The presence of positive changes in the experimental group was proved by statistical analysis of the data using Wilcoxon's T-test. (the results of the experimental group fall into the area of significance:  $T_{\text{exp}} < T_{\text{kr}}$  (0.05), which makes it possible to use the developed prophylactic program in working with caregivers to prevent the development of CEB.

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**Primary Paper Section:** A

**Secondary Paper Section:** AM, AN, AQ

## **B PHYSICS AND MATHEMATICS**

BA	GENERAL MATHEMATICS
BB	APPLIED STATISTICS, OPERATIONAL RESEARCH
BC	THEORY AND MANAGEMENT SYSTEMS
BD	INFORMATION THEORY
BE	THEORETICAL PHYSICS
BF	ELEMENTARY PARTICLE THEORY AND HIGH ENERGY PHYSICS
BG	NUCLEAR, ATOMIC AND MOLECULAR PHYSICS, ACCELERATORS
BH	OPTICS, MASERS AND LASERS
BI	ACOUSTICS AND OSCILLATION
BJ	THERMODYNAMICS
BK	LIQUID MECHANICS
BL	PLASMA PHYSICS AND DISCHARGE THROUGH GASES
BM	SOLID-STATE PHYSICS AND MAGNETISM
BN	ASTRONOMY AND CELESTIAL MECHANICS, ASTROPHYSICS
BO	BIOPHYSICS



## CONSERVATION LAWS FOR TWO DIMENSIONAL HIROTA-MAXWELL-BLOCH SYSTEMS

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Abstract: In this paper, we consider the two-dimensional Hirota-Maxwell-Bloch equation. Lax pairs are presented for this equation, conservation laws are obtained for the two-dimensional Hirota-Maxwell-Bloch equations.

Keywords: Hirota and Maxwell-Bloch equations, Lax representation, integrability, conservation laws.

### 1 Introduction

Modern nonlinear science as a powerful subject explains all kinds of secrets in the problems of modern technology and science. The non-linear nature of real systems is considered fundamental to understanding most natural phenomena. Integrable systems are the main part of the theory of modern nonlinear science. One of the interesting integrable systems is the so-called one-dimensional Hirota-Maxwell-Bloch equations (HMBE). They describe the nonlinear dynamics of the propagation of a femtosecond pulse through a doped fiber. In this article, we will consider one of the two-dimensional integrable generalizations of one-dimensional HMBE, namely, two-dimensional HMBE. We note that many nonlinear partial differential equations (PDEs) admit an infinite number of conservation laws. Although most do not have a physical interpretation, these conservation laws play an important role in creating the complete integrability of PDEs.

### 2 Materials and Methods

The nonlinear Schrödinger equation is widely used in various fields of physics, for example, in nonlinear optics, plasma physics, superconductivity theory, and low-temperature physics. The structure of (1+1)-dimensional nonlinear Schrödinger equations is now very well studied. However, much is still not known about the properties of multidimensional nonlinear evolution equations.

Nonlinear equations have been the subject of research in various fields of nonlinear sciences. Nonlinear equations are often used to describe many problems in physics (heat flux and wave propagation phenomena), protein chemistry, quantum mechanics, plasma physics, wave propagation in shallow water, optical fibers, fluid mechanics, biology, solid-state physics, chemical kinematics, etc. It is widely known that the study of integrability and finding exact solutions of nonlinear equations are always one of the interesting topics in physics and mathematics. Over the past decade, the theory of various solutions has evolved in many different directions. Various nonlinear solutions, such as positons, solitons, and dromions, are presented for nonlinear integrable equations. Along with the development of the soliton theory, various powerful methods for working with nonlinear equations were developed, such as the inverse scattering transform [1], the Hirota bilinear method, and others. The theory of nonlinear partial differential equations has attracted much attention from researchers and is fundamentally connected with some major developments in the field of soliton

theory. By a partial differential equation is meant an equation for a function of two or more variables containing at least one partial derivative of this function. Moreover, the function itself and independent variables may not be included in the equation explicitly. Any partial differential equation has an infinite number of solutions. Of greatest interest are solutions that satisfy the additional condition. These conditions are called boundary conditions and consist in specifying the behavior of the solution on some boundary line (surface) or in its immediate vicinity. From this point of view, the initial conditions are boundary conditions in time. Boundary conditions are used to select a particular solution from an infinite number of solutions. Almost any problem that describes a physical process and formulated in terms of partial differential equations includes boundary conditions.

### 2.1 Two-dimensional Hirota-Maxwell-Bloch equation and its reduction

One of the interesting integrable system is the so-called (1+1)-dimensional Hirota-Maxwell-Bloch system. It describes the nonlinear dynamics of femtosecond pulse propagation through doped fibre.

The two-dimensional Hirota-Maxwell-Bloch equations have the following form, (1-2)

$$iq_t + \varepsilon_1 q_{xy} + i\varepsilon_2 q_{xy} - vq + i(wq)_x - 2ip = 0, \quad (1)$$

$$v_x + 2\varepsilon_1 \delta(|q|^2)_y - 2i\varepsilon_2 \delta(q_{xy}^* q - q^* q_{xy}) = 0, \quad (2)$$

$$w_x - 2\varepsilon_2 \delta(|q|^2)_y = 0, \quad (3)$$

$$p_x - 2i\omega p - 2\eta q = 0, \quad (4)$$

$$\eta_x + \delta(q^* p + p^* q) = 0, \quad (5)$$

where  $q, p$  - complex functions,  $v, w, \eta$  - real-valued function.  $\varepsilon_1, \varepsilon_2, \delta, \omega$  - real constants and  $\delta = \pm 1$ . The symbol \* denotes complex pairing. This system is integrated by the inverse scattering method and admits the following integrable reductions: (2,3)

**Case 1:**  $\varepsilon_1 = 1, \varepsilon_2 = 0$

$$iq_t + q_{xy} - vq - 2ip = 0, \quad (6)$$

$$v_x + 2\delta(|q|^2)_y = 0, \quad (7)$$

$$p_x - 2i\omega p - 2\eta q = 0, \quad (8)$$

$$\eta_x + \delta(q^* p + p^* q) = 0, \quad (9)$$

We obtain the (2+1)-dimensional Schrödinger-Maxwell-Bloch equations when  $\varepsilon_1 = 1, \varepsilon_2 = 0$  (2,4)

**Case 2:**  $\varepsilon_1 = 0, \varepsilon_2 = 1$

In this case, when  $\varepsilon_1 = 0, \varepsilon_2 = 1$  we get (2+1)-dimensional complex modified Korteweg-de-Frieze-Maxwell-Bloch equations: (2,5)

$$iq_t + iq_{xy} - vq + i(wq)_x - 2ip = 0, \quad (10)$$

$$v_x - 2i\delta(q_{xy}^* q - q^* q_{xy}) = 0, \quad (11)$$

$$w_x - 2\delta(|q|^2)_y = 0, \quad (12)$$

$$p_x - 2i\omega p - 2\eta q = 0, \quad (13)$$

$$\eta_x + \delta(q^* p + p^* q) = 0, \quad (14)$$

**Case 3:**  $\varepsilon_1 = 1, \varepsilon_2 = 1, p = 0, \eta = 0$

In the third case, when  $\varepsilon_1 = 1, \varepsilon_2 = 1, p = 0, \eta = 0$  we get two-dimensional Hirota equations: (2,6)

$$iq_t + q_{xy} + iq_{xy} - vq + i(wq)_x = 0, \quad (15)$$

$$v_x + 2\delta(|q|^2)_y - 2i\delta(q_{xy}^* q - q^* q_{xy}) = 0, \quad (16)$$

$$w_x - 2\varepsilon_2 \delta(|q|^2)_y = 0, \quad (17)$$

In this paper, our goal is to find conservation laws for the two-dimensional Hirota-Maxwell-Bloch equations through the Lax representation.

### 3 Results and Discussion

#### 3.1 Lax representation

The corresponding Lax representation is given as

$$\Psi_x = A\Psi, \quad (18)$$

$$\Psi_t = (2\varepsilon_1 \lambda + 4\varepsilon_2 \lambda^2)\Psi_y + B\Psi, \quad (19)$$

where  $A$  and  $B$  have the following form

$$A = -i\lambda\sigma_3 + A_0, \quad (20)$$

$$B = \lambda B_1 + B_0 + \frac{i}{\lambda + \omega} B_{-1}. \quad (21)$$

Here

$$B_1 = iw\sigma_3 + 2i\varepsilon_2 \sigma_3 A_{0y}, \quad (22)$$

$$A_0 = \begin{pmatrix} 0 & q \\ -r & 0 \end{pmatrix}, \quad (23)$$

$$B_0 = \frac{i}{2} v\sigma_3 + \begin{pmatrix} 0 & i\varepsilon_1 q_y - \varepsilon_2 q_{xy} - wq \\ i\varepsilon_1 r_y + \varepsilon_2 r_{xy} + wr & 0 \end{pmatrix}, \quad (24)$$

$$B_{-1} = \begin{pmatrix} \eta & -p \\ -k & -\eta \end{pmatrix} \quad (25)$$

and  $r = \delta q^*$ ,  $k = \delta p^*$ , as well as  $\delta = \pm 1$ . The spectral parameter  $\lambda$  is detected as

$$\lambda_t = (2\varepsilon_1 \lambda + 4\varepsilon_2 \lambda^2)\lambda_y. \quad (26)$$

In this article, we restrict ourselves to the case  $\delta = +1$  that corresponds to the attractive interaction. We note that by  $y = x$  system (1)-(5) turns into one-dimensional HMBE. (7) This fact explains why we called system (1)-(5) two-dimensional HMBE.

#### 4 Conservation laws

Knowing the laws of the action of forces on a system of particles and the state of a system of particles (coordinates and velocities of all particles) at a certain initial moment of time, it is possible to predict its further behavior using the equations of motion, that is, to find the state of the system at any moment in time. However, a detailed consideration of the behavior of the system using the equations of motion is often associated with great mathematical difficulties. And in those cases when the laws of action of forces are unknown, this approach is in principle impracticable. Therefore, the question arises: are there any general principles that would allow a different approach to solving the problem?

It turns out there are such principles. These are conservation laws. Conservation laws allow us to consider the general properties of motion without solving the equations of motion and detailed information on the development of processes in time. Conservation laws were established empirically, as a generalization of a huge number of experimental facts. In mechanics, three conservation laws matter: the conservation of energy, the conservation of momentum, the conservation of

angular momentum. These laws are among those fundamental principles of physics, the importance of which is difficult to overestimate. Their role especially increased after it became clear that they go far beyond the framework of mechanics and represent universal laws of nature. In any case, still, not a single phenomenon has been discovered where these laws were violated.

Having opened up the possibility of a different approach to the consideration of various mechanical phenomena, conservation laws have become a powerful and effective research tool that physicists use every day. This crucial role of conservation laws as a research tool is due to the following reasons.

Conservation laws do not depend on the trajectories of movement, nor the nature of the acting forces. Therefore, they allow one to obtain some general and essential conclusions about the properties of various mechanical processes without going into a detailed discussion of them using the equations of motion.

Since conservation laws do not depend on the nature of the acting forces, they can be used even when the forces are unknown. In these cases, conservation laws are the only and indispensable research tool.

Even in cases where the forces are exactly known, conservation laws should be used in solving many problems of particle motion. Although all these problems can be solved using the equations of motion, the use of conservation laws very often allows us to obtain a solution most simply, saving us from tedious mathematical calculations. Therefore, when solving new problems, it is usually customary to adhere to the following order: first of all, the conservation laws are applied, and only after making sure that this is not enough, the equations of motion are used to solve the problem.

Conservation laws are certain laws according to which some physical quantities are preserved without changing with time in certain interactions. Conservation laws play an important role in understanding the mechanisms of interaction of particles, their formation, and decay. Conservation laws determine the selection rules, according to which processes with particles leading to violation of conservation laws can occur in certain types of interactions. In addition to the conservation laws in force in the macrocosm, new conservation laws have been discovered in the physics of the microworld that explain the observed experimental laws. (8-10)

Some of the conservation laws are always satisfied under any conditions (for example, the laws of conservation of energy, momentum, angular momentum, electric charge) or, in any case, processes that contradict these laws have never been observed. (11) Other laws are approximate and valid only under certain conditions (for example, the law of conservation of parity is valid for strong and electromagnetic interactions, but is violated with weak interactions).

Conservation laws are the result of a generalization of experimental observations. Some of them were discovered as a result of the fact that the reactions or decays allowed by all previously known conservation laws were not observed or were strongly suppressed. So, the laws of conservation of baryonic, lepton charges, strangeness, charm, and others were discovered.

