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INTEGRATION OF THE COGNITIVE AND COMMUNICATIVE APPROACH IN THE PRACTICE OF LANGUAGE EDUCATION OF STUDENTS

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Abstract: The article considers the problem of realization of the cognitive and communicative approach in language education. The concept of a cognitive and communicative approach in the language education of students, which is based on the integration of cognitive and communicative approaches, has been given. In linguodidactics, the emphasis was primarily on language and communication aspects, but with the development of cognitive science, the priority of the communicative approach has been replaced by a cognitive and communicative approach in recent decades. In teaching languages, the problem of revealing the connection between communicative and cognitive approaches to the organization of linguistic education became relevant because essential characteristics of the cognitive process are predetermined by the integrative study of language as a means of learning, cognition and as a means of communication. This relationship of cognitive and communicative aspects in linguodidactics is based on the integration of the two main functions of the human language: communicative and cognitive.

Keywords: cognitive and communicative approach, language education, methodology, didactics.

1 Introduction

We justify the need to integrate these approaches and consider it appropriate to apply the cognitive and communicative approach in the practice of language education for students. The reorientation of linguodidactic and methodological research into the problems of the cognitive-communicative approach is due to the achievement of certain successes in this area: cognitive-linguocultural methodology (1), cognitive and communicative approach in teaching spelling as text-formulating activity (2), cognitive-communicative approach in terminology (3), the cognitive-communicative approach in text activity (4), integrated technology. (5)

The cognitive-linguocultural methodology as a universal conceptual basis for multilingual and multicultural education was developed at the Kazakh Ablai Khan University of International Relations and World Languages by S.S. Kunanbaeva. (1) In this methodology, in the complex of methodological principles as the fundamental provisions of the theory of language education, the cognitive principle is defined as the leading one. The language education, based on the cognitive principle, is carried out through the thought process, there is a correlation of knowledge with existing cognitive concepts. The formation of a new concept (concepts) always takes place according to a certain pattern, in which the universal side of man's cognitive activity is manifested when mastering non-native languages. The mastering of languages is the application of successive systems of cognitive strategies. This happens through the use of a set of cognitive techniques, such as metacognitive, cognitive, social, affective. Despite the fact that mastering the cognitive strategies in the educational process is extremely important, but they are not self-sufficient - a synthesis of the connection between cognitive and communicative methodological principles is necessary. The basic schema of the essence of language in the cognitive and linguocultural methodology looks like an interdisciplinary construct in the triad of language-culture-personality.

E.I. Golovanov (2) notes that languages serving various areas of professional activity are considered by us as special cognitive-communicative spaces. At the heart of the organization of each such space is a complex of significant concepts, categories, and subcategories. Since the terms form the core of the languages of professional communication, they serve as the main means of conceptual orientation in the cognitive-communicative space, set the direction of the thinking activity of specialists, serve simultaneously as a guide to thinking and a guide to activity.

V.M. Leichik (6) proposed to consider the term as a complex multilayered formation in which the natural language substratum and the logical superstratum form respectively the lower and upper layers, and its core is the terminological entity. This approach to the structure of the term is justified in modern conditions and can be interpreted along the lines of the cognitive-communicative approach. (2)

Skriabina O.A. (3) believes that the cognitive-communicative approach in teaching spelling as a text-forming activity rests on the following provisions: 1) speech is "not only a system of signs, not only a means of communication, which is much higher than communication but also a phenomenon of psychology and neurophysiology of man" (I.M. Rumyantseva); "Speech is a means of regulating (organizing) the higher mental processes of man" (A.R. Luria); 2) the text is "not the sum of components, but a whole work having a goal-setting, functional purpose and possessing author's modality" (N.S. Valgina); 3) a literate letter "is a highly functionally coordinated action and is the result of self-consistency of the mechanism of thought-speech-language activity" (V.K. Radzikhovskaya). The cognitive component in the formation of spelling is the ability of the individual to control activity. In modern studies, the cognition is regarded as a cognitive activity of a person, which has a psychological nature, is associated with speech as a form of expression of thought [E.S. Kubryakova, E.F. Tarasov, and others].

O.A. Skriabina tries to answer the question, what cognitive skills provide the internal processes of successful movement of thought to the word? Is the implementation of the communicative intention of the writer important in the creation of the text? O.A. Skryabina determines that in writing a whole range of cognitive skills related to inner speech is important: to set a goal and plan its achievement using the imagination; to form and to formulate a thought, to choose a language form and orthographic and punctuation spellings for its adequate graphic design; to anticipate the choice of writing and prepare for it; to stop on "thinking", relying on reflection; to choose consciously, using rational-logical thinking, or intuitively, relying on the "sense of language"; to activate long-term memory of spelling norms and operational - about operations; To control, collating the image of the result with the real incarnation, activating the attention; to correct and edit the message created by the course of the letter, combining verbal self-control with spelling control. These skills are formed in written speech as activities based on cognitive mechanisms: goal setting, planning, prejudging (anticipation), choice and control. (3)

2 Materials and Methods

In the previous works of the author of this study (4,7), an attempt is made to consider the integration of cognitive and communicative approaches in textual activity. We shall delineate the functions of each of the approaches and define the parameters that unite them. The communicative approach of the teaching of textual activity is understood as the orientation of learning on the formation of the semantic perception of the text in students, the understanding of reading and the mastery of linguistic material for constructing speech utterances as a result of the discussion of the text. The cognitive approach as a learning procedure for isolating semantic supports is directed at processing the information contained in a speech work sufficient to perceive the meaning of the text at a deep level, using keywords and activating a body of knowledge in the form of situational models that, as an extralinguistic factor of speech activity, are an important element influencing the language design of speech. The cognitive approach is realized mainly in

the classroom, aimed at determining how we receive information about the reality, how we decode it, conduct comparisons, make the necessary decisions, or resolve problems that arise in the process of reading and interpreting the text. In this respect, communication strategies are aimed at making the cognitive information from the text using communication tools.

In order to manage the reading comprehension process, it is necessary for the trainee to work on updating and identifying relevant knowledge and ideas about the information embedded in the text. Communicative attitudes, which students receive immediately before reading the text, make the process of thinking purposeful, help to predict the topic or idea of the text. Many methodologists attach special importance to cognitive strategies of comprehending the names of topics that often have great informative value. The cognitive-communicative approach to textual activity is determined by three types of communicative needs - contact-setting, information and impact, and also with three aspects of cognition that includes the processes of perception, cognition, and presentation. The activity of the teacher and students in information processing is expressed in the cognitive strategy of the lesson, which allows you to mobilize the necessary amount of local and global information in order to implement a dialogical strategy for its interpretation, taking into account the following moments of the discursive organization of the text:

- the general composition of the text, which requires the student to identify the author's techniques for promoting the most important information and creating a background;
- the connectedness of the text, which is denoted by the terms “cohesion” and “coherence”.

It is the teaching of foreign languages (in common with the teaching of the national language) that acts as an effective means of developing the communicative abilities of trainees, preparing them for interpersonal and intercultural interaction/cooperation both within their own country and at the international level. It develops value orientations, including, on the basis of the inclusion of students in the dialogue of cultures, contributing to the formation of a person of culture, striving for self-development and self-realization, who can avoid and overcome conflicts.

The main objective of modern foreign language education is not only the formation of effective communication skills, but also the social and personal development of students - the development of independent critical thinking, the culture of cognition and mental work among the students, the training in self-education skills, which is associated with the search for information and its processing, which implies the variability of the approaches used to implement the learning process.

The implementation of innovative approaches to teaching a foreign language today should be seen as a way of innovative transformation of modern pedagogical reality and the educational environment by a teacher. It is the teacher who designs and implements various forms of the organization of the learning process in general and the learning sessions as its individual elements, uses a variety of methods, forms, means, and technologies, ensuring the gradual movement of the students thought along the path of cognition and creating a varied educational environment.

We note that the traditional methods of teaching a foreign language at school imply the assimilation of knowledge in artificial situations so that the student does not have the opportunity to see the connection of the studied subject with his life or to correlate it with his future. In this regard, in recent years, the modernization of scientific approaches to the teaching of a foreign language in the school has been transformed in the direction of a dialogue of cultures and has also acquired a new sound in accordance with the genesis of the goals of teaching foreign languages. In the course of its evolution, the teaching of foreign languages has evolved from a single target component - to their diversity, from politically conditioned learning goals - to universal and social goals that open up humanistic ideals of communication and existence in the modern world community for the trainees.

With the approach to learning a foreign language, we consider it advisable to understand the theoretical and methodological basis that determines the learning strategy and the choice of methods and corresponding methods of teaching a foreign language, implemented on certain principles of education.

The transformation of scientific approaches to teaching a foreign language is taking place today under the influence of research in the basic sciences for the methodology of foreign language teaching of sciences. Among them - psychology and linguistics, the main combination of directions which determined the emergence of a cognitive-communicative approach, the interdisciplinarity and multidimensionality of its content as a scientific term.

The cognitive-communicative approach is considered by us as a modification of the cognitive approach with the addition of its communication component.

However, first of all, it should be noted that the cognitive-communicative approach owes its integral formation and development to a generalizing humanistic approach to learning a foreign language that appeared in the foreign method of foreign-language teaching in the 1960s and 1970s of XX century. The essence of the humanistic approach is a comprehensive orientation on the personality of the trainee, on his interests, needs, and opportunities, and also on the choice of methods, techniques, forms, and technologies of training that correspond to the individual characteristics of the student. This approach is characterized by a complete reorientation of the main focus of the entire process of foreign language instruction from the teacher's personality and the choice on their basis of methods of teaching the student's personality and the appropriate choice of methodological tools.

The cognitive aspect must be included in the communicative and subordinate to it, but at the same time it should be shown where there is a basis for this: where it is necessary to find any analogies facilitating the assimilation, or, on the contrary, to reveal differences in order to avoid likening (interference). (3) We hold the opinion about the equivalence of communicative and cognitive components in learning. The derivation of the concept of "cognitive" in the name of the approach to the first place is due to the historical primacy of its appearance and the basis of personal-individual and socially-personal characteristics of the trainees for choosing the methodological tools and approach to learning.

The cognitive-communicative approach to learning is, on the one hand, the theoretical justification of the communicative methodology for teaching foreign languages, that is, the solution of such methodological issues as selection, organization, the sequence of studying linguistic and speech material and the ways of presenting and training it, taking into account the communication needs of students of a certain age and educational conditions, on the other hand, from cognitivist positions, it ensures the conscious assimilation of knowledge and information of the linguistic, cultural and aesthetic character, satisfying and developing the cognitive interests and requests of the developing personality of the student in a society that is mastering a foreign language at the minimum necessary level. (4) In this regard, the trainee becomes an active participant in the process of foreign-language learning and socialization and not simply an object of the teaching activity of the teacher.

In turn, in the learning process, real communication models and features of real foreign language communication are realized, since the possession of a language system (knowledge of grammar and vocabulary) is insufficient for the effective use of a trained foreign language in conditions of intercultural communication.

Thus, communicative teaching methods, activated by the cognitive approach and the humanistic concept, make it

necessary today to take a fresh look at the traditional ways and methods of teaching a foreign language in a secondary school in the absence of a natural language environment, increasing the emphasis on the social and personal development of students.

In the work of Kondubaeva M.R. (5) "Integral technology of teaching philological courses" is analyzed a postulate of academician O.S. Naraikin (8), who believes that if functional blocks can be singled out in technical systems, then in the human body this is impossible, since in humans "everything is integrated at the cellular level". The cell simultaneously works as a sensor, and as an energy, and as an information system, therefore, it is impossible to exclude the first language from learning the learner while mastering the second language. Therefore, the integral technology, according to the author's conception, is based on a holistic philosophy of philological education, including an accounting of such general linguistic factors as the infinity of language, as a social order for a multilingual education formulated in the Project on Multilingual Education.

In addition, the philosophy and methodology of education, aimed at preparing a competitive personality, includes competence, socio-cultural, cognitive-communicative and information technology approaches.

3 Results and Discussion

The most important component of integral technology is a hypertextual representation of knowledge, intended for mastering a linguistic material, which is aimed at teaching the understanding of the text of learning, hence, conscious remembering of the information obtained. (5) We believe that this work sheds light on the subject of our research due to the fact that due to the cognitive-communicative approach, the implementation of integrated technology is possible.

In the mainstream of this approach, the theoretical basis is the position about the activity nature of language, according to which language is viewed as a cognitive process carried out in communicative activity and provided with special cognitive structures and mechanisms in the human brain. (9)

If we turn to the integration of these two approaches for educational purposes, we get a cognitive-communicative approach to linguistic education, which is a person-oriented concept, a methodical system that suggests that the trainees have an adequate understanding of the system of the language being studied and the ability for speech actions and skills in a speech sphere, a cognitive approach is understood as the solution to traditional problems of linguodidactics by methods that take cognitive aspects into account, which include the processes of perception, thinking, cognition, explanation, and understanding. The cognitive approach in any subject area focuses on "knowledge", or rather, on the processes of their representation, storage, processing, interpretation and production of new knowledge. (10) The cognitive approach differs from other approaches in that it is rather a general (universal) empirical approach that combines a set of topics related to the processing of information by people, the establishment of a hierarchy of meanings and values in the picture of the world of the individual.

For the theory of the cognitive approach, it is important to determine how the information related to the cognitive structures of the individual is represented. There are two types of cognitive structures: personal constructs and schemes. Physical constructs in linguistic education reflect the vital or situational dominants of the personality, attitudes, motives that are reflected in the processes of creating texts and their content, as well as in the perception of other people's texts. Schemes as a cognitive structure create a background image similar to what is present in the mind of the bearer of language and culture. To identify such a cognitive structure, it is important to operate with images in the minds of the speaker and the listener as it happens when communicating the speakers of the same language and the same culture.

As a modern paradigm of linguodidactics cognitive-communicative approach to language education operates the principles of the communicative and cognitive orientation of learning. The communicative orientation means the organization of the formation of ideas about the linguistic phenomena of language according to the regularities of the natural process of cognition, ensuring the active role of the student in comprehending linguistic phenomena. The cognitive orientation of language education makes it possible to make the learning process more effective by using the metalinguistic consciousness of the trainee in revealing reliable thematically relevant information for further use in oral and written professionally oriented communication. The principle of cognitive orientation forms the conscious use of the language of a certain branch of knowledge among learners.

Learners acquire language education in the process of solving cognitive and communicative problems. The principle of the communicative orientation of education assumes that the formation of different types of speech activity is carried out in the process of communication activity.

Conducting classes aimed at forming the communicative competence of trainees is based on the parallelism and interconnectedness of instruction characteristic for the communicative methodology of all types of speech activity. This is provided by an integrative system of cognitive-communicative exercises, where the types of speech activity are interrelated and contribute to the functional use of the language, i.e. solving certain communicative tasks.

The cognitive and communicative approach to language education is manifested in the fact that the scale of the human perception of the world is transferred to the entire studied system of the relationship between language and culture, since language is a means of forming and preserving culture, a kind of key to understanding its semantics, codes, and attitudes.

The essence of the communicative principle in linguistic education is understood as the orientation of instruction in the formation of a system of speech resources for pupils, the assimilation of which would ensure communicative activity in situations of communication; Semantic perception of language material, understanding of reading and mastering of linguistic material for constructing speech utterances as a result of discussion of the problem. A communicative approach to linguistic education involves modeling the learning process in real communication. In the lessons on languages, the main, fundamentally important parameters of communication are modeled, which include: creating a discussion-oriented situation; Ability to predict the possible course of the discussion and determine your own strategy of argumentative speech behavior; Making possible alternative judgments on the main staging question and determining the course of counter-arguments; The ability to build his speech on the basis of a demonstrative discourse, suggesting the removal of the majority of non-independent points of view; The ability to choose the logic of constructing his speech and tactics of his speech behavior on the basis of taking into account the nature of the interlocutors; The ability to use metacommunication influencing tools to create a background for supporting your point of view; The ability to get in touch with the audience. Tasks built with the above criteria contribute to the formation of the highest level of the linguistic personality, the advanced communicative situations as forms of the functioning of communication provide a substantive basis for the process of language education. The cognitive approach is aimed at solving problems such as processing, structuring, preservation, and the use of knowledge (4,9); The perception, knowledge, and understanding of learning language phenomena, the dialogue between the author of the text and the reader, the strategy of forming a linguistic picture of the world. The integration and synthesis of the two approaches are manifested in the interconnection and interdependence of its two aspects: functional, cognitive-linguodidactic. (11) The first aspect is functional, it is the conceptual core of the cognitive-communicative approach to language education, since it is the

study of the language in real functioning, connected with the use of language units in a particular situation, which requires the transmission of some information, i.e. knowledge, forms the communicative competence of the learner. The second aspect is cognitive-linguocultural, it is associated with the use of language as an instrument of cognition of another linguistic culture and, consequently, a means of developing intercultural competence and a linguistic personality in the whole. (12)

In language education, it is very important to form a language model of the world that is associated with metalinguistic comparisons of language phenomena in the native and learned the language. The linguoculturological component is very important in the language consciousness of the personality, which participates in the categorization of objects, the identification of a general/different, the classification of concepts that are in the language picture of the world, imprinted with the means of language, specifying patterns of interpretation of the perceived. (13)

The language picture of the world, according to I.P. Susov, is built on the cognitive structures that have undergone language processing that provide the student with orientation in the environment, as well as control his behavior. A communicative-pragmatic space is created around the trainee, whose functions in describing the surrounding reality include: a) the interpretation of the information received; b) the "new" subjective reflection of the world. (14)

For the formation of cognitive abilities, which include the construction of images and the logical conclusion on their basis, the acquisition of new knowledge, drawing on the available information, drawing up and implementing plans (15), it is very important to introduce a cognitive-communicative approach, which is the key to solving questions related to the analysis of cognitive processes.

The cognitive-communicative approach as a scientific paradigm is defined as a linguodidactical complex of methods and technologies associated with the use of language as an instrument of cognition of another linguoculture based on the application of cognitive-linguocultural complexes, including the sphere and the situation of communication, determine which conditions must be modeled in the educational process for their integration. (16)

We, recognizing the effectiveness of the cognitive-communicative approach, which activates the actual recognition of linguistic phenomena, allows successfully implementing the strategy and tactics of communication, taking into account the situation, we offer cognitive strategies of language education. Cognitive strategies for the formation of pedagogical discourse, which are represented by stages: general (global) understanding - modeling of personal understanding - interpretative understanding - critical thinking, relevant for interaction based on professional discourse, and cognitive resources of communication subjects that correlate with a personal phenomenon. (17)

Students of pedagogical faculties in the learning process should receive "an idea of both new ideas that have already been implemented in the practice of advanced teachers or in experimental scientific research, as well as the prospects for the development of methodology, to determine their attitude to individual methodological provisions and specific recommendations, and then on the basis of developed point of view to outline ways to improve their own practice of language education. Comprehensive professional training of the future teacher is based not only on acquiring the necessary theoretical knowledge but also in mastering the scientific and pedagogical discourse that is shaping the scientific and professional competence. (18)

We consider cognitive strategies for the formation of pedagogical discourse as a set of functionally organized activities of students in a certain branch of knowledge. Cognitive strategies, being the technology of the organization of learning, form certain requirements for learning activity and can serve as a criterion in the evaluation of the conceptual and content aspect of teaching. To denote this phenomenon J. Bruner (19) clarifies, "Strategy is a way of acquiring, preserving and using information that serves certain purposes in the sense that it must lead to certain results."

In the article, the discourse is considered as an integral set of functionally organized, contextualized units of language use in a certain branch of knowledge. Discourse, being a peculiar form of the existence of knowledge, sets certain parameters in this existence, forms certain requirements and can serve as a criterion in the evaluation and calculation of the conceptual and informative apparatus of educational knowledge. The fact that the term “scientific and pedagogical discourse” has the right to exist is written by scientists A.V. Litvinov (20), V.E. Chernyavskaya. (21) In their opinion, the discourse is at the same time an instrument that creates a social life. As Karasik notes, the texts of textbooks, chrestomathies, rules of behavior of pupils, etc., as precedent phenomena of pedagogical discourse are among the precedent texts of the scientific discourse: the works of the classics of science, famous quotations, the names of monographs, articles, some illustrations. (22) The term "scientific and pedagogical discourse" from the point of view of an integrated approach to the study of the scientific and pedagogical (in the sphere of higher education) seems justified for the implementation of intercultural studies. To denote this unity, L.V. Kulikova suggests using the term "academic discourse", understood as "a normatively organized speech interaction possessing both linguistic and extralinguistic plans, using a certain system of professionally oriented signs that takes into account the status and role characteristics of the main participants in communication (Scientists as researchers and / or teachers, as well as students in the field of university education), interpreted as a culturally marked communication system". (23) We believe that the term "scientific and pedagogical discourse" more reflects the purpose of our study - the actualization of the text of the textbook presented in a discourse aimed at realizing its significance in the classroom from the standpoint of cognitive-communicative methodology.

In modern technologies for the formation of a certain discourse, there is a model of perception of the new material, which is carried out through certain cognitive strategies, by which methods of forming the interrelation between mental operations and actions aimed at realizing the methods of activity in cognitive (educational) activities are understood. (24) Cognitive strategies are aimed at adequately reacting trainees to specific educational problems so that students rationally apply knowledge and skills in practice. The content of any strategy is the set of decision rules used to determine the main lines of business. There are strategies for learning and communication, learning and mastering strategies, product strategies and receptions, and others. The conceptual field of cognitive strategies answers the question "I know how", than "I know what". (25) A.A. Pligin (26) notes that "cognitive strategy" contains two components: general and structural. According to the general definition, the cognitive strategy is the individual interconnection of mental operations and actions aimed at realizing the result in cognitive (educational) activity. The structural-cognitive strategy includes the individual interconnection (sequence) of operations and actions (intellectual and practical) aimed at realizing the result in cognitive (educational) activity. Cognitive strategies are the strategies of the learner, which serve to learn their own actions to achieve a specific goal. The composition of cognitive strategies is determined by the structure and components of the goal-oriented cognitive activity. For example, in order for the learner to correctly understand the basic meaning of the text, the general idea of the text, which manifests itself both in choice, in comprehension, and in the evaluation of what has been read, it is necessary to methodically provide an adequate perception of the text's educational potential. (27)

In science, the typology of cognitive strategies for each type of learning activity is already known. For example, E.M. Klimova

(28) gives the structure of cognitive decision strategies for schoolchildren and their relationship to the success of training. She notes that cognitive decision-making strategies are strategies that ensure the cognitive activity and independence of schoolchildren leading to the achievement of the learning goal that unfolds through the structure of learning activity. By cognitive strategies in building the texts of the media N.N. Boldyrev understands the strategies for choosing ways to conceptualize and categorize the events covered by the calculation of the corresponding pragmatic installations. These ways and determine the choice of the necessary linguistic means. (29) Depending on the nature of the problems being addressed and the analysis of various aspects of the language, different types of strategies are singled out: general and private, direct and indirect, strategies used in evaluating performance.