Conservation laws can be considered as one of the integrable properties for nonlinear evolution equations. (12-15) Recently, several methods have been proposed for deriving conservation laws, for example, through the Lax representation, (16) the Bäcklund transform, (17) formal solutions of the eigenfunctions, (17-18) the scattering problem, (16-17) and the quasi-differential operator based on the theory Sato. (19-20)

Now we find the conservation laws for the system (1)-(5). From  $\Gamma = \Psi_2 \Psi_1$  and  $w = iq\Gamma$  (21) Riccati type equation can be obtained through the Lax representation (18):

$$\bar{w}_x - \frac{q_x}{q} \bar{w} + i|q|^2 - 2i\lambda \bar{w} - i\bar{w}^2 = 0. \quad (27)$$

We rewrite  $\bar{w}$  into the form of formal power series in regard to  $1/\lambda$ ,

$$\bar{w} = \sum_{n=1}^{\infty} \frac{\bar{w}_n}{\lambda^n}. \quad (28)$$

Substituting series (28) into the Riccati equation (27) and equating the expressions with the same powers  $\lambda$ , we obtain:

$$\bar{w}_1 = \frac{1}{2}|q|^2, \quad (29)$$

$$\bar{w}_2 = -\frac{i}{4}qq_x^*, \quad (30)$$

$$\bar{w}_3 = -\frac{1}{8}(|q|^4 + qq_{xx}^*) \quad (31)$$

Substituting the above expressions into the compatibility

condition  $\begin{pmatrix} \Psi_{tx} \\ \Psi_x \end{pmatrix} = \begin{pmatrix} \Psi_{tx} \\ \Psi_x \end{pmatrix}$ , we obtain an infinite number of conservation laws for the system (1)-(5):

$$\frac{\partial \rho_i}{\partial t} = \frac{\partial J_i}{\partial x}, \quad i = 1, 2, 3, \dots \quad (32)$$

In accordance with (12,21-22),  $\rho_i$  and  $J_i$  ( $i = 1, 2, \dots$ ) are the conserved densities and fluxes, respectively. The first three conservation laws that describe energy, momentum, and the Hamiltonian have the following form:

$$\rho_1 = -\frac{i}{2}|q|^2, \quad (33)$$

$$\rho_2 = -\frac{i}{2}w|q|^2 - \frac{1}{4}qq_x^*, \quad (34)$$

$$\rho_3 = -\frac{i}{8}|q|^4 - \frac{1}{4}wqq_x^* - \frac{i}{8}qq_{xx}^*. \quad (35)$$

In deriving (33)-(35), we did not use (19); therefore, these expressions coincide for any equations solvable by (18).

$$J_1 = 8i\omega^3 \eta q + 4\omega^2 pq^* + 2i\omega pq_x^* - pq^*|q|^2 - pq_{xx}^*, \quad (36)$$

$$J_2 = 4i\omega^3 \varepsilon_2 qq_x^* + 4w^3 \varepsilon_1 q_x q^* + 4i\omega^3 \varepsilon_2 q_{xx} q^* + 4i\omega^3 w|q|^2 - 4\omega^2 pq^* - 2i\omega pq_x^* + pq^*|q|^2 + pq_{xx}^*, \quad (37)$$

$$J_3 = 2w^3 \varepsilon_2 q_{xx} q_x^* - 2w^2 \varepsilon_2 |q|^4 - 2w^2 \varepsilon_2 qq_{xx}^* - 2iw^2 \varepsilon_1 q_x q_x^* + 2\omega^2 wqq_x^* + 2i\omega pq_x^* - pq^*|q|^2 - pq_{xx}^*. \quad (38)$$

#### 4 Conclusion

The Hirota and Maxwell-Bloch equations are well-known partial differential equations that provide a successful model in nonlinear optical theory. In this paper, for the first time, conservation laws were found for the two-dimensional Hirota-Maxwell-Bloch equations with the corresponding Lax representation, which play an important role in creating complete integrability of the PDE.

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**Primary Paper Section: B**

**Secondary Paper Section: BA**

## MAXIMUM PERMISSIBLE ESTIMATES IN THE PROBLEM OF PARAMETRIC IDENTIFICATION OF THE EXTENDED COBB-DOUGLAS FUNCTION

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Abstract: Cobb-Douglas production functions are one of the most popular instruments for analyzing the relationship between the factors of production-economic activity. Their construction is traditionally performed using mathematical-statistical methods. To a great extent, the problems of identifying models of this type are related to a priori uncertainty of the available data, in particular, their inaccuracy and insufficient depth of presentation. The present paper describes the developed method for the parametric identification of the extended Cobb-Douglas production function, which neutralizes these types of uncertainty and is based on using Kantorovich's idea for calculating interval estimates of the sought-for parameters.

Keywords: : extended Cobb-Douglas function, parametric identification, maximum permissible estimates of parameters, uncertainty region.

### 1 Introduction

Cobb-Douglas production functions are actively used in research to establish a relationship between the resulting indicators of production activity ( $Y$ ) and the exogenous factors influencing them ( $K$  is capital and  $L$  is labor): (1-2)

$$Y = AK^\alpha L^{1-\alpha} \quad (1)$$

Due to the transparency of interpretation of its parameters, the classical Cobb-Douglas function (1) is widely used in research practice. (3-4) At the same time, there is also a great desire to increase the application scope of this tool of applied analysis by including more factors (3,5) in the model (1). However, for a number of objective reasons, extended Cobb-Douglas functions today remain not a real instrument for studying the relations between production factors, but rather a desirable one.

The main factors restraining the use of extended Cobb-Douglas functions for economic analysis and substantiation of managerial decisions are:

- the scantiness of the available statistical information;
- computational difficulties that arise in the application of mathematical-statistical methods, the main tool for determining estimates of the desired parameters.

In particular, it is well known that, for each exogenous variable, 6-7 data are required to obtain statistically significant estimates of parameters. Therefore, a priori, "short" series of data do not allow obtaining reliable relations, thus limiting the possibility of using mathematical-statistical methods. Moreover, even in the presence of the "long" series of initial data, the use of mathematical-statistical methods does not guarantee to obtain adequate models.

However, there is another objective problem that researchers prefer not to touch upon in practical research, and which, in the author's opinion, deserves serious attention. This problem concerns a priori inaccuracy of the initial data. The data of any observations (both active and passive) contains some errors. On the other hand, statistical data on socio-economic indicators are based on multi-stage procedures for collecting and processing information, as a result of which errors accumulate and can result in significant distortions of the real picture. It is not possible to assess the accuracy of the data obtained due to the lack of reference values and the impossibility of multiple observations under the same conditions.

All of the above necessitates the application of special approaches to the construction of the extended Cobb-Douglas function. Of particular interest in this regard, in the authors' opinion, is the approach, the founder of which is the outstanding

scientist Kantorovich, who for the first time formulated in his work (6) the idea of obtaining exact two-sided boundaries for the parameters of models and regions for the sought-for and observed quantities. A distinctive feature of this approach is that it was a new word in the theory of mathematical processing of experimental data, because it does not require knowledge of the statistical properties of the distribution of measurement errors and allows the determination of the desired parameters considering the requirements that are of interest from the point of view of the researcher.

The ideas, expressed by Kantorovich, laid the foundation for interval analysis, which is being actively developed due to the work of foreign and Russian authors. (7-11) They are also successfully used in certain scientific areas, (12-13) in particular, in solving problems of chemical kinetics. (14-15) In the present work, developing the ideas for obtaining precise two-sided boundaries for model parameters under conditions of the initial data uncertainty, the authors present the method of parametric identification of the extended Cobb-Douglas function based on the use of maximum permissible parameter estimates.

### 2 Materials and Methods

The extended Cobb-Douglas function of the following form will be considered:

$$Y = \alpha_0 \cdot X_1^{\alpha_1} \cdot X_2^{\alpha_2} \cdot \dots \cdot X_n^{\alpha_n} \quad (2)$$

$$\alpha_j \geq 0, \quad j = \overline{0, n},$$

where  $X_1, \dots, X_n$  are exogenous variables of the model,  $Y$  is the endogenous variable,  $\alpha_j, j = \overline{1, n}$  are the parameters that are the elasticity coefficients for the corresponding exogenous factors,  $\alpha_0$  is a parameter characterizing the scale of the economy as a whole.

The initial information is represented by the sets of values:

$$\{X_{1t}, \dots, X_{nt}, Y_t\}, \quad t = \overline{1, m}, \quad (3)$$

which cannot be considered as absolutely precise. Therefore, it can be assumed that the true values of the initial data belong to some, not always a priori known, intervals:

$$X_{jt} \in [\underline{X}_{jt}, \overline{X}_{jt}], \quad Y_t \in [\underline{Y}_t, \overline{Y}_t], \quad t = \overline{1, m}, \quad j = \overline{1, n}. \quad (4)$$

Considering (4), the determination of a single set of parameter values  $\bar{\alpha} = \{\alpha_0, \alpha_1, \dots, \alpha_n\}$  can lead to the fact that an exact solution will be obtained based on a priori inaccurate data. For this reason, it may be more appropriate to search for a region  $\Lambda^*$ , consisting of sets of parameters  $\bar{\alpha} = \{\alpha_0, \alpha_1, \dots, \alpha_n\}$  that ensure acceptable agreement between the experimental and calculated values of the variable  $Y$  from the positions of the introduced optimality criterion. The region  $\Lambda^*$  will be called the region of uncertainty, implying in this case that the term "uncertainty" reflects the fact according to which each point of the region  $\Lambda^*$  can be selected to specify the final form of the model (2).

The region  $\Lambda^*$  may have a complex structure. Therefore, instead of establishing the exact boundaries of this region, the traditional approach can be used based on the consideration of a set approximating the initial region. To do this, for each of the parameters  $\alpha_j$ , a segment is defined:

$$\alpha_j \in [\underline{\alpha}_j, \overline{\alpha}_j], \quad j = \overline{0, n}, \quad (5)$$

consisting of the values  $\alpha_j$ , for each of which there exist some values of other parameters that form the set  $\bar{\alpha} = \{\alpha_0, \alpha_1, \dots, \alpha_n\}$ ;  $\bar{\alpha} \in \Lambda^*$ , whereas for  $\alpha_j \notin [\underline{\alpha}_j, \bar{\alpha}_j] \exists \bar{\alpha} \in \Lambda^*$ .

This interval will be called the uncertainty interval, whereas its boundaries, the maximum permissible estimates of the parameters of the identified dependence (2).

Let us introduce the uncertainty set  $\Lambda$ , given by the direct product of intervals (5):

$$\Lambda = [\underline{\alpha}_0, \bar{\alpha}_0] \times \dots \times [\underline{\alpha}_n, \bar{\alpha}_n]. \tag{6}$$

It is obvious that  $\Lambda^* \subset \Lambda$ , by virtue of which  $\Lambda$  is a set approximating the region  $\Lambda^*$ . The set (5) has a simpler structure compared to the region  $\Lambda^*$ . In this case, the estimate (7) is valid,

with the help of which conclusions can be drawn about the degree of uncertainty in solving the parametric identification problem for the model (2)

$$diam \Lambda^* = diam \Lambda = \max_{j=0,n} (\bar{\alpha}_j - \underline{\alpha}_j). \tag{7}$$

**3 Results and Discussion**

The construction of the extended Cobb-Douglas function was carried out in the context of establishing a connection between the gross domestic product (GDP) of the Russian Federation (RF) and the factors characterizing the cost of labor and the composition of labor resources (Table 1).