I.R. Galperin singled out cognitive text strategies, which include: the cognitive strategy of informing, when the content of the text gives information, sometimes repeating what is already known, and a cognitive-conceptual strategy, when it is necessary to analyze the idea of the text, that is, the comprehension of the text from the point of view of the reader, to identify the conceptual information. (30)

In this sense, it is important for us that students master the learning strategies - a stable set of activities that are purposefully organized by the subject for solving various types of learning tasks. The curriculum strategies are divided into cognitive (the learning activities are aimed at processing and assimilating information) and metacognitive (organizing and managing educational and cognitive activities). Cognitive learning strategies include repetition, elaboration (development) and organization. (31)

As cognitive strategies that involve memorizing and manipulating the structures of the language, N.N. Sergeeva, E.A. Ivanova propose the following groups of strategies:

- the imitation of both native speakers and the teacher, the use of phonetic, intonational, language cliches as an example, their sound copying;
- the information retrieval – the use of existing knowledge about the subject to find the necessary language phenomena (search for patterns, similarities and differences, details, features);
- the analysis of information - isolation of language phenomena, allowing a detailed consideration of similarities and differences;
- strategies for the development of memory (auditory, figurative, verbal-logical, emotional, involuntary, arbitrary) (32-33) help to eliminate the difficulties of remembering and storing information.

From this list of strategies, the last three are very suitable for the formation of scientific and pedagogical discourse: the information search, the information analysis, the memory development strategies. The analysis and synthesis of information make it possible to further comprehend the material studied, it is possible when the data obtained are used to further study new phenomena. Cognitive analysis and synthesis strategies allow you to organize your activities in such a way as to increase the opportunities for obtaining new information.

4 Conclusion

Among the most common cognitive strategies for the formation of scientific and pedagogical discourse, we distinguish strategies that include 4 types of its understanding.

1. General (global) understanding, it is expressed in the form of a common perception, which is provided by a generalized comprehension of the topic, the ability to create an analytical reference on a topic.

At this stage, students' verbal behavior is modeled on a frame basis. The frame of the situation-thematic formation of scientific and pedagogical discourse covers a range of problems related to the topic. Students build conceptual clusters from associations caused by this problem. An important point in this approach is the acquisition of meaningful knowledge. For example, students are required to be able to analyze a textbook, to determine which content exercise corresponds to one or other conceptual frames.

Thus, knowledge of the theory becomes a tool for solving practical problems, because, in order to draw a lesson, one must be able to creatively apply knowledge and systematize what has been learned. Analysis of the textbook assumes a support not only for scientific knowledge but also methodological, taking into account the requirements for the level of students of a certain class.

At the next stage, students process information related to the drawing up of the lesson plan. Through the active transformation of concepts and their inclusion in professional personal baggage, the second type of understanding is created - personal, which refers to the perception that links information with personal experience. During the discussion, students comment on the different options for the lesson, on a conventional basis (rules, norms, training standard), exchange opinions and conceptualize the information in the learning process.

The interpretational understanding (the third type of thinking) is a cognitive strategy of discourse formation, based on the discussion of implied connections and ideas in different linguistic phenomena. The narrative frame creates a unified framework for scientific and pedagogical discourse, which aims to reflect the communicative strategy in the process of speech interaction. The interpretational understanding requires students to be able to materialize speech behavior, presented in a single text of dialogue in the form of a dialogue.

And, finally, critical understanding as a cognitive strategy for the formation of a scientific and pedagogical discourse assumes a critical assessment of the possible and already obtained results in order to improve the process of activity and its product. The result of this type of comprehension should be a written work that reveals the semantic-pragmatic content of the topic. Students are required to use the language tools to express the objective meaning of the utterance, its illocutionary aspect, which includes the appropriateness of the tasks, functions, and content of the thematic-textual unity.

Thus, the four types of comprehension of material considered by us teach students information and speech impact, provide reasoning for the reliability of information, improve their own practice of teaching and form a scientific and pedagogical discourse. In general, when the scientific and pedagogical discourse is being formed, one can agree with the opinion of T.N. Astafurova (33) who believes that cognitive strategies are mental strategies that involve planning, control, and evaluation of knowledge since the reflexive strategy as an evaluation strategy of the result of training is very important.

Thus, the cognitive-communicative approach as a paradigm of language education is based on the fact that the cognitive orientation of language learning, carried out in communicative activities that stimulate their speech initiative, that is, cognitive activity, including the processes of perception, categorization, and conceptualization of objects, is closely related to communicative aspects of the language education.

The cognitive-communicative approach in linguistic education forms cognitive-communicative competence through the construction and understanding of utterances, their perception from the point of view of the speaker and the listener, the psychological processes accompanying the speech situation.

Literature:

1. Kunanbaeva SS. Modern foreign language education: methodology and theories, Almaty; 2005.

2. Golovanov EI. Linguistic interpretation of the term: cognitive-communicative approach. News of the Ural State University. 2004; 33:18-25.
3. Skriabina OA. The cognitive-communicative approach in teaching spelling as a text-formulating activity. Abstract; 2011.
4. Kulgildinova TA. On the implementation of the communicative-cognitive approach in pedagogical communication. The Management in Education. 2008; 3(50):102–106.
5. Kondubaeva MR. The integral technology of teaching philological courses. Almaty; 2013.
6 Leichik VM. Problems of domestic terminology in the end of XX century. Questions of the philology. 2000; 2.
7. Kulgildinova TA. The cognitive and communicative approach to text activity of students-journalists. The collection of materials of the 2nd International Practical conference devoted to the seventieth anniversary of Zhanalina. The Kazakh Ablai Khan University of International Relations and World Languages JSC; 2014.
8. Naraikin OS. From a new science to a new engineering. In the world of science. 2011; 12:29.
9. Kubriakova YeS. The initial stages of the development of cognitivism: linguistics - psychology - cognitive science. Questions of the language. 1994; 4:34–47.
10. Plotinsky YuM. Models of social processes: Textbook for higher educational institutions. 2nd ed. Moscow: Logos; 2001.
11. Poliakov OG. Fluency of speaking the foreign language as a linguomethodological issue. Language and Culture. 2014:167-174.
12. Yusupova TG. Designing a model of social and personal development of schoolchildren in the foreign educational environment. Bulletin of Kostroma State University. 2015; 21:184-186.
13. Yusupova TG. The content of cognitive-communicative approach in training the foreign language, Bulletin of Kostroma State University. 2014; 4(20):36-37.
14. Susov IP. The problem of semantic categories in syntax // Semantic categories of language and methods for their study: // Abstracts of the Scientific conference (28–30 May 1985) / Ed. L.M. Vasilyev. P. 1. Ufa: The State University of Bashkiriya; 1985: 6–7.
15. Demyanenkov VZ. Cognitive linguistics as a kind of interpretive approach. Questions of Linguistics. 1994; 4:17-33,27.
16. Sharandin AL. Lexical grammar as an object of cognitive linguistics, "Questions of Cognitive Linguistics", No. 3, 2015, pp. 72-79.
17. Niyazova AYe. The communicative and cognitive approach in learning English for students of higher educational institutions. Symbol of Science. 2017:165-167.
18. Miasnikov AA. Principles of the implementation of communicative and cognitive approaches in training of foreign terminology of the mining business. Bulletin of A.S. Pushkin Leningrad State University. 2014:15-23.
19. Bruner J. The psychology of cognition. Moscow: Progress; 1977.
20. Litvinov AV. The scientific discourse in the light of intercultural communication. Philology in the system of modern university education. Materials of the scientific conference. Moscow: Publishing House the Russian Innovative Education University; 2004:283–289.
21. Cherniavskaya VYe. The interpretation of the scientific text: the textbook for high schools. 5th edition. Moscow: KomKniga; 2009.
22. Karasik VI. The language circle: individual, concepts, discourse. Volgograd: Peremena; 2002.
23. Kulikova LV, Astafiev VP. *Kommunikativnyy stil v mezhkul'turnoy paradigme* [Communicative style in the intercultural paradigm]. Krasnoyarsk: Krasnoyarsk State Pedagogical University; 2006.
24. Matienko AV. Assessment activities as means of cognitive and communicative development of a personality's potential. Bulletin of Russian University of People's Friendship. 2016; 4:109-116.
25. Khutorskoi AV. The didactic heuristics. The theory and technology of creative education. – Moscow: MG; 2003.
26. Pligin AA. Personally oriented education: history and practice: monograph. Moscow: KSP+; 2003.
27. Karabutova YeA. Cognitive-communicative activity-based approach teaching students of the non-language high school in professional foreign language speech activity. Higher Education in Russia. 2014; 8-9:131-135.
28. Klimova YeM. Cognitive decision-making strategies for schoolchildren and their relationship to the success of learning. Moscow; 2008.
29. Boldyrev NN. The cognitive semantics: Course of lectures on English philology. Tambov: The publishing house of the Tambov University; 2001.
30. Galperin IR. Text the as an object of the linguistic research. 4th edition. Moscow: KomKniga; 2006.
31. Bordovskaya NV, editor. Modern educational technologies: a textbook. Moscow: Knorus; 2013.
32. Sergeeva NN, Ivanova EA. Strategies to overcome the difficulties of mastering the hearing-speaking skills of foreign language speech. Pedagogical Education in Russia. 2012; 1.
33. Astafurova TN. Strategies of communicative behavior in professionally significant situations of intercultural communication (linguistic and didactic aspects) [dissertation]. [Moscow]; 1997.

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THE DANCE INTERPRETATION BY K. SOMOV AND S. SUDEYKIN IN THE CONTEXT OF RETROSPECTIVE ARTISTIC IMAGINARY NATURE

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Abstract: The article's urgency is caused by the special importance of both masters' creative stylistic nature. They had adjoined to different artistic groups at the turn of the 19th – 20th century – such as «World of Art» (known in Russia as "Mir Iskusstva") and «Blue Rose». Thus, both masters were striving to imprint the Russian ballet's image via the retrospective view of the romantic epoch. The author considers different relations between the dance and painting based on the different creations. These relations were reflected in multiple edges: spiritual, psychological, aesthetical, associative and visual. Following article is based on unique data and artifacts, which has been found in foreign and domestic private collections and partly upon public museum collections. Also, materials from the manuscript departments of Moscow and S. Petersburg museums were used in the article.

Keywords: dance, «the World of art», «Blue Rose», artistic imaginary, retrospection, interpretation, K. Somov, S. Sudeykin.

1 Introduction[1]

This article is an attempt to describe dance images in art creation of both bright masters at the turn of 19th–20th century. K. Somov and S. Sudeykin are in the main ideological and stylistic trends. In general, it means those art phenomena in which something new discovered is caused by essential time requirements. This includes numerous searches including one-sided sometimes contradictory but has made a significant contribution to the choreographic culture of the 19th century. "In my opinion, a ballet has a great future but of course not in the form in which it exists now. We have to give the ballet modern color, to put it our life's expression, refined, painful feelings, sensations, and aspirations. The obscurity, vapidity, elusive must find and will find, in all probability, its existence in the ballet, as in any other field of art such as conditional and vague nature" (1) exactly determine the nature of its relationship to age, that the present-day literature tries to express submitting to the crisis needs of the modern spirit. These needs, more precisely - a new life's and art's sense make artists dependent and independent of each other to create new tools and to seek. K. Somov entered to the «World of Art» association. S. Sudeykin belonged to the «Blue Rose» but the desire to the ballet brought them closer. A theme of the dance in the art in the end 19th - early 20th century had run a new, interesting and perspective milestone. We can say that it was grown and was crystallized in a very special and unusual vast area, directly or indirectly affecting the creative experience of the majority art masters. The ballet was trying to enter the other arts in the form of artistic mean support of its ideas. The general plastic ideas of the era were fixed in the dance images. Thus, the analysis of the creative development ballet theme at the turn of the centuries opens close relationship between the artist from the social and artistic situation of the ballet. Deep social-historical changes in the choreography had identified a new perspective authors, dictated the art solution of dance images, the change, and the compositions and plot. Therefore, in most cases, works on the ballet theme of this time are not the only result of logical thinking artists but a consequence of their intuitive insight and aesthetic taste. The artists of the "World of Art" and the "Blue Rose" are seeking poetic dance images harmony of their own aesthetic culture. So, there is an internal relationship of modern in painting and drawing with the aesthetics of the ballet at the turn of the 19th-20th centuries as an expression of style generality inherent in the era.

Oleographic symbol gets great importance from the artists of "Blue Rose" so typical for the drama and musical theater that time.

Therefore, the dance tune so naturally entered the elegant and decorative atmosphere of so-called "picturesque" and the graphic stylings of K. Somov and S. Sudeykin where elegance and plasticity of art language have played an active semantic role. Great opportunities were opened in the world of modern decoration, plastic depiction, mastering the art of new composite structures, elements, rhythms. The traditional genre forms were enriched in the line of this trend.

2 Materials and Methods

A careful study of the available publications about the artists, newspaper and magazine articles, reviews, exhibition catalogs and museum collections of foreign and domestic, as well as a direct acquaintance with the works of K. Somov and S. Sudeykin show their identity quest in the interpretation of the dance theme. Addiction to the theatricality is clearly felt in the works of these painters. S. Ernst shows "The first strong theatrical impression of Somov is associated with the ballet – he was three years old child when he saw the now-forgotten historical ballet "Camargo" is presented in a weighty "Lunkeizn" decoration and his imagination was struck for a long time." (2)

The authors repeatedly stressed by the available publications about S. Sudeykin, "Sudeykin thinks theatrical images, the theater completely captured his artistic conception of the world." (3) "The ballet and the dance since the beginning of artist career were the elements permeating entire flesh of his art. A passion for the ballet, the dance was another aesthetic utopia captured Sudeykin like many of his contemporaries who saw the condition of a freedom in the emancipations' body, in the harmonies of its forms, in the beauty and relaxedness of his movements." (4)

Works with the ballet plot can be identified in the individual, not quite similar group in the work of both the artists. Somov has graphic drawings, a theatrical theme with evident elements of dance plastic categories and easel paintings of the "Russian Ballet". Sudeykin had paintings on the theme of "Ballet" as well as sets and costumes for the ballet performances. We'll try to find the common and special in their dance images considering the work of these masters in parallel. First of all, we should turn to the gesture drawings of K. Somov "Rehearsal of the ballerina" (1909, SRM), "The dancer Anna Pavlova in the ballet", «Harlequinada" (1909, SRM), "A dancer". "The gesture drawings for a costume of Anna Pavlova" (SRM) etc. which is common by their nature with gesture drawings costume design of S. Sudeykin "T. Karsavina in Salome" (SCTM) although they carry personal artistic objectives. It's difficult to establish whether the gesture drawings "Rehearsal of the ballerina" by Somov is a gesture drawing of a particular ballet but it is undeniable that it is made from nature. A half-figure of a dancer takes the central part of the sheet where a certain gesture of the hands is captured and it is repeated again in a smaller size just below. Single and duet figures in packs are illustrated along the edges of the sheet in different drawings. Rapid movement of the pen in a variety of perspectives: front, top, side imprint a series of ballet poses and movements from the simplest pas to the partner support. The gesture drawings by Somov is close to the choreographer gesture drawings in this sense and it reminds the creative work of the choreographer.

Although the other two gesture drawings: "A dancer", "Anna Pavlova's ballet costume for "Harlequin" (1909, SRM) are

[1] Abbreviation:
NMFA - National Museum of Fine Arts of A.S. Pushkin.
SCTM - State Central Theater Museum of A. Bakhrushin.
SRM - The State Russian Museum.
STG - State Tretyakov Gallery.
YAG - Yekaterinburg Art Gallery.
KRAM - Kirov Regional Art Museum of M. Gorky.
NRAG - Novosibirsk Regional Art Gallery.
OAM - Oxford. Ashmolean Museum.
OAM - Odessa Art Museum.
PMTMC - St. Petersburg Museum of Theatrical and Musical Culture.
SAM - Saratov Art Museum of Radishchev.

gesture drawings of costumes, the solvable problems in them correspond to more tasks are put in separate works. The choreography consists of motor action which is characterized by very complex anatomical and physiological functions and is subjected to the mechanic law.

First of all, our glance stops not on the image suit our view in figure "A dancer. The gesture drawings for the costume of Anna Pavlova" it is almost hasn't developed and the fourth leg position, live movement of the ballerina. It's not ballet clothes are shown on one sheet in the four figures and artists owning their body to perfection. The suit appears only a necessary attribute of classical dance here. This aspect of the theme - the mechanics of motion is shown in the gesture drawings of Somov "A dancer. Anna Pavlova's costume for the ballet "Harlequin" where one model - Anna Pavlova is presented in different phases of movement. If in the previous gesture drawing Somov shows the same model just in different static positions four times, emphasizing pose not dancing movement here he focuses on individual elements of the same movement as if he fixes its condition three times passing its amplitude from start to finish that allows feeling its significance, its previous and subsequent stages. The ability to think on paper appeared clearly here involving the audience in the process of his thoughts. If you look closely to the gesture drawing, you may notice that one support leg of Anna Pavlova remains unchanged with one hand motionless so. The motion is carried out by means of a second working leg, head and another arm also change its position. You can even define a particular motion shown by Somov - rond de jambe par terre en de dans or rond de jambe en l'air en dedans - circular movement of working leg on the floor or inside the air. Line motion begins with little marked by the artist leg which gradually straightens, the sock is pulled forward, then the motion is made along the arc on the floor or in the air and fixed by Somov's working leg is turned on the toe to the side, completing the movement. Fixed by Somov's running leg is turned on the toe to the side completing the movement in the arc on the floor or in the air. We can assume that another movement is shown attitude but it's the only one poses of illustrated figures. The other two figures fix movement battement tendu simple - putting of foot forward, to the side, back-to-toe. Moreover, the artist conveys easily recognizable movement ballet pas de bourre - quick run on the fingers in the upper part of the sheet in two moving figurines. It remains unchanged when we looking through in detail all specified by the artist phases of ballet movements we looking at the gesture drawing of the Anna Pavlova's costume we feel the mutual consistency of separately shown elements of pas.

K. Somov demonstrates how comfortable a suit he proposed for classical dance, as we said this a gesture drawing gives a spectacular example of a reflection in the ballet theme one of its aspects - the transfer mechanics, technicians of ballet movements and everything else is portrayal with A. Pavlova and the form of costume recede into the background.

Along the way, we'll stop at the most indicative for S. Sudeykin "Costume for T. Karsavina in "Salome". Immediately we can see their difference which consists not only in the fact that Somov is interested in the motion. Even if we compare finished version suit's Somov where the single pose is captured as with Sudeykin the main difference will be in the other. Gesture drawings of Somov do not carry the recognizable sign of Anna Pavlova in all the liveliness transmitted motion, we can catch not only the appearance of T. Karsavina in the gesture drawing of Sudeykin costume but also a deeply personal individual note of her work. The commonness of costumes of Somov and Sudeykin consists of attention both to the transfer of motion however if Somov deeps into the dance process but the Sudeykin's motion is typical as if it fix the most characteristic culmination moment typical for specific role from the ballet, not for nothing one of the foreign artists repeated it exactly in his sculpture showing of T. Karsavina in this manner.

It necessary to touch a series of easel works based on Italian comedies and Harlequinade as discussed about ballet images in the works of two masters that demonstrates special «theatrical» view of artists seeking out in nature spectacular foreshortening, plastic motions, expressive silhouette rhythms. Aesthetic ideals of ballet are the harmony and beauty of human body is expressed in endless Harlequin and Columbine, there is a certain cultural and aesthetic canon biography of retrospection in their plastic poses. Here we meet with the ballet theme echoes in a different, much subtler and complex refraction. We find not a direct image of the dance and the transfer of its properties which appears only in the classical dance in the "Harlequinade", "Masquerade», "Columbine", "Ladies" and "Pierrot" of K. Somov and S. Sudeykin. The ability to plastically express the idea - that's what distinguishes a ballet dancer on stage. Works of K. Somov open imaginary world of fancy presentation, transmit artistic expression of choreographic art in this regard. J. Noverre wrote: «The human passions have a certain degree of ardor which can't be expressed in words or rather for which words are not enough. The triumph of effective dance comes then. "One pas, one gesture, one movement can express that can't be expressed by any other means, the stronger the sense that is necessary wrote alive the more difficult it is expressed in words." (5) Gestural speech is not primitive in ballet and it is able to talk about. And the heroes of Somov have it that is also unusually - expressive. Cutesy 18th century like comes to life in his paintings before eyes - the century of minuet and powdered wigs. The plot is completely subordinated to the aims and objectives of psychological acquire meaning and interest only in the psychological interpretation image. It's no matter how the events are significant in the picture themselves they acquire meaning and interest only in the psychological interpretation. The main characters of Somov and Sudeykin are highlighted almost all the time to the foreground. If they are more puppet, static and contemplative from Sudeykin ("Columbine and Punchinello" - GUTM, "Masquerade» - 1911, Coll. RE Krotte, "Harlequin's Garden" – 1915-1916, SAM, "Masquerade" - 1937, YAG, "Harlequinade" - KRAM and etc.) then the characters live as play from Somov as it is usual of theater actor, whose facial expression is emphasized in accordance with the specifics of the stage action.