Tab. 1: Variables of the Model (2)

Notation of the variable	Name of the indicator
$Y$	GDP (in prices of 2000), billion rubles
$X_1$	The value of fixed assets (in prices of 2000), billion rubles
$X_2$	The average annual number of people employed in the economy, thousand people <ul style="list-style-type: none"> <li>▪ with higher education;</li> <li>▪ with secondary vocational education;</li> <li>▪ with complete secondary education;</li> <li>▪ with basic general education;</li> <li>▪ the remaining employed people (with other categories of education and not having basic general education)</li> </ul>
$X_3$	
$X_4$	
$X_5$	
$X_6$	

The values of the variables  $Y$  and  $X_1$  were reduced to a comparable form using the deflator indices of the physical

volume of GDP and producer prices in the construction industry, respectively (Figure 1). (16)

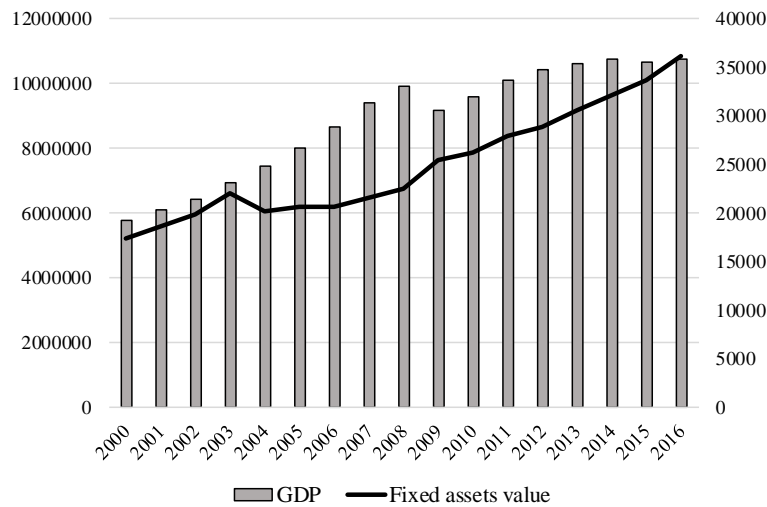


Figure 1: Dynamics of the Cost Indicators of the Model (2)

Data on the average annual number of people employed in the region's economy (Figure 2) were formed based on official statistical sources. (17)

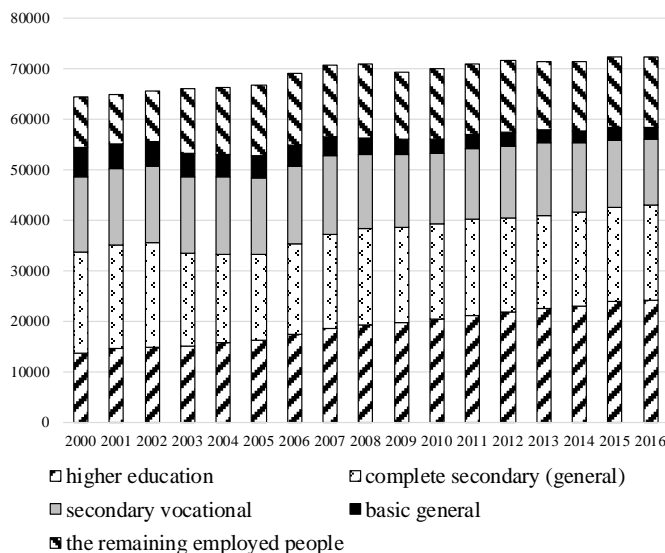


Figure 2: Dynamics of the Average Annual Number of People Employed in the Russian Economy

The parameters of the extended Cobb-Douglas function (2) were determined using the following three-stage procedure.

On the *first stage*, the linearization of the model was carried out:

$$\ln Y = \ln \alpha_0 + \alpha_1 \ln X_1 + \dots + \alpha_6 \ln X_6 \tag{8}$$

$$\alpha_j \geq 0, \quad j = \overline{0,6}.$$

On the *second stage*, the maximum permissible approximation error  $\xi^*$  was calculated – the indicator of the accuracy of the correspondence of the logarithms of the actual ( $Y_t$ ) and the calculated ( $\hat{Y}_t$ ) values of the endogenous variable  $Y$ . The implementation of this stage was carried out based on solving the problem:

$$\xi \rightarrow \min$$

$$|\ln Y_t - \ln \hat{Y}_t| \leq \xi, \quad t = \overline{1,17} \tag{9}$$

$$\alpha_j \geq 0, \quad j = \overline{0,6}.$$

Additionally, the accuracy of the model was estimated based on the average approximation error

$$\bar{A} = \frac{1}{17} \sum_{t=1}^{17} \left| \frac{Y_t - \hat{Y}_t}{Y_t} \right| \cdot 100\%$$

The result of the numerical implementation of the model (9) is the maximum permissible approximation error  $\xi^* = 0.029$  and the point estimates of the parameters  $\alpha_j^*$ ,  $j = \overline{0,6}$ , which allowed writing the model (2) in the form:

$$Y = 1.0 \cdot X_2^{0.820} \cdot X_3^{0.114} \cdot X_4^{0.111} \cdot X_6^{0.604} \tag{10}$$

The average approximation error for model (10) was  $\bar{A} = 1.74\%$ .

In the *third stage*, the maximum permissible estimates were calculated for each of the parameters  $\alpha_j$ ,  $j = \overline{0,n}$  using the models:

$$\alpha_j \rightarrow \min(\max), \quad j = \overline{0,6}$$

$$|\ln Y_t - \ln \hat{Y}_t| \leq \xi^*, \quad t = \overline{1,17}, \tag{11}$$

$$\alpha_j \geq 0, \quad j = \overline{0,6}.$$

As a result, it was found that all maximum permissible estimates coincided with the corresponding point values of the parameters

$$\alpha_j^* : \alpha_j^* = \underline{\alpha}_j = \bar{\alpha}_j, \quad j = \overline{0,6}.$$

Following the assumption of a priori inaccuracy of the initial data, let us pose the problem of determining the value intervals of the parameters  $\alpha_j \in [\underline{\alpha}_j, \bar{\alpha}_j]$ ,  $j = \overline{0,6}$ , which ensure the closeness of the logarithms of the actual and calculated values of the variable  $Y$  at a level not exceeding  $\xi^*(1+\delta)$ . In essence, this means that a quantitative estimate of the degree of sensitivity of the set of values of the model parameters (10) to the change in the maximum permissible approximation error (i.e., to the accuracy variation) by  $100\delta$  percent ( $\delta \geq 0$ ) will be obtained. In this case, additionally, the condition for the maximum discrepancy between the actual and calculated values of the variable  $Y$  will be set at the level of 5%.

For these purposes, it is necessary to solve 14 problems of the following type:

$$\alpha_j \rightarrow \min(\max), \quad j = \overline{0,6}$$

$$|\ln Y_t - \ln \hat{Y}_t| \leq \xi^*(1+\delta), \quad t = \overline{1,17} \tag{12}$$

$$\frac{1}{17} \sum_{t=1}^{17} \left| \frac{Y_t - \hat{Y}_t}{Y_t} \right| \cdot 100 \leq 5$$

$$\alpha_j \geq 0, \quad j = \overline{0,6}.$$

The solution of the problems (12) for  $\delta = 0.02$  showed (Table 2) that the reaction to the expected changes in accuracy was observed to a greater extent for the parameter  $\alpha_0$ . The smallness of the ranges of variation of the parameters  $\alpha_1$  and  $\alpha_5$  is an additional confirmation of the fact that it is not advisable to include the corresponding variables to the Cobb-Douglas production function.

Tab. 2: Investigation of the Sensitivity of the Parameters of the Model (10) to Changes in the Maximum Permissible Approximation Error for  $\delta = 0.02$

Parameter	$\alpha_0$	$\alpha_1$	$\alpha_2$	$\alpha_3$	$\alpha_4$	$\alpha_5$	$\alpha_6$
$[\underline{\alpha}_j^\delta, \overline{\alpha}_j^\delta]$	[1, 1.376]	[0, 0.009]	[0.804, 0.835]	[0.090, 0.150]	[0.089, 0.134]	[0, 0.013]	[0.573, 0.613]

The results obtained allow drawing the following conclusions regarding the expanded Cobb-Douglas production function (10):

- the model (10) is characterized by increasing yield from scale ( $\sum_{j=1}^6 \alpha_j = 1.65$ );
- the factors  $X_2$  and  $X_6$  have the greatest impact on GDP; the factors  $X_3$  and  $X_4$ , to a much lesser extent; the factors  $X_1$  and  $X_5$ , very insignificant impact, as a result of which they are recommended to be excluded from consideration;
- the level of technological productivity (parameter  $\alpha_0$ ) increases the yield from the exogenous factors of the production function.

In order to carry out a comparative analysis of the possibilities of the presented method of parametric identification of the Cobb-Douglas production function and the classical mathematical-statistical approach using the same initial data using the least-

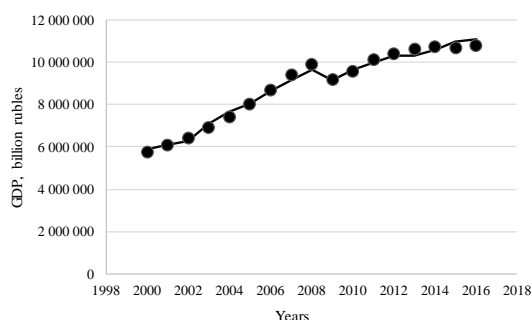
squares method, the authors estimated the parameters of the regression dependence of the form

$$Y = \alpha_0 \cdot X_2^{\alpha_2} \cdot X_3^{\alpha_3} \cdot X_5^{\alpha_5} \cdot X_6^{\alpha_6}$$

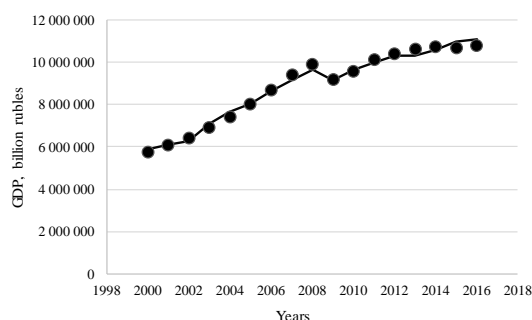
According to the calculation results, the extended Cobb-Douglas function assumed the following form:

$$Y = 0.0000896 \cdot X_2^{0.978} \cdot X_3^{0.378} \cdot X_5^{0.652} \cdot X_6^{0.602} \quad (13)$$

The average approximation error for the model (13) was 1.02%. A comparison of the models (10) and (13) showed that each of them describes with high accuracy the behavior of the endogenous variable (Figure 3). However, the smallness of the parameter  $\alpha_0$ , characterizing the level of technological productivity in the Russian Federation, in the model (13) does not allow considering it adequate even considering the confidence interval for its values ( $\alpha_0 \in [0.00000078, 0.0105]$ ).



a) model (10)



b) model (13)

Figure 3: Graphical Interpretation of the Constructed Cobb-Douglas Functions

#### 4 Conclusion

The paper presents a method for determining the parameters of the extended Cobb-Douglas function. Its distinctive feature is obtaining the interval estimates of values for each parameter being evaluated. For the presented approach, the necessary mathematical bases have been developed, according to which the problem of identifying the extended Cobb-Douglas function is reduced to the successive solving two types of linear programming problems: (9) and (11). Based on the results of the numerical solving of the problem (9), the value of the best approximation of the available data is established – the maximum absolute approximation error; according to the results of solving the problems (11), the maximum permissible estimates of the model parameters are calculated, which specify the ranges of variation of values for each of the parameters and allow estimating the degree of uncertainty of the obtained solution. Also, the procedure is formalized for studying the sensitivity of the obtained solution in the problem of parametric identification for the expected change in the accuracy of the model.

An important specific feature of the presented method is the ability to conduct research for the data that are characterized by the absence of a large number of observations.

The possibilities and advantages of the presented method are demonstrated by the example of a study of the dependence of the GDP of the Russian Federation on the value of fixed assets and the average annual number of people employed in the economy in terms of their education levels based on the data for the years 2000-2016.

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**Primary Paper Section: B**

**Secondary Paper Section: BA, BB**





## **J** INDUSTRY

JA	ELECTRONICS AND OPTOELECTRONICS
JB	SENSORS, DETECTING ELEMENTS, MEASUREMENT AND REGULATION
JC	COMPUTER HARDWARE AND SOFTWARE
JD	USE OF COMPUTERS, ROBOTICS AND ITS APPLICATION
JE	NON-NUCLEAR POWER ENGINEERING, ENERGY CONSUMPTION AND UTILIZATION
JF	NUCLEAR ENERGY
JG	METALLURGY, METAL MATERIALS
JH	CERAMICS, FIRE-PROOF MATERIALS AND GLASS
JI	COMPOSITE MATERIALS
JJ	OTHER MATERIALS
JK	CORROSION AND MATERIAL SURFACES
JL	FATIGUE AND FRACTURE MECHANICS
JM	STRUCTURAL ENGINEERING
JN	CIVIL ENGINEERING
JO	LAND TRANSPORT SYSTEMS AND EQUIPMENT
JP	INDUSTRIAL PROCESSES AND PROCESSING
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JY	FIREARMS, AMMUNITION, EXPLOSIVES, COMBAT VEHICLES

## METHODOLOGICAL FUNDAMENTALS OF A SYSTEM APPROACH IN THE MANAGEMENT OF THE OIL AND GAS INDUSTRY

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**Abstract:** In our time, an unprecedented progress of knowledge is taking place, which, on the one hand, has led to the discovery and accumulation of many new facts, information from various areas of life, and thereby confronted humanity with the need to systematize them, search for the common in the particular, stable in the changing. A clear concept of the system does not exist. In its most general form, a system is understood as a combination of interconnected elements that form certain integrity, a certain unity. The study of objects and phenomena as systems caused the development of a new approach in science - a system approach.