Their "stage" the behavior is a few mannered but the gestures are in tune with the movements of their souls. The gesture of Somov opens the deepest inside, causes innermost thoughts peculiar to them alone. The action in the pictures of Somov – it's something that you can't express in words this is his analogy with the language of ballet. An example of this the works are: "Masquerade scene. Composition gesture drawing", "Cupid and the lady in the mask", "Masquerade" (1914), "The Marquise and Cupid", "Lady and gentleman playing music" (1896), "The Lady, a knight and Cupid" (all – NMFA), "Harlequin and Dame. Composition version" (1912, SRM). "Harlequin and Dame" (1912, STG), "The tongue of Columbine" (1913, SRM), "Pierrot and Dame" (1910, OAM), "Masquerade" (NRAG), "Fireworks" (1912, Brodsky Apartment Museum), and others. These pictures of Somov have bright hue of its slide, the element of theatrical dialogue dominates reflecting the inner rhythm of surrounding life, by Sudeykin – balanced front ceremonial picture dominates.

3 Results

The first search for ballet image from Sudeykin are related to 1906, when paintings have appeared in exhibitions, "Apotheosis of the ballet" and "Ballet pastoral" (both - CS). They also adjoin "Columbine and Punchinello" (SCTM) and two "Ballet pastoral" (both – STG). They have come still from the theatrical character of K. Somov with him traditional tired-beautiful Columbine and exquisitely relaxed Harlequins, plastic figure movement of which is always in harmony with their inner world. The measure of artistic generalization thoughts and typification of characters is the same in the imagery of the paintings of Sudeykin in their poetics.

The theater for two are conditional and initially the viewer set to "Paint lie of fictional world". A.A. Yevreinova recalled, "Pierrot, Harlequin, Sly Columbine pictured in a merry dance almost hypnotically have been taken me away from too unbearable reality ... Waking up in the morning, I loved to say hello to my

new residents over my bed – of Sudeykin colorful characters Harlequinade." (6)

Traditional fairy tale lies from Sudeykin is stronger and brighter than from Somov not by chance he is interested in primitive rooted in the national consciousness, deliberately stylized art forms of this creativity. "An artist doesn't afraid to do wildest experiments, to give the most unexpected combinations, to refer to the strangest sources. He sets in going Russian Cup and antique porcelain, a farce and a tapestry, wood, and lace. He is like magician waves his hand and lovely in his clumsy Russian oleographs are replaced by elegant and tantalizing silhouettes and masks of the "Italian" comedy affairs "Art-e" … he goes to the production of "A watteau" from the productions in the style of Shrovetide farce. Sudeykin is here too". (6) K. Somov is not able to see the world through the clean children's eyes which are inherent to Sudeykin. However, a fancy-theatrical form of the Fokine Ballet performance is felt in the works of such form, both artists revived after Didelot, certain motifs and themes are felt always interested in ballet of Meister.

The other side is the construction of multi-figure compositions bringing to mind the former quest choreography by M. Petipa and L. Ivanova, it is characterized for the creativity of the artists of the "World of Art" except such a typical example of an image of indirect forms of dance. Such works are seen through the filter of memories, sounds like nostalgia for the past, as the idealization of what is left behind. Artists attach fundamental importance to the structural similarity between the internal organization of individual scenes of ballet and figurative system of their paintings. Ballet motive was the perfect form embodiment of their artistic concepts for artists at the turn of century. They saw something consonant

with their joys and sorrows in it, they found moments of complete peace convergence there. They tried to go into freakish peripetias of plot choreographic, in it endless expanse fantastic, as if they afraid of hard reality, boring reality life. They often find material for his compositions in the legends and tales of romantic ballet. The essence of one of the retrospective areas is expressed in "Ballet Pastoral" and "Apotheosis" of S. Sudeykin, "Ballet" of K. Somov - it escapes from reality into the dream world and day dreaming and. Numerous ballet works of S. Sudeykin: "Ballet apotheosis" (1906, CS), "Ballet Pastoral" (1906, CS), the "Ballet" (1910, SRM), "Composition based on "Swan Lake" (1910, PMTMC), "Set design for the ballet A. Adama "Giselle" (1913, SRM, L.S. Sigalova), "Scene design of for the ballet "Swan lake" (1914, SRM) and not only directly ballet works are imbued by dance and represent wealth material for reasoning about their own individual vision of the artist this theme. Ballet images of S. Sudeykin certainly adjoin to the "World of Art" traditions but nevertheless, the artist stands for it endowed with such imagination and way of mentality that give us a different organization of theater world rather than the artists of the "World of Art" can imagine. A fundamentally different character includes with ballet image in Sudeykin's work, he is unlike anybody decidedly - he lives alone, open emotionality isn't peculiar to him. The scene design for the ballet almost impossible to be distinguished of easel paintings on the theme ballet of Sudeykin what is explained by an originality of creative thinking of the artist, whose paintings reflect the ballet in, whether it is scenery for a play or just ballet motive, it means to create visual image of a certain theatrical fantasy. Gradually Sudeykin goes away from stylized paintings of Somov where the catastasis tied to the main characters and environment of them appeared mostly as a background. He refuses from the picturesque effect of theatrical costumes. The faces of the characters Sudeykin haven't deeply hidden emotions and feelings, the mystery of which appears from Somov with full force and exciting nakedness. His ballet composition reminding of the atmosphere paintings of A. Watteau and F. Boucher are built as a stage space on which a dreamy and ghostly theatrical performance deploy where the characters live as spontaneously, blissful thoughtlessness and disconnection. Poetic ballet works of Sudeykin is a sentimentalism peculiarly refracted through the prism of romance. He seeks to combine elements of both. The surprising calm reigns in the paintings of the artist, it may be said some patriarchy. The action of dance always unfolds slowly as it close to the rhythm of a steady life. According to Sudeykin, the plastic of heroes is free from any hint of waste eccentricity, claims on the external effect of Somov. No wonder critic V.M. Solovyov recognizing the theatrical thinking of Sudeykin nevertheless called theatrical action in his "atheatrical" paintings. (7) "If only chance one magician is found who would restore life to these beautiful fragments with his miraculous wand, it is quite possible that theatrical characters would be surprised and a little embarrassed. They could not develop continue the stage position which is indicated on the canvas by the artist. In the best case, some of them would be able to perform gavotte, minuet or some role of the program fully choreographic character».

4 Discussion

We can say the emotionality of Sudeykin is a special nature, it's not open but it's directed to the viewer. The choreography is unique art of its kind in many respects. The empathy and co-creation play a significant role in the ballet. The artist encourages viewers' activity, realizing this he outlines only basic contours of the psychological state of the characters but otherwise, he relies on the viewer's imagination.

Duo or a group of dancers usually are placed in the foreground of S. Sudeykin's compositions who divides into separate pieces gradually shaded by the sidelined. The duo who comes into the picture, doesn't include "plug-divertissement" and it constitutes its atmosphere, it superimposed on its background exactly. There are no formal protagonists in the pictures. The group is their hero but also the life of this group doesn't exhaust the content of the work. Allegorical figures of animals, cupids, and angels are so

beautiful and significant for Sudeykin, they wove into the character and melody of their dance quite organically, full of the cloth fine narrative because Sudeykin's ballet is a ballet-tale, a ballet joke, a ballet-irony. The dancers know the value of silence, introspection, dive into some state unknown for us.

The topic of the landscape arises in collaboration with the characters. The environment nature in Sudeykin's works is an essential part of that helps him to discover his own original method of understanding and interpretation of ballet story. The picture of the "Ballet" (1910, GRM) is particularly revealing in this regard. Nature and dance are probably the main theme of this work. Its meaning is dissolution state mind of the hero in the environment. The life of nature and the life of the soul, the nature of mood and the mood of dance are equal to each other. These traits become central here manifested before in other works, their vague contours coagulated, symbolism acquired some kind of poetic visibility. We must not forget that we are talking about sentimentalism in the poetics of which a landscape inspires the soul, calms passions, harmonizes the world. An equal cool color of the "Ballet", giving a symbolist to feel a credo, is an aroma of flower fairy "Blue Rose", it differs from a live color smear "Ballet pastoral" or "Ballet apotheosis". Dancers in white and purple glare looked like hallucinations as they are woven from the water, mist, and fog. They are gently modeled by the artist, lose real contours, dissolve in feathered contours of blue landscape engaging with each other in pictorial and spatial harmony.

"Russian Ballet" (1931, OAM), "Russian Ballet. La Sylphide" (1930, OAM) of K. Somov - these works, as well as works of S. Sudeykin are interesting not so much for the foreshortening theme as expressed in it the artistic view of life is formed by the distance, which the preterit set. That is why the theme of these works isn't the ballet and rather emotional memories of it. A dreamy illumined image of Sylphide returns us to the engravings of the 19th century, to the images of M. Taloni and A. Istomina, the then romantic direction in the ballet. But the fundamental difference between the works of Somov consists in other, it consists in an effort to see the ballet plot ambiguous, not straight forward and in the unity of the diverse qualities.

5 Conclusion

The combination of the real and the fictional attracts artists not so much as a borderland between reality and fantasy, that elusive moment when dance becomes a reality. If characters of Sudeykin's ballet are in the atmosphere, emitting mysterious and enigmatic mood, and their staying isn't momentary and eternal. They live and dance on these, created by the imagination of the artist, glades as on the stage among clean ponds reflecting in its waters their figures together with morning sunrises and evening sunsets, the "Russian Ballets" of Somov convey a very real situation that takes place in the auditorium. Though dancers of the artist are endowed with some feigned, purely gestures of Somov, they are still real people, they are only carriers of happening mysterious fabulously beautiful spectacle. The fates of romantic heroes are slightly opened only for a brief moment for them who fleeting living of his magic life. The artist directs the flow of light on groups of dancing ballerinas; shortening the distance between the auditorium and the stage. The fantasy of dance becomes an extension of his everyday life, but the works don't become poorer and nothing loses a magic. The dream becomes reality and the reality seems beautiful and long-awaited as a dream.

Those special interest is showed in the work of K. Somov and S. Sudeykin to the associative perceived world of a dance, to its substance, to the aesthetic and even philosophical comprehension of it. So, it's enough to slightly change the visual angle to cause the characteristic for the retrospective style of "eality shift" during the period of 19th – 20th centuries. The transformation that occurs with ballet image in time, is very interesting and revealing. It demonstrates how human perception change itself. A dance theme never had a penetrating power of "X-raying" era, such an expressive language that allows the painting to open direct access to the comprehension of the laws of art and life; visualize these laws across the image, psychology, attitude. The dismissal

gave the artist's creative method necessary distance with which we can judge enough about today's world through the metaphor, symbolism, association, allegory. The familiar reality was pushed from the eyes, seen from afar with impressive distance, from an unexpected side. They set as the purpose a remodel, re-creation of pass away eras in their tangible, visible images as the purpose, they had their own way in the world of theater, and of course, it was the way of the poet.

Literature:

1. Nuvelyu VF. 1987. A letter of Nuvelyu V.F. to Somov K.A. - Somov K.A. Letters. Diaries. Judgments of contemporaries. Moscow; 1974.
2. Ernst SR, Somov KA. Saint-Petersburg; 1919:7.
3. Solovyov VN, Sudeikin SY. Apollon. 1917; 8-10:13.
4. Kogan DZ, Sudeikin SY. Moscow; 1974:69.
5. Noverre JG. Letters on dance and ballet. Leningrad; 1965:45.
6. Yevreinova AA. Memories of Sudeikin. TsGALI; 1956; 921(1):346.
7. Solovyov VN. Opere citato; n.d.

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IS THERE A BASIS FOR RUSSIAN NON-COMPLIANCE WITH INTERNATIONAL COURT RULINGS? THEORETICAL SOURCES AND MODERN PRACTICE

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Abstract: Recently much has been devoted to the question of the Russian Federation recognising decisions made in international courts. This issue came to a head in relation to the Russian Federation's wish not to comply with the Ruling of the European Court of Human Rights of 31 July 2014 in the case 'OAO Neftyanaya Companiya Yukos vs. Russia' (Application No. 14902/04). The matter of the Russian Federation's inability to comply with the European Court of Human Rights' ruling became subject to consideration by the Constitutional Court of the Russian Federation. (The Court was petitioned by the Justice Ministry of the Russian Federation, which argued that compliance with the European Court of Human Rights ruling was impossible in the Russian Federation as the ruling was based on an interpretation of provisions in the Convention for the Protection of Human Rights and Fundamental Freedoms and its protocols (hereafter, 'Convention') that was at variance with the Constitution of the Russian Federation in its basic, fundamental provisions).

Keywords: Court, constitutional order, human rights, authorities, legislation, constitution.

1 Introduction

The most vital principle of constitutional order in the Russian Federation is the sovereignty of the Russian Federation. Sovereignty presupposes that decisions of international bodies be assessed from the position of whether they exceed international obligations accepted by the Russian Federation upon its accession to international agreements. The Russian Federation's recognition of the European Court of Human Rights' (1) jurisdiction that resulted from its accession to the European Convention on the Protection of Human Rights and Fundamental Freedoms presupposes that it accepts the implementation of the European Court of Human Rights' (2) decisions only within the scope that the Convention defines as part of its jurisdiction. This involves, in principle, the review of cases, related to violations of the Convention as well as the scope of governance of the European Court of Human Rights. In a sense, the Constitutional Court's subjection would contradict a whole range of basic, fundamental principles enshrined in the Constitution of the Russian Federation. (3)

Of course, Section 3, Article 47 of the Constitution of the Russian Federation guarantees the right of any party to appeal to international bodies entrusted with the protection of human rights and freedoms if all existing means of protection in the local legal system have been exhausted, and in concordance with international agreements signed by the Russian Federation. This right presumes that the state in question may accept the international obligation to recognize the jurisdiction of international courts and, at once, agree with the possibility of deliberating cases beyond the limits of the national court system. However, international court jurisdiction has a subsidiary character and does not ipso facto cover the national legal system. It is, rather, realized through decisions taken by national state agencies. By such means, national state agencies are also entrusted with testing the legality of international court decisions.

Meanwhile, according to Article 46 of the Convention and Article 1 of the Federal Law (4) of 30 March 1998, 54-FZ 'On the Ratification of the Convention for the Protection of Human Rights and Fundamental Freedoms (5) and its Protocols', the legal positions of the European Court, which are final rulings, are obligatory for the governing state when taken with respect to the Russian Federation. The imperative of the European Court's rulings has been accepted by higher courts of the Russian Federation several times. The Constitutional Court of the Russian Federation (6) ruling of 14 July 2015 (21-P) settled on the obligation of executing final rulings of the European Court in cases related to Russia. This included payment of necessary, commiserate, just compensation (section 2.1). The Constitutional Court's ruling noted that such a judgement by the European Court is, in effect, a part of the Russian legal system (section 2.2) and that the Constitution of the Russian Federation and the Convention 'are based on one and the same basic values for the protection of human and civil rights' (section 4). The Constitutional Court of the Russian Federation reaffirmed its previous finding that 'The Russian Federation may join intergovernmental associations and convey some of its authority in accordance with international agreements if this does not lead to limitations of human and civil rights and freedoms and does not contradict the constitutional order of the Russian Federation'. It also reaffirmed that Russian participation in international organizations and acceptance of the obligation to abide by resulting legal outcomes does not nullify the primacy of the Constitution of the Russian Federation for the Russian legal system. Thus, rulings of the European Court of Human Rights 'are a realization within the confines of this system only under the condition that they abide by the superior legal authority, namely the Constitution of the Russian Federation'. Furthermore, the Constitutional Court of the Russian Federation stipulated that 'Russia may in exceptional cases decline to enforce its obligations when such action is the only possible means of avoiding a violation of the Constitution of the Russian Federation' (section 2.2). This stipulation does not especially refer to the international agreement itself, but to 'an obligation set by a governing international agency that results from the standard interpretation of a rule in the course of its consideration of an individual case' (section 3). The Russian Federation's Constitutional Court in the ruling of 19 April 2016 (12-P) reconfirmed its previous finding on the supremacy of the Constitution of the Russian Federation making use of the right of exemption from the European Court of Human Rights (section 4.4).

The demand to respect and protect human rights which has been developed over several different international acts, including the body of the United Nations and the 1948 Universal Declaration of Human Rights, by virtue of its universality and general applicability, is addressed not only to states but also to international associations they might form. It also applies to those vested with individual state powers, including, obviously, the European Court of Human Rights itself. In order to accept the imperatives and norms developed by the European Court of Human Rights in its rulings and contacts with individual states, it is imperative that these legal norms and the procedures for adopting them correspond to requirements that have been accepted and adjudicated *in toto* by the international community of states as received norms from which it is unacceptable to deviate in practice.

One must accept that this theoretical speculation was not prompted by the financial difficulties that had arisen for the Russian Federation. Russian legal scholars would argue that pre-Revolutionary jurisprudence might serve to inform the present case. Of course, pre-Revolutionary jurists themselves hailed from different philosophical and legal conceptions. One, therefore, may resort to one conception that helps to settle one aspect of the issue, or perhaps even settle the issue as a whole. Furthermore, one must consider that the theoretical development and foundation behind the thought of pre-Revolutionary legal scholars seems to be a great deal more substantial than many modern attempts to establish defensible scholarly work. (7-9)

2 Materials and Methods

The problem of in coercion in law concerned many pre-Revolutionary scholars, legal minds and philosophers, though special attention should be given to the work of G.F. Shershenevich.

In order to assess the approach of one or another author to the understanding of 'coercion', one must assess that author's conception of the state and law in general; that is, one should adopt a more complex analysis and move from general categories to the specific. (10-11)

Thus, the problem of the association between state, law and society have, in an objective sense, a multivalent character. '...The body of the state is not invented but trickles down from the conditions in which a given society is placed. G. F. Shershenevich comes to the conclusion that, historically, the state preceded the law. For there is no law outside the state, and the effect of the norms of law are restricted by the limits of state power. Therefore, the law is a manifestation of the life of the state and it can only be understood against the background of an understanding of the state. Moreover, he proposed that truth is inscribed in the law, in the dogma of law. Because the law is a product of the state it requires an organizing force, and only the state has that force. This apparently rather typical statist approach to law should be examined more carefully.

Thus it is essential to note that G. F. Shershenevich's understanding of the state has a significant speculative weight: 'the name 'state' signifies a union of people settled into well-known borders and subject to a single power'. '[...] It is the obligation of each citizen to think of what, in his opinion, the best form is for the state to take, what laws are necessary and how the state should govern to the common good.

G. F. Shershenevich developed a theory of the basic signs of a coherent state. The first sign is the ability to impose will (to subordinate others' wills to one's own, to compel oneself to conform one's will to that of the powerful, to insert one's will as an essential motivation that determines the behaviour of another). The second sign is the collection of persons which form the population of a state or people. The third sign is the territory (that is, the space over which state power is extended).

At the same time, like a true civil jurist, G. F. Shershenevich proposed that 'the state not only acts as a social organization which stands above citizens and exerts power over them but also as subject to laws and obligations, equal to all citizens, addressing them as one equal to another'. However, the relations that make up the state are always public and the state can never be a private legal entity. Furthermore, to the extent that the state is a source of law, it cannot be subject to legal sanction. His clarification does not conform to the modern theoretical conception of the legal subjugation of such an institution as the state, though it follows perfectly from his initial positions. Indeed, one cannot relate seriously to the idea that one 'carves out for oneself' particular norms that in turn have been established for themselves. (12-14)

State power, according to G. F. Shershenevich, is a higher authority, one of the many aspects of social authority. In his opinion vlast' (power, authority) is the central element of the state to the extent that 'only state power can turn a mass of people into a state' (all other forms of power which act within the same territory have a derivative character). He related the most important signs of state power with its independence, absoluteness, supremacy, unity and indivisibility. Under the sense of the independence of state power, G. F. Shershenevich understood it to be a self-reliant entity with respect to other states. To wit, if an authority is independent with respect to that which is outside it, it is supreme within (if there is another authority within the state that does not cede to the force of the state, and also seeks after superiority, then the state is under revolutionary conditions). Shershenevich arrives at the conclusion that state power is superior and thus is 'unlimited'. Unlimited refers to the ability to act from the position of the state upon the will of those subject to it (so far as this is physically possible). Unity refers to the sign that state power is the supreme power and that is is one. This leads to the next sign, indivisibility.

To effect state power, G. F. Shershenevich isolates the following functions: 1) imposition of the norms of law, 2) execution of acts of government within the boundaries of these norms, 3) protection of the norms of law from their violation. In analysing these functions, he arrives at the conclusion that they conform to the three branches of state authority (vlast'): legislative, executive and judicial.

Shershenevich accorded a principal role to government's administrative authority, calling it state power's source. The state mechanism becomes perfected in the course of its activity, which leads to an 'increase in the number of secondary agencies and wheels and cogs'. All the strength of the state 'mechanism coalesces in the hands of the agencies of state power'. Thus 'the more perfected the mechanism, the easier it is for one to control an enormous state'.

He proposed that state authority is 'granted by the very conditions of social life'. In his opinion Shershenevich argues that the limits of this authority depend on the extent to which the populace submits to the state (vlast'). If it 'allows itself to go too far beyond the limits that can be tolerated by the public's world-view, it must then expect an expression of its subjects' dissatisfaction', and the forms of this dissatisfaction 'may be diverse, from stifled grumbling to armed insurrection'. Law acts as the deterring, uniting element in society.

At the same time, Shershenevich was identifying the preeminent characteristics of a state governed by law (which is to say a state where the principal aim is that law rules over discretion everywhere and over everyone). The basic means of forming such a state are the removal of arbitrary exercise of power on the part of the state, a strict distinction of authority among government agencies and a restriction of the government by the protections of personal law. It is essential that each aspect of state power be expressed through particular acts – legislative ones set in law, executive ones through administrative actions, and judicial ones by means of court judgments. In a state ruled by law, each function must be accorded to a particular party. A legally instituted 'administration' and independent court are the main structures of a legal state.

It is important to note that Shershenevich's theory characteristically rejects the principle of divided government. If such an event would take place, the unity of the state could not be preserved. Thus he wrote: 'The legislative, executive and judicial are not three branches of government but three forms of controlling one, indivisible state power'. He went on to criticise the conclusions of Charles Louis de Montesquieu (1689-1755) regarding the division of powers and noted that Jean-Jacques Rousseau (1712-1778) had already subjected such a theory to severe criticism. 'Three equal powers cannot exist together: the one that is the stronger will be the true power, and the others will submit to it in any case and will cease to be independent powers.