**Keywords:** oil industry, gas industry, management, system approach.

### 1 Introduction

It is known that the term “system” comes from the Greek word “systema” and means a whole, a particular connection made up of parts. Each system is formed from the set of its constituent elements that are in a relationship with each other, forming certain integrity, unity. Following the theory of consistency, the built-in system has such integral qualities and features that are not able to reproduce each element in the system. (1)

In the framework of system theory, system management is understood as a management process that is implemented considering all the relationships between managers, employees, colleagues, customers, suppliers, financiers, the market, society, culture and the environment in the aggregate. System management specialists are skeptical of individual targeted measures since in complex systems this or even greater success can be achieved by resolving and encouraging self-organization (“autopoiesis”). The actions of executives are only one of the many situational factors that exert their influence on subordinates. (2)

Systematic management approaches are a “frontal attack” on a traditional understanding of management. The image of the manager as an authoritarian leader who manages the enterprise with the help of a rigid hierarchy and monopoly of influence is replaced by a focus on autonomous, decentralized, independent and self-organizing subsystems (“fractal factory”). Meanwhile, management has long recommended a partnership management style, the formation of partially autonomous groups, the weakening of control, etc. to avoid the negative consequences of excessive directive management and regulation. All these recommendations are mainly developed on the ideology of “human relations”, which is focused on self-realization, improving the production climate, establishing trusting relationships, etc. and, as a result, increased efficiency. (3)

The systematic approach considers organizations, the industry as systems that under no circumstances can be completely organized “from above”. Some experts deny any possibility of system management. The implementation of the concepts of system theory in the control range is often very difficult since representations and tools of thinking are not linked to an understanding of social reality (causal thinking) and the acquired models of perception that managers follow. Simple explanations are much more attractive than indications of complex and complex “relationships”, which are not so easy to trace. (4-6)

### 2 Materials and Methods

The approach to system management is based on the postulates of new system theory, in particular, the Luman theory. In this case, the main attention is paid to the development of self-organization processes, as well as to the conscious formation of a “substantively organized” order. According to the definition of the Academy of Management and Economics, systematic management involves the definition of framework conditions, as well as the formation and use of appropriate incentives. (7) Leading employees who use a systematic approach, due to their personal qualities and competencies, initiate development processes, improve the structure and communication, which, in turn, has a positive impact on the communication process, removes mental blockages and thereby ensures an effective process of doing work. Systematic management means that the focus is not only on the team and organization but also on individuals. And only when management at the individual level is not enough, should the processes occurring in the team and throughout the organization be considered. Leaders are also seen as an integral part of the system, subject to certain factors. The approach developed by Daniel F. Pinnow proceeds from the fact that the structures and cultures that form in organizations are too complex and are not included in the classical notions of management (and cause-effect relationships). In contrast to such concepts, the theory of social systems is formed on the model of networks of actions, consequences, and consequences with a wide variety of feedback cycles, while it is necessary to consider mechanisms that have the property of self-reinforcement.

Let's define the features of a systematic approach:

A systematic approach is a form of methodological knowledge combined with the study and creation of objects as systems and applies only to systems.

The hierarchy of knowledge, requiring a multi-level study of the subject: the study of the subject itself is an “own” level; the study of the same subject as an element of a wider system - a “higher” level; the study of this subject in relation to the elements making up this subject is a “lower” level.

A systematic approach requires analyzing the problem, not in isolation, but in the unity of relations with the environment, to comprehend the essence of each connection and an individual element, to carry out associations between general and private goals.

Based on the foregoing, we define the concept of a systematic approach:

In our opinion, a systematic approach is an approach to the study of an object (problem, phenomenon, process) as a system in which the elements, internal and external relationships that most affect the investigated results of its functioning are highlighted, and the goals of each of the elements, based on general purpose of the object.

We can also say that a systematic approach is such a trend in the methodology of scientific knowledge and practical activity, which is based on the study of any object as a complex single socio-economic system. (8)

Let's turn to history. Before the formation of the science of management at the beginning of the 20th century, rulers, ministers, generals, builders, making decisions were guided by intuition, experience, and traditions. Acting in specific situations, they sought to find the best solutions. Depending on experience and talent, the manager could expand the spatial and temporal framework of the situation and spontaneously comprehend his control object more or less systematically. Nevertheless, until the XX century, management was dominated by a situational approach, or management according to

circumstances. Accordingly, the determining principle of this approach is the adequacy of the managerial decision in a relatively specific situation. Adequate in this situation is the decision that is best from changing the situation, immediately after exerting appropriate managerial influence on it.

Thus, the situational approach is the focus on the nearest positive result (“and then we will see ...”). It is thought that “further” again there will be a search for a better solution in the situation that will arise. But the solution at the moment is the best, it may turn out to be completely different as soon as the situation changes or in it, unaccounted circumstances are discovered. (9-10)

The desire to respond to each new turn or turn (change of vision) of the situation in an adequate way will lead to the fact that the manager is forced to take more and more new decisions that are contrary to the previous ones. He ceases to control events and floats along their course.

The foregoing does not mean that management in circumstances is inefficient in principle. A situational approach to decision-making is needed and justified when the situation itself is extraordinary and the use of previous experience is risky when the situation changes quickly and unpredictably when there is no time to consider all circumstances. (11) So, for example, rescuers of the Ministry of Emergencies often happen to look for the best solution precisely in the context of a specific situation. Nevertheless, in the general case, the situational approach is not effective enough and must be overcome, replaced or supplemented by a systematic approach.

Next, we consider the basic principles of a systems approach (system analysis):

1. *Integrity*, allowing us to simultaneously consider the system as a single whole and at the same time as a subsystem for higher levels.
2. *The hierarchical structure*, i.e. the presence of a plurality of (at least two) elements located based on the subordination of lower-level elements to higher-level elements. The implementation of this principle is visible in the example of each specific organization. As you know, any organization is an interaction of two subsystems: managing and managed. One obeys the other.
3. *Structuring*, allowing to analyze the components of the system and their relationships within a specific organizational structure. As a rule, the process of functioning of a system is determined not so much by the properties of its elements as by the properties of the structure itself.
4. *Multiplicity*, allowing the use of many cybernetic, economic and mathematical models to describe individual elements and the system as a whole.

The systematic approach as a general methodical principle is applied in various branches of science and human activities. The epistemological basis (epistemology is a branch of philosophy, the forms and methods of scientific cognition are comprehended) is the general theory of systems, the beginning of which was laid by the Australian biologist L. Bertalanffy. In the early 1920s, the young biologist Ludwig von Bertalanffy began to study organisms as defined systems, summarizing his view in the book “Modern Theory of Development” (1929). In this book, he developed a systems approach to the study of biological organisms. In the book “Robots, Men and Minds” (1967), he transferred the general theory of systems to the analysis of processes and phenomena of social life. 1969 – “General System Theory”. L. Bertalanffy is turning his system theory into a disciplinary science. He saw the purpose of this science in the search for the structural similarity of laws established in various disciplines, from which general systematic laws can be deduced.

Thus, system management is based on the concept of the behavior of senior employees, which operates considering the structural and cultural aspects of management. At the same time, it is important that systemic thinking expands and complements

the arsenal of tools used by the management team, and does not replace them. Also, system management focuses on the humanistic values of organizational formation, the concepts of system theory, the concept of constructivism and system consultation, as well as the concepts of enterprise economics and organization theory.

Let me remind you that the systems theory was developed by Ludwig von Bertalanffy in the XX century. Systems theory deals with the analysis, design, and operation of systems - independent business units, which are formed by interacting, interconnected and interdependent parts. It is clear that any organizational form of business meets these criteria and can be studied using the concepts and tools of systems theory.

The value of a systematic approach is that managers can easily coordinate their specific work with the work of the organization as a whole if they understand the system and their role in it. This is especially important for the CEO because a systematic approach stimulates him to maintain the necessary balance between the needs of individual departments and the goals of the entire organization. It makes him think about the flow of information passing through the entire system, and also focuses on the importance of communications. A systematic approach aims to establish the reasons for making ineffective decisions; it also provides tools and techniques to improve planning and control. A modern leader should have systemic thinking, as:

- the manager must perceive, process and systematize the huge amount of information and knowledge that is necessary for making management decisions;
- the leader needs a systematic methodology with which he could compare one area of his organization’s activities with another, not allow quasi-optimization of managerial decisions;
- the manager must see the forest behind the trees, the private behind the general, rise above everyday life and realize what place his organization occupies in the external environment, how it interacts with another, larger system, of which it is a part;
- a systematic approach to management allows the leader to more productively implement his main functions such as forecasting, planning, organization, management, control.

Systemic thinking not only contributed to the development of new ideas about the organization (in particular, special attention was paid to the integrated nature of the enterprise, as well as the paramount importance and importance of information systems), but also provided the development of useful mathematical tools and techniques that greatly facilitate the adoption of managerial decisions, the use of more advanced planning and control systems. (12-13) Thus, the systematic approach allows us to comprehensively evaluate any production and business activities and the activities of the management system at the level of specific characteristics. This will help to analyze each situation within a single system, to reveal the nature of the problems of entry, process, and exit. The application of a systematic approach allows you to best organize the decision-making process at all levels in the management system.

Despite all the positive results, systemic thinking has not yet fulfilled its most important purpose. The assertion that it will allow the use of a modern scientific method for management has not yet been realized. This is partly because large-scale systems are very complex. It is not easy to understand the many ways in which the external environment affects the internal organization. The interaction of many subsystems within an enterprise is not fully understood. It is very difficult to establish the boundaries of systems; too broad a definition will lead to the accumulation of expensive and unsuitable data and too narrow - to a partial solution of problems. (14) It will not be easy to formulate the questions that will arise for the enterprise, to enter with accuracy the information necessary in the future. Even if the best and most logical solution is found, it may be impossible. Nevertheless, a systematic approach makes it possible to better understand how the enterprise and the industry as a whole work.

The oil industry is an independent component of the fuel and energy complex. It has its characteristics, specific technical base, and organization of production, development and placement conditions. The industry forms a whole chain of production processes that are organically interconnected and encompass the entire oil and gas economy, starting with the search, exploration, and preparation of oil and gas fields, including their rational development, ending with the production of an extensive assortment of products that are most valuable to the national economy. (15-16)

According to confirmed oil reserves, Kazakhstan is among the 15 leading countries of the world. These figures are enough to boldly and confidently say that Kazakhstan has an oil future. The question is only one thing - the wise use of the wealth of Kazakhstan and a prudent attitude to its natural and human potential. This task can and should be solved by the state through a whole system of methods and levers of influence available to it.

The oil and gas industry of the Republic of Kazakhstan is divided into four sub-sectors according to industrial specialization such as oil-producing, oil refining, gas production, and gas refining. They are mutually intertwined and complement each other in the process of extraction and processing.

In general, the oil industry includes three levels:

- *first level* - organization of the oil industry;
- *second level* - the infrastructure of the oil industry, i.e. institutions involved in the creation of conditions for the functioning of the main production. This category should include scientific organizations, executive bodies in this industry, associations coordinating the activities of oil industry entities;
- *third level* - business entities belonging to other industries for which oil is only a sphere of economic interests. This group should include educational institutions that produce specialists, oil industry workers, oil-oriented media, various enterprises for the production, repair, and maintenance of oil equipment. (17)

We believe that the management system in the oil and gas industry is based on the following principles:

- systematic relationships and relationships of all elements of the management system;
- purposefulness;
- the validity and objectivity of decisions;
- stability and continuity in time and space;
- an adequate and optimal response to the impact of internal factors and environmental factors;

- responsibility of both system managers and performers of the innovation process.

The methodology for the formation of control systems in the oil and gas industry involves the following steps:

- identify and formulate objectively necessary goals, objectives and management functions;
- determine, based on scientific research and calculations, the necessary management operations, volumes and flows of information;
- substantiate technologies and technical means for performing management functions;
- determine the volume of necessary investments in the formation and technical equipment of the management system;
- substantiate the professional composition of a specific governing body and its units;
- determine the complexity of the management functions and the number of staffs.

Based on a systematic approach, it is possible to determine a three-level management system in the oil and gas industry: at the macro, meso, and micro levels and we offer an author's interpretation of the concept of "management system".

The management system in the oil and gas industry at the macro level is the targeted action by the state to develop and implement state policy to form the organizational, economic and legal mechanism for the functioning of the oil and gas sector.

The management system in the oil and gas industry at the mesoscale is the targeted actions of local authorities to develop and implement regional and municipal programs aimed at improving the oil and gas production, technology of operation and management, considering the achievements of scientific and technical progress and the demands of the regional market.

### 3 Results and Discussion

The organizational and economic mechanism for the development of the oil industry is a system of conditions that, on the one hand, carry out administrative and legal, and on the other, economic regulation of the oil industry. In accordance with this, the action of this mechanism should be aimed at creating an optimal structure for managing enterprises in the industry, streamlining the legislative framework and improving the regulatory framework, information support in this area, as well as stimulating the economic and social activity of various elements and subsystems in the oil industry (in accordance with Figure 1).