Certainly one could find weaknesses in Shershenevich arguments. At once he presents three branches of government, legislative, executive and judicial, and then proclaims the error of divided government. Yet it would be improper to see an internal contradiction in Shershenevich's concepts where one simply does not exist. In the context of already-existing authorities, it is always possible to search out differing aspects and tendencies in the workings of the state. Likewise, an analysis of a legal entity's authority may also take note of its legal status. This tract does not propose that government activities be administered independently and divided from one another.

In fact, only a state can institute the rules in a society that can be called laws. Therefore, the norms of law are a requirement of the state and so law itself is a mutable substance. 'Law is a product of state power. Rules come out of it in the form of legislation that serves to justify the usefulness of the state to the citizenry which expects it to be so.' The state institutes law beginning 'with the principle of the common good'. Thus Shershenevich determined the basic outlines of the law: 1) law is expressed in the form of rules of behaviour, 2) legal norms have an enforceable character, 3) legal norms are supported by the force of the state (the state protects the norms of law from violations of them (effective rule of law)).

At the basis of law lies fear of the threat of punishment. A particularity of legal norms is that the threat of punishment comes from the state and is carried out by state agencies. Law is a norm (a rule) of behaviour whose adherence is upheld by the threat of suffering on the part of one who is subject to the state. If the requirement to observe norms comes from a higher power, then these norms are called legal. (15-17)

Furthermore, it is worth noting that Shershenevich held that 'there is no single government (vlast') in the world that possesses enough power to force a man to act as it would and not as he would'. The task of government is to assure that the social conditions under which citizens live equip them with choices that conform to lawful behaviour.

Shershenevich's position clearly wields a blow to the possibility of the existence of international law, generally held principles and human rights that could be characterised as 'supra-governmental law'. Indeed, in Shershenevich's position there can be no law which does not come out of the government. In the opposite case, it is not clear how to make possible proper enforcement of legal norms without the real prospect of incurring adverse consequences. Yet it is also necessary to consider the fact that 'international law' does not arise from somewhere. Here one should set in first place the so-called 'law of international treaties'. Accordingly, it is possible for a party to bear responsibility for the violation of rules of behavior that have been set by international agreements (that is, in the context of treaty obligations). A state in this case merely resembles an entity subject to civil law. In such case conflicts with international agreements (conventions) that have not been signed by the state in question (unratified agreements) are not considered. (18)

Therefore, Shershenevich's conception excludes the formal use of the term 'international law', though it does not go beyond the scope of law in the sense of the practical conditions behind concluding international treaties (agreements). In other words, there is a conflict over terminology that need not interfere with actual situations.

Somewhat more difficult, however, is the situation of so-called 'general principles of human rights'. The problem is not so much that this category is directly linked with theories of natural law in contrast with positivism. It is important to identify the list of these 'natural rights' which are recognized by a particular state. If one were to extrapolate from Shershenevich's theoretical model it is clear that this list is absent. In fact, each state has its own independent, legislatively enforced list of human rights. Amendments that might be made to this list are merely literary attempts to illustrate the significance, from the point of view of the contents, of their inclusion in the list of rights. Certainly, there are cases where, in effect, it is observed that legal powers of different states coincide. This, in itself, is not surprising considering the integrative tendencies in international development. And the number of such coincidences, in the end, must only be increasing. The fact of various states converging will, for obvious reasons, remove or at least reduce, the problem of enforcement. What would be the basis on which a state, firstly, will assume the even voluntary responsibility that does not conflict with its 'intra-governmental' legal system and that, secondly, will allow it to levy sanction against itself? Clearly, such arguments run against Shershenevich's claims. B. A. Kistyakovsky demonstrated that Shershenevich's theories have two overriding characteristics. The first is that the latter applied a purely psychological understanding to the notion of the necessity of law. This is expressed in the fact that legal norms are manifested by the threat of untoward consequences should they not be followed. The second is the 'utterly, exclusively formal and logical sequence he applied to all of his studies'.

G. F. Shershenevich's central position in his teaching of law is, rather, the following: Law is a norm directed toward the relation between one man and another, the threat of imminent suffering if he violates it, and the government agencies put in place to inflict that suffering. Shershenevich believed that law protects, above all, the inviolability of power.

Furthermore, he was in support of the notion of a 'sense of legality'. This was when a person must follow a law not from the sense of danger at the 'untoward consequences that menace him for his lack of adherence', but by virtue of the fact that the habit of 'following lawful prescriptions' works upon a person to make them adhere and 'demand they not deviate' from a law. He adds that, in his opinion, Russia is 'poor soil' for the development of a sense of legality: Russian citizens do not participate in the work of lawmaking ('he has invested neither his effort nor his blood' into it, and the 'norms that preserve order speak nothing to his heart').

3 Results and Discussion

Russia is one of the leaders in terms of the overall number of registered applications it has filed against it in the European Court of Human Rights. In December 2015, Russia adopted legislative amendments which means that decisions issued by the ECHR and other international courts are not enforced.

In 2014, 8,952 complaints against Russia were registered in the ECHR and in 2013, the number reached 12,328. The only country that had more applications filed against it than Russia in 2014 was Ukraine, with a total of 14,198.

In 2014, in respect of Russia, the ECHR recorded the largest number of violations of the right to liberty and security of person (56), the right not to be subjected to inhuman and degrading treatment (50, not including procedural violations and violations related to deportations/extraditions), the right to effective domestic means of legal protection from presumed violations of other rights (30), the right to a fair trial (24, not including excessive durations of trials and lengthy non-enforcement of judicial acts). (19-20)

In 2015, Russia became the leader among all countries with regard to the number of violations of human rights conventions - the ECHR established the presence of such violations in 109 complaints regarding Russia.

The most well-known ECHR verdicts in cases against Russia:

The death of civilians in Chechnya. A number of inhabitants of Chechnya managed to bring Russia to account for the deaths of civilians during the so-called counter-terrorist operation with the aim of preserving the republic within the composition of the RF. There are in excess of two hundred ‘Chechen cases’ being dealt with by the ECHR.

Khodorkovsky and the YUKOS case. A court adopted a decision ordering Russia to pay 1.86 bln euros in compensation to YUKOS company shareholders.

The storming of the centre on Dubrovka and the school in Beslan. In 2012, the ECHR decided that the decision on the storming had been justified, as had been the use of special means and gas. However, it did agree with the plaintiffs that the Russian military and security forces had committed a violation in the planning and execution of the assault and ordered the Russian authorities to pay between 9 thousand and 66 thousand euros to each of the 64 plaintiffs.

One of the most eagerly awaited decisions of the court in Strasbourg may be the analogous case of ‘Tagayeva and Others v. Russia’ – a class action filed by a combined total of 447 Russian citizens who suffered damages resulting from the capture of hostages by terrorists in the Beslan school in September of 2004. In the summer of 2015, the ECHR found the majority of the applications to be admissible. A verdict is expected in 2016.

Military aggression against Ukraine. Presently, more than 500 applications from residents of Ukraine on violations of their rights during the time of the RF’s aggression have already been deemed admissible by the ECHR.

On 15 December 2015, Vladimir Putin signed amendments to the Federal Law 'On the Constitutional Court of the RF'. According to the amended law, the Constitutional Court of the RF now has the power to adopt decisions on the impossibility of enforcing decisions of an inter-state organ for the protection of human rights and liberties (first and foremost the ECHR) should they contradict the Constitution of the RF.

Russia has thereby abrogated the priority of international law over domestic law and has given itself the opportunity to avoid enforcing ECHR decisions.

Thus, The Russian Constitutional Court (CC) concluded that it was impossible to execute judgment issued by the European Court of Human Rights (ECHR) in Strasbourg, the judicial authority operating as part of the Council of Europe's system of legal protection. The decision passed by the ECHR on 4 July 2013 imposed on Russia the obligation to amend the regulations depriving detainees of the right to vote (active suffrage). Pursuant to article 32 of the Constitution of the Russian Federation, any citizen placed in detention under a court verdict is deprived of active suffrage.

The amended Constitutional Court Act came into force in December 2015 and grants the CC with the right to rule that it is impossible to carry out a decision of an international court if the decision contradicts the principle of the prevalence of the norms set under the Constitution of the Russian Federation.

The Russian Constitutional Court's decision has set a precedent in the context of relations between Russia and the Council of Europe. This decision violates the obligations Russia took on when it joined the organisation. Article 46 of the European Convention for the Protection of Human Rights and Fundamental Freedoms (ratified by Russia in 1998) imposes the obligation on the parties to carry out the judgments of the ECHR. Russia did not raise any reservations that would have restricted or made conditional the execution of these judgments in the process of the convention's ratification. (21-23)

The CC's decision is the first case when the act of December 2015 was put into practice. The direct reason behind the hasty implementation of the legislative changes vesting the Russian Constitutional Court with new rights were the judgments passed by the ECHR and the Permanent Court of Arbitration in The Hague (PCA) in July 2014 in the cases that had been launched upon a motion from former shareholders of the Russian oil company Yukos, which were unfavorable for Russia. The ECHR ruled that Russia should pay damages of 1.9 billion euros, while the PCA ruled that it should pay around 50 billion euros. The amendments are also a consequence of the discussion underway over the past few years in Russia about the need to restrict external institutions' 'interference' with the functioning of the Russian legislative and political system. The ECHR's judgments quite often assume that legislative changes are necessary, while these changes frequently contradict the guidelines of the Russian government's domestic policy. According to statistics, Russia is the third country – after Turkey and Italy – in terms of the number of judgments stating that the country's obligations under the European Convention for the Protection of Human Rights and Fundamental Freedoms have been violated. (24-25)

Moscow's moves also need to be viewed in the context of strained political relations with the West in consequence of the Russian aggression in Ukraine. The Russian delegation's right of vote at the Parliamentary Assembly of the Council of Europe has been suspended since 10 April 2014. In response to this Moscow has suggested it may leave the organisation.

It is rather unlikely that the Russian Constitutional Court's decision is a sign that all rulings passed by international courts with regard to Russia will be rejected. However, it indicates that Moscow, by reserving the right to make arbitrary evaluations, will most likely reject those international solutions that it views as being politically disadvantageous. (26-27)

Whilst it is Russia's decision to have no further connection to the International Criminal Court (ICC) which is attracting the most attention, two legal steps taken by Russia to distance the country from the European Court of Human Rights may be of greater practical significance. Russia's Constitution -drafted by pro-Western liberals during the political crisis of 1993 – specifically provides Russian citizens the right to bring cases to international courts like the European Court of Human Rights. Since this is a right set out in Russia's Constitution, Russia is not in a position where it can simply quit the European Court of Human Rights, as some people wish it would do.

Recently, however, as following the breakdown in relations between Russia and the West the trend of decisions in the European Court of Human Rights has increasingly gone to Russia, the Russians have started to edge away from it.