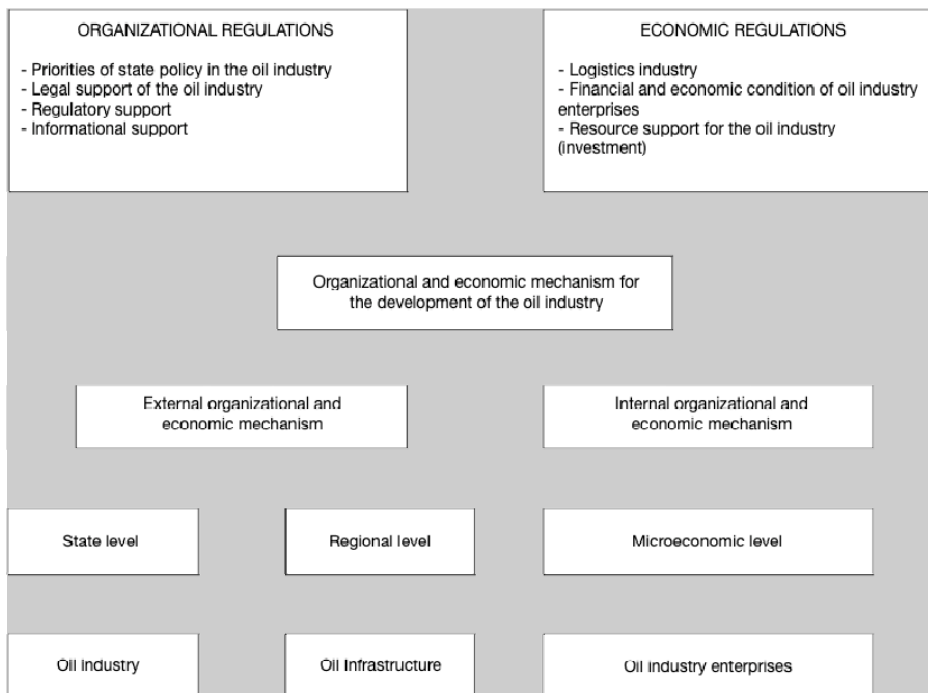


Figure 1. Structure of the Organizational and Economic Mechanism of the Oil Industry

The control system in the oil and gas industry at the macro- and mesoscale suggests some subsystems that ensure its effective

functioning (Figure 2). Malfunctioning in one part of the system causes difficulties in its other parts.

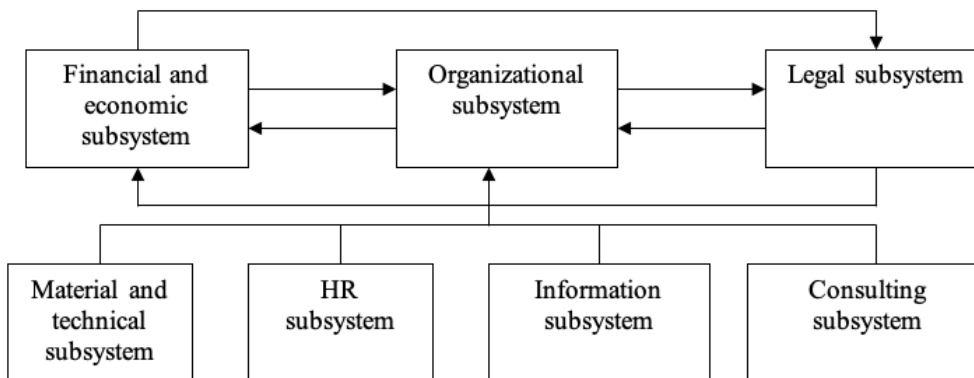


Figure 2. Management System Structure in the Oil and Gas Industry

The implementation of a systematic approach to management is ensured by comprehensive target programs, which reflect in detail and work out not only the targets but also the relevant organizational, resource, methodological measures aimed at implementing the necessary conditions for achieving the ultimate goal.

The management system in the oil and gas industry at the micro-level is the targeted action of oil and gas producing and refining enterprises to form a fixed set of elements that are functionally interconnected with respect to setting goals, reproducing processes and achieving the specific greatest result with minimal cost of resources in cost terms over a certain period of time.

So, in his scientific work, R.V. Ivanov (18) offers a comprehensive oil and gas industry enterprise management system based on a combination of functional and process-oriented approaches. Particular attention is paid to the difficult conditions of implementation, which are due to the complex scheme of technological processes and the important role of

auxiliary industries, interacting not only with the main industries but also among themselves. Such intra-organizational interactions are reflected in the redistribution of resources between the links in the value chain of manufactured products and, accordingly, should be considered when introducing management control tools (Figure 3).

R.V. Ivanov (20) a result of the analysis of the existing elements of the management control subsystems at the enterprises of the oil and gas industry, on the one hand, determines aspects of the implementation of process-oriented management control tools, on the other hand, determines the procedure for implementing an integrated management system at oil and gas enterprises, and also expresses the basic requirements for organizing this the process:

- firstly, the application of the process approach in management at an enterprise in the oil and gas industry should be focused on technological processes, which are divided into main and auxiliary. It is these processes that

participate in the chain of creation of a marketable product and form its value. Their management will allow controlling the achievement of some general goals of enterprises: the implementation of the production program, the budget of revenues and expenses, the search for internal reserves, the optimization of the technological process and inter-functional interaction, etc.;

- secondly, the existing distribution of functions at enterprises of the oil and gas industry does not allow

organizing transparent activities for strategic and operational planning and control, therefore, an essential organizational aspect of the application of the proposed concept is the creation of a separate controlling service that supports the enterprise management system;

- thirdly, in order to create a process-oriented system of responsibility and budgeting, in all likelihood, employees and fixed assets should be assigned to processes.

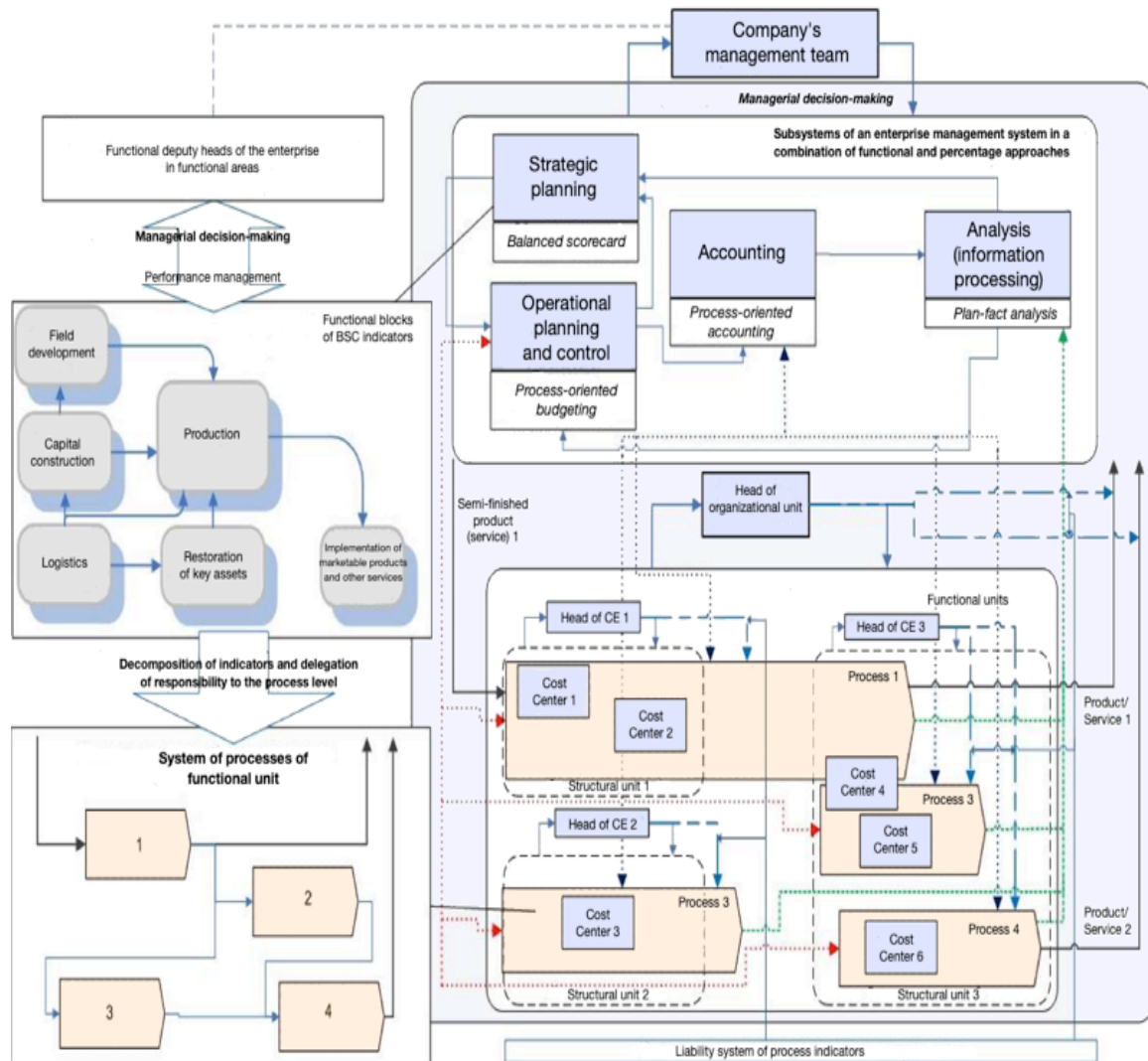


Figure 3. The Oil and Gas Industry Enterprise Management System in a Combination of Functional and Process Approaches

Thus, one of the most important principles for implementing an enterprise management system based on a combination of process and functional approaches is the exclusively integrated use of process-oriented management control tools. (20)

### 3.1 Foreign Experience in Systems Management in the Oil and Gas Industry

As practice shows, a cluster approach is used for effective system management in the oil and gas industry of foreign countries. The formation and development of industrial clusters that integrate the activities of various enterprises and organizations contribute to the effective implementation of these development strategies. (21-22)

The cluster approach, as the world experience of its application shows, is an effective tool for building industrial and investment policies both for the state and for various firms and

organizations. International practice indicates that clusters can increase the efficiency of introducing new technologies, reduce costs and improve the quality of high-tech services, unify approaches in quality, logistics, information technology, ensure consolidated lobbying for the interests of cluster members, etc. Companies win by having the opportunity to share positive experiences and reduce costs by sharing the same services and suppliers. (20)

A similar approach is adopted around the world: in Australia, Ireland, Croatia, Sweden, Finland, Denmark, Belgium, Spain, Italy, Brazil, the Netherlands, Slovenia, and others. In Germany, for example, since 1995 there have been clusters in the field of energy, transport, and the aircraft industry, as well as about 100 "networks of competence" in other areas related to the development of technology; these associations enjoy state support, in particular in reaching the international level.

The global practice of implementing cluster policy allows us to note the individuality of each country in the implementation of cluster initiatives, in which many levels of government assist many countries. (23-24)

During the analysis of industrial clusters, the author paid special attention to the organization of relationships between enterprises and firms of the petrochemical and chemical cluster, which is shown schematically in Figure 4.

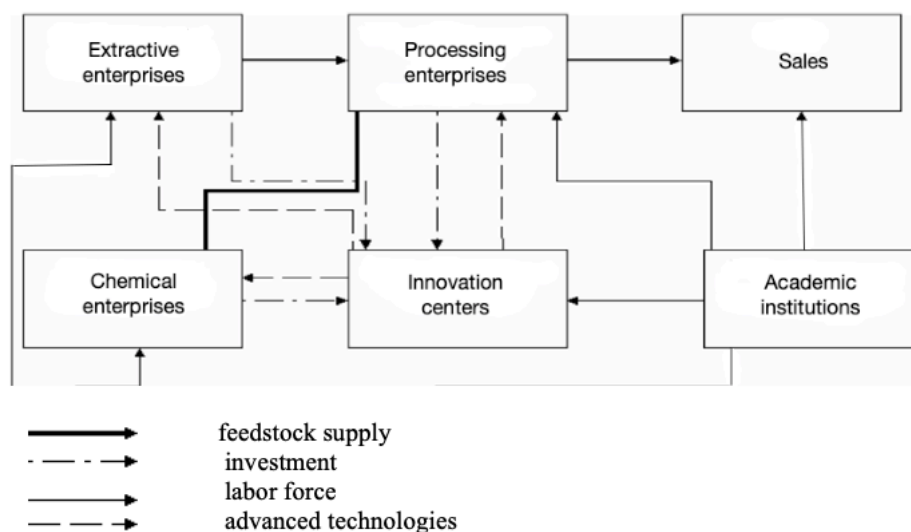


Figure 4. Interconnection of Enterprises Within the Framework of the Petrochemical Cluster

The cluster includes the following enterprises such as mining enterprises, processing enterprises, chemical production, innovative enterprises, and educational institutions. The core of the cluster consists of powerful mining enterprises, which are the initial link in the entire production chain.

Also, vertically integrated companies are used for system management in the oil and gas industry of foreign countries.

The development of the oil business in the West from the very beginning followed the path of vertical integration. The largest oil companies such as Standard Oil, Gulf, Texas, Shell, and others have established control over all areas of oil business on a national, and then international scale. Many small outsider companies adhered to the same approach, although they operated in limited territories. (25-26)

In the 60-70s, serious changes took place in the global oil business. The oil-exporting countries that were part of OPEC have managed to significantly introduce control over their oil resources. Now almost all oil-producing countries have powerful national oil companies. However, even having gained the right to dispose of most of the oil produced, the producing countries were not able to obtain a fair, in their opinion, share in the total revenues resulting from the exploitation of oil resources. The main reason for this is the lack of or limited access to markets for final products. (20)

Therefore, in the 70s, first for the self-sufficiency of petroleum products, and then intending to enter foreign markets with them, Saudi Arabia, the largest oil power in the world, and many other manufacturing countries began the construction of oil refineries and petrochemical plants. In the 80s, they diversified their policies by acquiring tangible and financial assets of oil refineries and marketing companies in the territories of oil-consuming countries - in North America and Western Europe. From here, in the provided case, the process of vertical integration developed in the direction from oil exploration and production to the areas of its refining and product marketing. The most important prerequisites for such a process can be considered the desire to seize the markets of final demand and competition in the field of oil production in a fairly saturated market and the declining efficiency of investments in the development of new oil resources. (20)

In another direction, integration was taking place in the oil companies of Western Europe, excluding British Petroleum and Shell, which had long been among the largest international companies. For example, in France and Italy, the powerful state sector in the oil refining and petrochemical industries, which was created back in the 1950s, was heavily dependent on supplies from the largest oil companies in the world. Using competitive contradictions between transnational oil corporations and the governments of oil-producing countries, primarily in North Africa, European state and private companies managed to break into the sphere of oil production on concession terms more acceptable for the countries-owners of resources. In other words, the key driver of this integration process was the desire to overcome dependence on raw material supplies. (27-28) As a result of this, large oil companies, such as the French Total and Italian ENI, are now included in the top twenty.

Analyzing the experience of forming vertically integrated oil companies in Western countries, the following should be noted among the most important priorities of vertical integration:

1. The desire of oil companies to control the markets for final products - first oil products, and then petrochemicals.
2. Due to natural, technological and economic factors, the need to form an effectively managed organization of production and marketing. (29)
3. The possibility of economies of scale. The concentration of capital and production, the availability of a unified infrastructure, and the possibility of maneuver (capital, capacity, flows of raw materials and products) contribute to a reduction in unit costs in production and lead to an increase in marketing activity, an increase in the mass and rate of profit.
4. Provision of vertically integrated structures of controlled sources of raw materials.
5. The international nature of the oil business and its relationship with the world and national politics.

The optimal strategy of vertical integration in the growing market of oil and oil products, which is just inherent in the People's Republic of China. Interesting observations can be drawn from an analysis of American experience in the development of the oil and gas sector. In the USA, a situation often arises when individual oil refineries dangerously come close to the bankruptcy line. The American oil business is

organized in such a way that, except for some of the largest companies, there is a fairly tough divide between primary oil production, its refining, and marketing of oil products. It is not uncommon for companies that own oil refineries to show financial insolvency with rising oil prices and lower refiners' margins, and due to the impossibility of overflowing financial resources between the links in the value chain within the oil and gas complex, nothing can create a financial "pillow" for them. As a result, another argument in favor of vertically integrated companies in China, including all the links in the value chain, is the ability to constantly maintain the required level of production efficiency for them through the internal transfer of resources. This, in turn, creates stability for a large number of employees, supports the economy in the regions where companies are present. (20)

The abolition of the Ministry of Geology and Natural Resources was a significant milestone in the restructuring of the management structure of the Chinese oil and gas complex. The three largest companies after 1998 received more freedom of action. The functions of public administration and control were transferred to the State Administration of Petroleum and Chemical Industries (SAPCI), which is subordinate to the State Economic and Trade Commission (SETC). CNSPC acted as an independent company for less than two years, at the beginning of 2000 it became a part of Sinopec as a division and was renamed into Sinopec Star Petroleum Corporation (SSPC). (29)

Natural gas is produced by units of all three leading oil and gas companies in the country. For example, in the Sichuan province - the main gas-producing region of China - Sichuan Petroleum Administration, a subsidiary of CNPC, is engaged in the exploration, production, transportation, and marketing of gas.

Trade, export, and import of crude oil and basic petroleum products is the responsibility of state-owned companies such as Unipet (United International Petroleum & Chemical Co., Ltd), Chinaoil (China National United Oil Corp.) and Sinochem (China National Chemical Import & Export Corp.). At the same time, Sinochem is a subdivision of the Ministry of Foreign Trade and Economic Cooperation (since 2003 - the Ministry of Trade) and specializes in export-import operations with oil and oil products.

Thus, at present, China's oil and gas industry is divided between CNPC, Sinopec and CNOOC. The predominant position in oil production is held by CNPC, controlling the oil fields in the north, west, and east of China. In 2001, CNPC's share of China's total oil production was 67% or 2.1 million barrels per day. Sinopec (considering SSPC) produced 720 thousand barrels per day, which amounted to 23% of the total production. At the same time, it owns a large number of refineries and controls a large part of the retail market for petroleum products. The remaining 10% of oil production comes from CNOOC. The imbalance between CNPC and Sinopec is the need for Sinopec to buy crude oil from CNPC and for CNPC to sell petroleum products in a market controlled by Sinopec — is a serious problem for these two state-owned oil companies, especially in view of the need to increase economic efficiency as main argument in the restructuring of the oil industry in 1998.

#### 4 Conclusion

It can be concluded that the vertically integrated oil and gas companies that are created are not fully balanced in terms of oil production and refining capacities, which, in the face of insufficient maturity of market relations, will stimulate them to further improve the structure, competition and expansion into the "traditional" competitor markets (recall that in 1998, in CNPC and Sinopec were combined mining and processing facilities in two different geographical areas of China - the northern and southern parts of the country). The current stage of corporate restructuring in the oil and gas complex of China is associated with the creation of three leading state-owned companies of holding-type oil and gas business groups, consisting of a complex of joint-stock companies and limited liability

companies. Part of the shares of joint-stock companies is intended for circulation on the national and foreign stock markets. (30)

The accumulated world experience in creating powerful vertically integrated structures indicates that the oil company, under any favorable raw material replenishment of its assets, will never enter the world market as an equal participant if its structure does not contain those components that determine the possibility raising the technical level of own production, financing (at least 50%) of new construction, guarantee the production of a wide range of oil and gas products shoes and petrochemicals. The effectiveness of structural transformations in the oil and gas industry, the formation and effective functioning of vertically integrated oil and gas companies, their integrated use of oil and gas raw materials are noticeably felt on the results of their production and commercial activities.

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**Primary Paper Section: J**

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## IMPROVING THE MECHANISM FOR SYSTEMATIC MANAGEMENT OF THE OIL AND GAS INDUSTRY AT THE MACRO LEVEL

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Abstract: The Republic of Kazakhstan has a dynamically developing oil and gas industry, which plays a significant role in the formation of the state budget. Currently, the share of the oil and gas industry in the total gross product is about 30%.

Keywords: oil and gas industry, management, production, infrastructure, industries.

### 1 Introduction

Since the presence of large stocks of raw materials is a necessary but not sufficient condition for the development of the oil and gas industry, it is necessary to identify priority areas for its development. The following directions can be designated as such:

- exploration and development of new oil and gas fields (in particular, development of resources of the Kazakhstan sector of the Caspian Sea);
- increase in oil production;
- modernization and development of transport infrastructure for ensuring maximum access to oil and gas companies to export routes;
- reconstruction of existing and creation of new industries (especially petrochemical) with the advanced construction of facilities for deepening oil refining, improving the quality of petroleum products, production of catalysts;
- improving the efficiency of the oil and gas complex (the use of modern production technologies and the integrated use of oil and gas resources, the production of electricity based on modern gas turbine power plants);
- development of the legal system in the oil and gas complex.

### 2 Materials and Methods

World experience shows that the possession of large hydrocarbon reserves does not lead to national prosperity, it is necessary to develop the service sector of the oil and gas complex as a huge "field" for national investments, development of own production and creation of jobs.

The oil and gas industry of the republic is one of the most attractive for investment by both domestic and foreign investors. This industry has a globally powerful raw material base and a developed infrastructure for the extraction and processing of raw materials. However, there is a high dependence of the results of their activities on the global conjuncture of oil and gas prices associated with mono production. (1-2)

At the same time, in the conditions of market transformations in the oil and gas sector of Kazakhstan's industry, as in other sectors of the economy, positive and negative processes were observed. Among the obvious negative phenomena are the lack of clear goals and an understanding of the mission of the enterprise, inability to identify emerging market opportunities, the disconnectedness of planning and financial services, the

inability of a systematic vision of the functioning of a modern enterprise, and some other.

The further development and successful functioning of the oil and gas sector enterprises in the market requires a review of the management system and methods, and primarily based on a strategic approach. Expanding the scope of strategic planning to the widest possible number of industrial enterprises is a fundamental condition for ensuring sustainable long-term economic growth and diversification of the economy of Kazakhstan.

The use of strategic planning creates the most important advantages in the functioning of the enterprise: prepares the company for changes in the external environment; links its resources with changes in the external environment; clarifies emerging issues; coordinates the work of its various structural divisions; improves control in the enterprise.

It is also necessary to increase the efficiency of vertically integrated oil companies.

The sources of efficiency gains in vertically integrated companies are diverse. The main ones are as follows:

- the ability to organize intensive information exchange between its divisions, which allows you to coordinate plans and schedules for the supply of raw materials, materials, and semi-finished products, their processing and delivery of final products to the consumer;
- the possibility of significantly accelerating the entire cycle of material movement and, accordingly, accelerating the turnover of capital and cost recovery;
- the possibility of saving on the costs of market transactions (costs associated with finding a supplier, negotiating transactions, in case of violation of the terms of the contract, etc.
- especially large in countries with poorly developed market infrastructure).

To ensure economic growth requires identifying market opportunities in areas where the company will have a clear competitive advantage. It is possible to develop a growth strategy based on an analysis conducted at three levels. At the first level, identify opportunities that the company can take advantage of at the current scale of activity (opportunities for intensive growth). At the second level, the possibilities of integration with other elements of the industry's marketing system (opportunities for integration growth) are identified. At the third stage, opportunities that open up outside the industry (opportunities for diversification growth) are identified. (3)

Intensive growth is justified when the company has not fully used the opportunities inherent in its traditional markets. The three main varieties of intensive growth opportunities are:

- the deep market introduction consists in finding by a company way to increase sales of its products in existing markets through more aggressive marketing;
- expanding the boundaries of the market lies in the company's attempts to increase sales by introducing existing products into new markets;
- product improvement is the company's attempts to increase sales by creating new or improved products for existing markets.

Integration growth is justified when the company's business area has strong positions and/or when the company can get additional benefits by moving back, forward or horizontally within the industry. (4)

Regressive integration is the company's attempt to acquire or put more stringent control over its suppliers. Progressive integration is the company's attempts to acquire or tightly control the

distribution system. Horizontal integration is the company's attempts to acquire or put under more stringent control of some competing enterprises.

Diversification growth is justified when the industry does not give the company opportunities for further growth or when growth opportunities outside this industry are much more attractive. Diversification does not mean that a company should take on any opportunity that has come up. The company should identify areas that will help eliminate its shortcomings. There are three varieties of diversification:

- concentric diversification, i.e. replenishment of its product range with products that, from a technical and/or marketing point of view, are similar to existing company products;
- horizontal diversification, i.e. replenishment of its assortment with products that are not related to manufactured products, but which may cause interest of existing consumers;
- conglomerate diversification, i.e. replenishment of its nomenclature with products that have no relation either to the technology used by the company, or to its existing goods and markets. (5-6)

### 3 Results and Discussion

Currently, there is a tendency to transform large companies interested in their further growth into multinational companies. From ethnocentric companies that consider their foreign operations as something secondary, they are transformed into geocentric companies that consider the whole world a single market. Company growth is one of the main sources of increasing its effectiveness and a means of survival in the competition. One of the reasons stimulating the growth of companies is the desire to save on the scale of the sphere of activity.

In the long run, there is no optimal company size, as its growth is limited only by resources and the ability of managers to adapt to the new dimensions of the organization and maintain the integrity of the company. However, the faster the growth, the more difficult it is for the corporate governance structure to adapt to changing external conditions and the higher the adaptation costs that are opposed to savings on growth. With the growth of the company, management functions and the organizational structure of management should radically change. Only in this case will it be able to maintain stability and realize the potential for economies of scale in production. (7)

World experience in the organization and management of enterprises and sectors of the fuel and energy complex indicates the need for fairly strict regulation of their activities by the state. This is due to the following:

- the enterprises of the complex are few, belong to strategic sectors of the economy, and a large extent determine the industrial and military potential, as well as the state of affairs in ecology;
- oil and gas in various forms are consumed by absolutely all members of society, and the feature of this process is its continuous nature.

This means that the issues of oil and gas production and processing were and remain political issues; the oil and gas industry is characterized by high development inertia, huge capital intensity and concentration of material resources, the need for large-scale and comprehensive development of national natural resources, a predominantly monopoly position in the market and the inability to duplicate some industries in a certain territory. (8)

For these reasons, the governments of most foreign countries prefer to keep many of the fuel and energy industries in state ownership with very strict regulation of the activities of industries and enterprises that did not get there that are directly related to the functioning of the national oil and gas industry.

The following can be noted as the main tasks of state regulation in the oil and gas industry:

- creating conditions for fair competition;
- contributing to the stable development of oil and gas production;
- environment protection;
- regulation of corporate profit margins.

The degree of state participation in the regulation of the fuel and energy sectors, as international experience shows, entirely depends on the stage of development, the specific situation, the nature and scale of the tasks to be solved. For the effective functioning of the economic mechanism, an optimal combination of market methods and methods stipulated by state regulation is necessary. The state and dynamic interconnection between the systems of commodity-money relations and state regulation of the economy are essential. Without state participation, the reproduction process is simply impossible. Forms and methods of financial and economic state regulation are not stable. They evolve depending on specific conditions. The experience of industrialized countries confirms that the sharper the situation, the more actively the state intervenes in the regulation of the fuel and energy sectors.

The strategic management changes necessary for sustainable development of oil companies should include:

- organizational and economic consolidation of the company and its subsidiaries;
- allocation of support and service services;
- a sharp increase in the quality of financial management, primarily in terms of the budget, accounting, and control of production and marketing costs;
- creation of powerful marketing systems;
- development of a modern integrated management information system;
- substantial development of the human resources management system. (9)

Thus, foreign experience in managing the oil industry in the form of vertically integrated companies is extremely important for Kazakhstan. In the former USSR, perhaps the world's most integrated oil and gas complex management system existed, although some parts of the technological chain belonged to different departments. All threads converged in the former Governmental plan, where the planned balances for the production, refining, and distribution of oil and oil products were developed at prices set above, which ensured the integration of the entire system - from the well to the gas station. However, this was not economic integration based on the interest of equal partners, but administrative-command based on non-economic management methods. Not only in the conditions of the market, but also in the transition to it, such a system could not be maintained, because it contradicted the logic of reforms. The collapse of the planning and distribution system in the oil and gas complex turned out to be extremely painful when, as a result of the liquidation of the USSR, certain parts of a single technological chain ended up in different independent states, and long-term ties were broken. At present, some relations have been restored, and the need for their restoration in full, but on other, mutually beneficial grounds, is obvious. Further development of vertically integrated companies and the realization of the potential laid down in their structure should play a significant role in this integration process not only within the Republic of Kazakhstan but also on the economic territory of the whole CIS.

### 4 Conclusion

In conditions of high uncertainty and instability of the economic situation, vertically integrated companies have significant advantages over independent production and intermediary firms both in terms of the survival of their units and in terms of normalizing the overall economic situation in the country. The integration allows you to increase the efficiency of the company and its survival in the competition. The advantage of an integrated company is a balanced distribution. When the price of

oil falls, the profit of the producing units decreasing, but the refining and petrochemical industries increase the profit, since the decrease in the cost of raw materials is usually greater than the decrease in the cost of the product, so the losses of one are compensated by the acquisitions of the other unit.

In general, as practice shows, the vertical integration of companies engaged in the oil business has competitive advantages over enterprises and specialized firms.

In implementing their strategies, domestic oil and gas companies can in the future compete with similar foreign companies not only due to the presence of the richest reserves of oil and gas and cheap labor (i.e. natural, raw material qualities, which, undoubtedly, are a big plus and reserve) but also with their developed qualities obtained as a result of the implementation of their own original managerial decisions and approaches, knowledge and ideas.

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# **K MILITARISM**

KA MILITARISM

## THE MODERN WAYS TO IMPROVE CORPORATE CULTURE IN THE MILITARY-INDUSTRIAL COMPLEX

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**Abstract:** The relevance of researching the ways to improve the level of corporate culture in the military-industrial complex (MIC) is based on the increasing role of the MIC due to the growing tension in the world. According to the Stockholm International Peace Research Institute (SIPRI) data published in March 2018, total global sales of a weapon in 2013-2017 rose by ten percent compared to the previous five years (2008-2012). Among the five biggest exporters of armament are also France, Germany, and China. The economic significance of the MIC is based on the fact that it fosters the development of related industries such as metallurgy, electronic engineering, instrument-making and so on. At the same time the MIC faces the following industry-specific challenges: - Rigid state regulation of production; - State control over export and import operations; - High sensitivity to political factors of the external environment; - Ambiguous and polarized public attitude towards weapon and its manufacturers, from massive support of patriotically-minded part of the population to absolute aversion of its pacifist part. The authors of this article attempt to identify those particular methods of improving company performance which are successfully put into practice and are really beneficial for the MIC enterprises applying them which may later serve as a basis for developing a set of measures to increase corporate culture level in the MIC enterprises in Russia. The materials of the article have theoretical value for academic specialists studying corporate governance as well as a practical benefit for top-managers, members of the Boards of directors of the MIC companies, other competent specialists in corporate governance seeking to improve corporate governance quality. The analysis is based on comparing the corporate culture of global industry leaders in the USA, Russia and the UK, which are the world's biggest weapon exporters. The studies and conclusions presented in this article can be practically beneficial not only for the MIC enterprises the specificity of which is a stress test for corporate culture but also for other industrial sectors.

**Keywords:** corporate culture, fight against corruption, conflict of interest, corporate ethics, social policy.

### 1 Introduction

Studying corporate culture is an up-to-date direction of research, already quite relevant in the modern complex of management sciences. In the 1980s the idea that effective leadership and long-term business success are connected with creating a healthy corporate structure in the company was first put forward in the book "Corporate Cultures: The Rites and Rituals of Corporate Life" (1984) by Terence Deal. (1) The same ideas were outlined in the book "Organizational Culture and Leadership" by Edgar Schein. (2) The most comprehensive study of the interrelation between positive corporate culture and performance is considered to be the book "Corporate Culture and Performance" by John Kotter and James Heskett. (3)

In the corporate governance theory, there are a number of approaches to defining corporate culture. For example, M. Albert and F. Khedouri (4) define corporate culture in the following way, "Atmosphere or climate in an organization is called its culture. The culture reflects prevailing habits, customs, and reflections in an organization."

In Howard Schwartz's and Stanley Davis' opinion, (5) corporate culture is a "complex of convictions and expectations shared by the members of an organization, these convictions, and expectations shape norms which sufficiently determine the behavior of individuals and groups in an organization."

According to Elliott Jaques, (6) corporate culture is a "way of thinking and mode of action which grew into the habit and became a tradition, is more or less shared by all employees of the enterprise, and which should be learned and at least partly adopted by new staff members to "blend in."

Russian authors have also studied corporate culture. According to A. Krylov, (7) "Corporate culture is a set of a set of ideas, values, generally accepted patterns and norms of behavior typical for a particular organization; the joint experience of the members of an organization, formed in the course of collective activity and expressed in both material and spiritual forms."

The Asia Pacific region is increasingly perceived as the century's geopolitical center. With one-third of the world's population, a significant share of the world's trade and production, it seems that the weight of this region is going to be highly relevant in the foreseeable future.

Some nations in the Asia-Pacific region are major importers of conventional weapons, including South Korea, Taiwan, Singapore, and Australia. There are also defense industries in the region that are being developed towards a more self-sufficient production, such as the industries in North Korea and China. The growing economy of China, in particular, has facilitated an increase in military spending which provides consistent financial support to their defense industries.

### 2 Materials and Methods

Works of foreign and Russian scientists have served as a methodological framework of this research. There are several typologies of corporate cultures, for convenience's sake, each of them will be represented in a table. Depending on the influence of an organization's activity on the final result positive and negative corporate cultures are discerned, their salient features are outlined in Table 1. (8)

Table 1. Positive and negative corporate cultures

Positive corporate cultures	Negative corporate cultures
Democratic	Authoritative
Person-centered	Function-oriented
Integrated	Disintegrated
Stable	Unstable

Typologies of cultures can also base on corporate structure flexibility. Corporate culture typology according to Jeffrey Sonnenfeld (9) is outlined in Table 2.

Table 2. Corporate culture typology according to Jeffrey Sonnenfeld

Type of corporate culture	Description
Baseball team	Decisions are made quickly; talent, innovation, and initiative are encouraged.
Club	This type is characterized by loyalty, devotion and good teamwork.
Academy	This type is characterized by a focus on the gradual growth of employees.
Fortress	This type is common for companies, which lost their former positions on the market as a result of wrong decisions or bad adaptation to the external environment changes.

Organizational psychologists and managers use different variants of corporate culture typology. For instance, an Irish expert on organizational psychology Charles Handy identifies the following types of corporate culture: (10)

1. Power culture
2. Role culture
3. Task culture
4. Person culture

One of the notable results of a strong corporate culture is low staff turnover thanks to the consensus among the staff on the mission and values of the organization. (11)

Another important result is the improvement of the company's reputation among such stakeholders as shareholders, customers, suppliers, and the government.

Basing on the factors that influence corporate culture formation and development, it is analyzed through the "externalist" approach, where corporate culture establishment strongly

depends on the national culture and is closely connected with the external environment, as well as through the "internalist" approach, where corporate culture is shaped in accordance with organizational culture. (8)

### 3 Results and Discussion

The authors tried to study the experience of corporate culture formation in the largest corporations basing on generally accepted international standards. The biggest companies of the MIC were chosen as the research base.

According to the ranking of hundred largest military-industrial companies in the world as of 2016 made by Stockholm International Peace Research Institute. The ranking was done by Gillam, Dr. Aude Fleurant, Alexandra Kuimova, Dr. Nan Tian, Pieter D. Wezeman and Siemon T. Wezeman 2017. The world's largest military manufacturers are Lockheed Martin (USA) Boeing (USA), Raytheon (USA), BAE Systems (UK), and Northrop Grumman Corp (USA).

Table 3. The world's largest military-industrial companies according to SIPRI ranking (12)

Position in SIPRI ranking	Name of the company	Annual volume of weapon sales, million US dollars
1	Lockheed Martin (USA)	40830
2	Boeing (USA)	29510
3	Raytheon (USA)	22910
4	BAE Systems (UK)	22790
5	Northrop Grumman Corp (USA)	21400

Analyzing corporate culture tools of the world's leading holdings of the MIC such as Lockheed Martin, Boeing,

Raytheon, BAE Systems, Northrop Grumman Corp, one can see a standardized approach to the corporate culture.

Table 4. Corporate culture documents

a	Lockheed Martin	Boeing	Raytheon	BAE Systems	Northrop Grumman
Code of conduct	+	+	+	+	+
Code of corporate governance	+	+	-	-	-
Anti-corruption policy	+	+	+	-	+
Social reporting	-	-	+	+	+

Lockheed Martin, Boeing, Raytheon, BAE Systems, Northrop Grumman Corp companies have formed a single standard package of regulatory documents: Code of conduct and Anti-corruption policy the main theses of which coincide almost verbatim. We should also note Raytheon's Social responsibility report in a single document, BAE Systems' Corporate responsibility report (2017), Northrop Grumman's Corporate responsibility report (2017) while the rest of the companies post this information on the official website. BAE Systems' Code of conduct also contains anti-corruption clauses, with a provision that the Code of conduct contains General corporate rules that may be applied in accordance with the local legislation. Northrop Grumman's standards of business conduct contain anti-corruption standards, and the company has a separate Anti-corruption compliance program.

This study supports an inference that anti-corruption policy is developed and implemented by the majority of the companies

under research. Anti-corruption mechanisms, such as regulation of receiving gifts and prevention of conflicts of interest are closely integrated with ethical norms and ethical policy mechanisms, almost all companies under research have hotlines and ethics commissions, which deal with both ethical issues and corruption violations (Tables 5 and 6). It should be noted that an essential gap in both global and national industry leaders is the lack of internal Corporate governance code, the fundamental document reflecting the quality of corporate culture and corporate governance, all the more so as its existence is recommended by the Corporate governance code approved by the Bank of Russia. (13) Another significant drawback is the absence of social reporting. The absence of such a single document is all the more surprising given that all the studied enterprises have a social policy that is implemented in practice.

Table 5. The main directions of anti-corruption policy

Directions	United Aircraft Corp	United Shipbuilding Corp	Almaz-Antey	Russian Helicopters	Tactical Missiles Corp
Prevention of conflicts of interest	+	+	-	+	+
Intolerance for corruption	+	+	-	+	+
Gift policy	+	+	-	+	-

Table 6. Ethical policy implementation mechanisms

Mechanisms	United Aircraft Corp	United Shipbuilding Corp	Almaz-Antey	Russian Helicopters	Tactical Missiles Corp
Bureau/Commission on ethics	+	+	-	+	-
Hotline	+	+	-	+	+
Obligatory training	-	-	-	+	-
Protection against accountability in case of reporting	-	-	-	-	-

Table 7. The main directions of ethical policy

Directions	United Aircraft Corp	United Shipbuilding Corp	Almaz-Antey	Russian Helicopters	Tactical Missiles Corp
Fair treatment	+	+	-	+	+
Human rights protection	+	+	-	+	+
Intolerance for discrimination and harassment	-	+	-	+	+
Inclusiveness	-	-	-	-	-
Labor protection	+	+	-	+	+
Calculation of labor costs and other expenses	+	+	-	+	+
Responsibility for the use of assets	-	-	-	+	+
Protection of confidential information	+	+	-	+	+
Prevention of conflicts of interest	+	+	-	+	+
Fair competition	-	-	-	+	+
Fight against insider trading	+	+	-	+	+

Studying the ethical policy of Russian companies, we can conclude that companies are guided mainly by the mandatory rules adopted in Russia by the state and society, the emphasis is made on observing human rights, fairness, labor protection, protection of confidential information, prevention of conflicts of interest and fight against corruption, with lack of attention to issues of special rights of minorities and inclusiveness which are relevant in the society of the United States, the EU, the countries of the British Commonwealth.

The main directions of social policy were analyzed on the basis of corporate reporting data (Table 8). The Almaz-Antey Air and Space Defence Corporation (14) does not provide internal documents and reports for public access, the information on social and personnel policy is posted on the official website of the corporation. JSC "Russian Helicopters" reflects its social policy in its annual report. The company developed the Code of corporate ethics, Anti-corruption policy. JSC "Corporation "Tactical Missiles Corp" developed the Anti-corruption regulation and the Basic social policy.

Table 8. The main directions of social policy

Directions	United Aircraft Corp	United Shipbuilding Corp	Almaz-Antey	Russian Helicopters	Tactical Missiles Corp
Additional social guarantees	+	+	+	+	+
Employees training	+	+	+	+	+
Cooperation with universities and schools	+	+	+	+	+
Support for militaries and their families	-	-	-	-	-
Volunteering	-	+	-	-	-
Support for sports	-	+	-	-	+
Support for culture	-	+	-	-	+
Support for children	-	+	+	-	+
Support for pensioners and disabled people	-	+	+	+	+
Support for the local population	-	-	-	-	+
Support for trade unions					

Table 9. Step 1. Results of the first step of evaluation of the effectiveness of the corporate culture tools implementation

Corporate culture tools / the expert's №	1	2	3	4	5	6	7	8	9	10
Corporate documents	8	7	7	8	7	8	7	8	7	6
Social reporting	7	6	8	7	8	7	8	7	8	7
Minorities	1	1	2	1	2	1	2	1	1	1
Inclusiveness	2	2	1	2	1	2	1	2	2	2
Volunteering	4	5	3	3	4	4	4	5	5	4
Militaries	5	4	6	5	5	6	5	3	5	5



Veterans	6	8	5	6	6	5	6	6	4	8
Schoolchildren / students	3	3	4	4	3	3	3	4	3	3

Step 2. Calculation of weight values of experts' opinions depending on their competence

- Ki-coefficient of competence of the i-th expert, considering the degree of familiarity with the question discussed (K3) and substantiation of the answer (Ka):

$$K_i = \frac{K_3 + K_a}{2}$$

Table 10. Step 2. Calculation of weight values of the experts' opinions depending on their competence

Calculation of weight values	1	2	3	4	5	6	7	8	9	10
Ki	2	2	2	1,5	1	2	1,5	2	1	1,5

Ki (average) 1.65

Step 3. Calculation of weight values of the experts' opinions depending on their competence

$$\bar{x}_j = \frac{\sum_{i=1}^m x_{ij} \cdot K_i}{\sum_{i=1}^m K_i}$$

Table 11. Step 3. Calculation of the effectiveness of the corporate culture tools implementation, considering the experts' competence

Corporate culture tools/ the expert's №	1	2	3	4	5	6	7	8	9	10	Weighted average
Corporate documents	9,6	8,4	8,4	7,2	4,2	9,6	6,3	9,6	4,2	5,4	7,3
Social reporting	8,4	7,2	9,6	6,3	4,8	8,4	7,2	8,4	4,8	6,3	7,1
Minorities	1,2	1,2	2	0,9	1,2	1,2	1,8	1,2	0,6	0,9	1,2
Inclusiveness	2,4	2	1,2	1,8	0,6	2,4	0,9	2,4	1,2	1,8	1,7
Volunteering	4,8	5	3,6	3,6	2,4	4,8	3,6	6	3	3,6	4
Militaries	6	4	7,2	4,5	3	7,2	4,5	3,6	6	4,5	5,1
Veterans	7,2	9,6	6	5,4	3,6	6	5,4	7,2	2,4	7,2	6
Schoolchildren / students	3,6	3	4,8	3,6	1,8	3,6	2,7	4,8	1,8	2,7	3,2

Step 4. Identifying the most promising ways to improve corporate culture

To identify more accurately the importance of the corporate culture tools and to develop an algorithm for their implementation, an abstract economic model is suggested for consideration. This model determines the qualitative characteristics of the modeled object, which is the modernization of corporate culture. When building the model, the main approaches of the multifactor model are used, namely, the

Kk and Ka are evaluated on a scale from 1 to 2, where 1 is the medium level of competence, 2 is the high level of competence

i=1..m — sequential numbers of experts;

m — the quantity of experts m=10;

Xij – evaluation of the relative importance (in points), set by the i-th expert to the j-th element;

j=1 ... n – sequential numbers of the studied elements;

n — the number of elements of the objectives tree n=8.

analysis of the individual factors influence separately and as a whole on the modeled object.

GfK Consumer Life conducted international research that identified 10 crucial types of corporate social responsibility from the consumers' point of view, which got top positions in the rating (Table 12). (15)

Table 12. Crucial types of corporate social responsibility from the consumers' point of view

No.	Type of corporate social responsibility	Importance Russia, %	Importance world, %
1	Providing good jobs	61	48
2	Production of high-quality goods and services	45	41
3	Fair prices of products and services	41	27
4	Protection of the employees' health and safe production	40	37
5	Participation in social programs	23	9
6	Being environment-friendly	20	37
7	Fair tax payments	12	19
8	Investments in research and technology	11	16
9	Supporting the local area	10	8
10	Educational support	9	8

Within the framework of the study conducted by KPMG and Effie in 2018, the finalists of the competition between companies implementing the sustainable development goals Effie Awards

Russia 2017 in their social projects were marked. The finalists pointed out in their projects the following sustainable development goals out of 169 sustainable development goals (Table 13). (16)

Table 13. Rating of sustainable development goals

No	Sustainable development goals	% of the goal representation in the finalists' projects
1	Good health and well-being	30
2	Industrialization, innovation, and infrastructure	30
3	Quality education	8
4	Responsible production and consumption	8
5	Partnership for sustainable development	8
6	Decent work and economic growth	5
7	Peace, justice and effective institutions	5
8	Eradication of poverty	3
9	Clean water and sanitation	3
10	Sustainable cities and communities	3

The corporate culture tools analyzed by the authors are currently highly recommended for all companies and mandatory for large businesses and companies with public ownership.

Internationally this is regulated by:

- The United Nations Convention against Corruption adopted by the UN General Assembly on 31 October 2003, which applies a broadside approach to identifying and preventing corruption risks in both public and private sectors;
- The Organization for economic cooperation and development (OECD) Convention on Combating Bribery of Foreign Public Officials in International Business Transactions;
- The US Foreign Corrupt Practices Act (FCPA);
- The UK Bribery Act 2010, etc.

In Russia, there are the following legislative norms that recommend and require to implement anti-corruption policy and prevent conflicts of interest:

- The Federal law of December 25, 2008, N 273-FZ "On Countering Corruption";
- The Corporate governance code approved by the Bank of Russia.
- Methodical recommendations of The Federal Agency for State Property Management (Rosimushchestvo) on the organization of risk management and internal control in the field of prevention and combating corruption and on the organization of the Board of Directors work in a joint-stock company;
- Anti-Corruption Charter of the Russian Business approved by The Chamber of Commerce and Industry of the Russian Federation.

Today there are three main concepts, on which modern theories of corporate social responsibility are based.

1. Stakeholders concept. A stakeholder is an individual or organization that exerts influence on or is influenced by the activities of another organization, its products, services, and related production performance indicators. (17)
2. Corporate citizenship implies the responsibility of companies for what is happening in the country and the mutual responsibility of the state and business to the society. (18)
3. The concept of corporate sustainability, which is the newest concept in the field of corporate social responsibility. Its founder J. Elkington introduced the concept of a triple bottom line of a corporation's activities, which includes financial and environmental dimensions complying with the idea of eco-efficiency with the addition of the assessment of social and broad economic impact. (19)

In Russia, large companies and companies with public ownership are guided by the approach to social responsibility, defined by the Concept of long-term socio-economic development of the Russian Federation. (20) There are no binding forms of social reporting, similar to annual financial statements, but the most widely used ones in the world at present

are the UN Global Compact, and The Global Reporting Initiative (GRI). (21)

The stability of the Asia-Pacific region is attracting major attention owing to its increasing relevance in the current globalized world. China has been predicted to be a world power in a few decades. The size and progress of the development of its defense industry are one of the most relevant factors influencing the current global arms market and the security stability in the region.

The region's nations place greater emphasis on foreign sales and exportation of their defense products. However, they face a highly competitive international arms market where a large number of companies compete to sell their products and only the development of niche technologies appears to have greater prospects for generating success.

Most South Korean defense companies have greatly diversified their production into the commercial sector, which may compensate for the above problems of overcapacity and poor economies of scale (and subsequent lack of competitiveness). The Chinese defense companies have similarly, although less significantly, achieved certain diversification of their production. (22) Conversely, Indonesian arms producers remain highly dependent on the state's procurement programs.

South Korea and Singapore have had unlimited access to modern weapons systems technologies and to the global arms market; China, on the other hand, has been under an arms embargo placed by the U.S.A. and the E.U. since 1989, and Indonesia was under a U.S. arms embargo between 1999 and 2005. In consequence, China relied on dual-use technologies and reverse engineering techniques applied to Russian weapons systems in order to then develop its defense sector, while Indonesia has been unable to develop its defense industrial base until recent years.

The mercantilist approach, in which the state exercises a large amount of control over the defense industry, may lead to extensive investments in the defense industry, lack of competitiveness, and an eventual decrease in the nation's security; whereas the application of liberal principles, in which there is minimum intervention by the state in the defense sector, may result in more competitive military equipment production and therefore greater security, although may also create certain vulnerability as there is greater dependence on foreign suppliers.

#### 4 Conclusion

The study substantiates the relevance of the choice of the research object – the largest enterprises of the military-industrial complex, as the political instability in the world, has led to a significant increase in demand for weapons, besides, the military-industrial complex is one of the most important sectors of the economy because its development fosters the expansion in the related industries – metallurgy, electronics engineering, instrument-making, etc. With significant dependence of the industry on internal and external factors corporate culture is becoming increasingly important for the development of corporations in the industry.

The study revealed that introducing such tools as human rights protection policy, anti-corruption policy, fight against discrimination, protection of information and assets, prevention of insider trading is universal in nature and these tools are implemented by the largest corporations in all the countries under research, namely the USA, the EU, the UK, Russia.

Depending on the calculated rating it is suggested that the companies of the military-industrial complex introduce the corporate culture tools in the following order:

1. Development of corporate documents (first of all the Corporate governance code).
2. Social reporting. Priority introduction in the short term up to 1 year.
3. Support for veterans, retirees, and reservists.
4. Support for militaries and their families. Introduction on a second-priority basis in the medium term from 1 to 3 years.
5. Support for volunteers.
6. Training events for profession-oriented schoolchildren and students. Introduction on a third-priority basis in the long-term period from 1 to 3 years.
7. Support for minorities.
8. Inclusiveness. The introduction is not recommended.

The implementation of the suggestions given in the article may have the following positive effects for the corporations of the military-industrial complex:

1. Creating a positive image in the host country and in the countries which are customers of the products.
2. Establishing a positive image in the eyes of the state customer, for instance, the support for military personnel/veterans creates a positive image in the eyes of the main consumer - the military department.
3. The development of the Corporate governance code, other important corporate documents, and transparent social reporting can increase credibility in the eyes of prospective shareholders.
4. Transparent social reporting, training programs for both personnel and future employees who are retiring militaries, students, schoolchildren will contribute to establishing a positive image among the staff.
5. Reducing, for the company, the risks from corruption losses.
6. Reducing for the company the risks from illegal/unethical behavior of the employees, as detailing ethical responsibilities, procedures, training its employees, the company acts in good faith and reasonably.

The research and conclusions presented in this article can be beneficial not only for the enterprises of the military-industrial complex but also for corporations in other industries making adjustments for an industry specificity.

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