Firstly, the Russians have reaffirmed that the court of ultimate appeal in any case involving the Russian Constitution is not the European Court of Human Rights but Russia's own Constitutional Court. Since the human rights provisions that the European Court of Human Rights enforces are set out in articles of Russia's own Constitution, that decision essentially transfers ultimate power to decide Russian human rights questions from the European Court of Human Rights to Russia's Constitutional Court.

The Russians are now taking the first step to give this affirmation practical effect. The Russian authorities have referred a decision of the European Court of Human Rights to award $1.86 billion to the former shareholders of Khodorkovsky's company Yukos to the Russian Constitutional Court for review.

The Russians have made no secret of their strong disagreement with this decision. If as expected the Russian Constitutional Court rules that the decision is inconsistent with Russian Constitution, then the decision will in effect have been quashed. This would be the first instance of a judgment of the European Court of Human Rights being quashed by the Russian Constitutional Court.

In parallel with this decision the Russians also took steps to signal their disagreement and to subvert a decision of the European Court of Human Rights which concerns the Russian liberal politician Alexey Navalny. In 2013 Navalny was convicted on theft and embezzlement charges by a court in Russia's Kirov region in a case involving Kirovles, a Russian timber company owned by the local regional government. I researched the case at the time and concluded that Navalny would almost certainly have been convicted on the same facts in a British court.

The European Court of Human Rights took a different view, and made a decision that looked to me less like a reasoned judgment and more like a copy of one of Navalny's own press releases which said that the judgment was not only wrong but that the case that had been brought against Navalny had been concocted for political reasons.

Following this decision of the European Court of Human Rights Russia's Supreme Court (which is not to be confused with Russia's Constitutional Court) has formally quashed Navalny's conviction by the Kirov court. However, instead of simply quashing the decision, to Navalny's anger it has ordered that the case Is retried, and has pointedly said that in the event that Navalny is reconvicted certain restrictions on his legal rights will be reimposed.

This is an elegant way of following the letter of the European Court of Human Rights' decision, whilst going flatly against its spirit, and doing so in a way that makes clear the Supreme Court's disagreement with its decision. Clearly, the Supreme Court does not accept that the case against Navalny was a travesty. Had it done so it would simply have simply quashed the judgment. In light of this, it is not surprising that Navalny is reported to be angry with the decision though whether the

Russian authorities will feel that there is any point in continuing with the prosecution after so much time has passed is another matter.

With the world's three strongest powers – the US, China, and Russia – all now refusing to have anything to do with the International Criminal Court, and with several African countries led by South Africa now pulling out of it, the International Criminal Court is losing such importance as it once had.

The European Court of Human Rights has existed for far longer, and the quality of its jurisprudence has been much greater. Britain is however now committed to withdrawing from its jurisdiction, and Russia is now taking steps to guard its legal system against its interference.

Meanwhile, following the change in Russian and Chinese attitudes in the UN Security Council, the days when the Western powers were able to use the UN Security Council to set up ad hoc tribunals, like the one concerning Yugoslavia, has passed.

One way or the other the high-water mark of attempts to impose a Western-sponsored international justice seems to be passed.

4 Conclusion

The state must develop among the populace a relation toward the law that is like that toward its own munificence, allowing for the compliant fulfillment of the law under the threat of punishment. Furthermore, legality must be formal and not 'for each unto his own' just as, indeed, justice must be.
Considering that the majority of Russian legal scholars have been brought up under Soviet legal practice, they are, for the most part, inclined towards a statist tradition in the execution of the law. It would thus be unfair to expect a fundamentally different approach from the Constitutional Court of the Russian Federation. The principle of state sovereignty cannot, in any full sense of the term, be limited by that which is exterior to the body of the state.

Literature:

1. Russia and the European Court of Human Rights; n.d. Available from: http://www.srji.org/en/echr/russia
2. European Court of Human Rights; n.d. Available from: ttp://echr.coe.int
3. The Constitution of the Russian Federation. Available from: http://www.constitution.ru/en/10003000-01.htm
4. The Federal Law since 30.03.1998; n.d. Available from: http://www.kremlin.ru/acts/bank/12169
5. Convention for the Protection of Human Rights and Fundamental Freedoms; n.d. Available from: http://hrlibrary.umn.edu/instree/z17euroco.html
6. The Constitutional Court of the Russian Federation, Available from: http://www.ksrf.ru/en/Info/Pages/default.aspx
7. M. Alekhina. Rossii dali polgoda na ispolnenie resheniya ESPCh po "Delu YUKOSa" [Russia Has Six Months to Implement the ECHR's Decision in the "YukosCase"; n.d. Available from: http://www.rbc.ru/society/10/03/2017/58c2c3be9a794728aa9cc5ad?from=newsfeed&utm_source=news_feed
8. A. Osavoliyk, Russia's ignoring of European Court of Human Rights decisions; 2016, Available from: http://en.odf oundation.eu/a/7280,russia-s-ignoring-of-european-court-of-human-rights-decisions
9. Abolished Committee against Torture appeals against a fine for breaking the foreign-agent law. Interfax news agency; 2015.
10. Law about 'undesirable foreign non-governmental organisations' excludes the possibility of work by any organisations that authorities dislike. Pravovoy analiz [Legal analysis]; 2015.
11. United Nations Convention on Jurisdictional Immunities of States and Their Property; 2004. Available from: http://legal.un.org/ilc/texts/instruments/english/conventions/4_1_2004.pdf
12. The ruling of the Plenum of the High Court of the Russian Federation, 27 June 2013, No. 21, 'O primenenii sudami obschei yurisdiktsii Konventsii o zaschite prav cheloveka i osnovnykh svobod ot 4 noyabrya 1950 g. i Protokolov k nei (On the assent of the courts to the general legal Convention for the Protection of Human Rights and Fundamental Freedoms of 4 November 1950, and its Protocols); 2013. Available from: http://www.garant.ru/hotlaw/federal/481520
13. Claimant in foreign-agent case asks Constitutional Court to explain its decision. Vedomosti daily newspaper. 2015.
14. Committee against Torture fined for leaflets without mention it is a foreign agent. OVD-Info; 2015.
15. Human rights centre of Kabardino-Balkaria will not challenge foreign-agent status. Regnum information agency; 2015.
16. Soros and Carnegie Foundations could be next after banning of NED. Moskovsky komsomolets daily newspaper. 2015.
17. Federation Council prepares a patriotic list of banned organisations for 8 July. Gazeta daily newspaper. 2015.
18. Federal Law No 287, 3 July 2016, amendment about establishing the status of NGOs carrying out "socially useful services"; 2016.
19. Foreign agents banned from observing conditions in prisons and penal colonies. Vedomosti daily newspaper; 2015.
20. Foreign agents turned out to be double agents. Kommersant daily newspaper; 2015.
21. Harsher measures postponed. Novye Izvestiya daily newspaper; 2015.
22. Decision of the Constitutional Court of the Russian Federation in the case of verification of the constitutionality of the provisions of Article 1, The Federal Law "On the Ratification of the Convention on the Protection of Human Rights, fundamental freedoms and the Protocols thereto"; n.d. Available from: http://doc.ksrf.ru/decision/KSRFDecision201896.pdf
23. Decision of the Constitutional Court of the Russian Federation in the case of the resolution of the issue of the possibility of execution in accordance with the Constitution of the Russian Federation of the judgment of the European Court of Human Rights of 4 July 2013 in the case of "Anchugov and Gladkov against Russia" in connection with the request of the Ministry of Justice of the Russian Federation; 2013. Available from: http://doc.ksrf.ru/decision/KSRFDecision230222.pdf
24. The Charter of the United Nations; n.d. Available from: http://www.un.org/en/charter-united-nations/index.html
25. The Universal Declaration of Human Rights; n.d. Available from: http://www.un.org/en/universal-declaration-human-rights/index.html
26. Russian court rejects ECHR order on $2bn Yukos compensation; n.d. Available from: https://www.rt.com/politics/374197-russian-court-rules-echr-order/
27. Russia versus the European Court of Human Rights: Russia rejects the Court's Yukos verdict; n.d. Available from: http://theduran.com/russia-versus-european-court-human-rights-russia-rejects-courts-yukos-verdict

Primary Paper Section: A

Secondary Paper Section: AG

FORMATION OF THE LOGICAL-INFORMATIONAL CULTURE OF A PRESCHOOL TEACHER

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Abstract: The modern stage of development of society and education is characterized by the introduction of new information technologies and the active use of a dynamic information environment. In the conditions of changes in the information environment, the specialist's ability to perceive a significant amount of information, as well as comprehend, analyze and systematize information, transfer it to a new educational and professional situation, is of particular relevance. A modern specialist faces the need to use new information environments, the development of which becomes possible within the framework of an intuitive interface ideology. The modern development of the system of preschool education involves the active introduction of innovations in the educational and upbringing process of preschool educational institutions, which affects the efficiency of its activities. In this case, the innovation processes in the framework of preschool education are an instrument for creating and developing a competitive educational environment aimed at developing the personality of the child.

Keywords: preschool education, preschool teacher, skills, information culture, modernization.

1 Introduction

The main contradiction of the modern education system is considered by scientists as a contradiction between the rapid growth rate of knowledge in the modern world and the limited possibilities of their assimilation by the individual. At the stage of the formation of the information society in the conditions of the "information explosion" and changes in the information environment, not only the ability to perceive a certain amount of information but also the ability to comprehend, systematize and transform the gained knowledge into a new learning situation, logical skills. The increase in the volume and efficiency of the use of information is achieved through the classification, abstraction, and coding with a combination of intuitive-logical and formal-logical human activity. All this underlines the importance of the problem of forming logical skills, the special relevance of which is connected with the preparation of preschool teachers.

In addition to that, the analysis of psychological and pedagogical literature shows that, although as a result of numerous studies of the problem of the formation of various skills, a great positive experience has been gained, they do not give an answer to the question of the formation of logical skills among preschool teachers, as well as the pedagogical conditions of their formation in the modern information environment.

A necessary condition for the qualitative renewal of society is the multiplication of its intellectual potential. The intellectual level of an individual is characterized in general by two main parameters: the volume of acquired information and the ability to use this information to solve various problem situations arising in the course of activity. The first of these parameters characterizes the erudition of a person, the second is his/her information development. The basic skills of a person include such skills as the ability to analyze, compare, summarize, substantiate and prove judgments, to formulate clear definitions. These skills develop logical intuition, briefly and clearly reveal the mechanism of logical constructions and teach their application. (1-2)

The connection of pedagogical activity and logical skills specific to the present stage can be traced in the qualification requirements for preschool teachers. First, pedagogical activity is based on logical abilities to operate information, secondly, it is aimed at creating a logical base for active use by pre-schoolers of the possibilities of the modern information environment. Thus, the relevance of considering the formation of logical skills of future preschool teachers is emphasized both from the standpoint of formal logic and the logic of algorithmized information environment, and its impact on the child.

The problem of forming the logical skills of preschool teachers was not the subject of special research by scholars and practitioners. This is due to the insufficient development of the theoretical and methodological foundations of the formation of the logical skills of the teacher and the corresponding technology of this process, as well as the specifics of the pedagogical activities of preschool teachers. (3)

A future teacher turns out to be professionally prepared for scientific and experimental work if he has logical skills, means, methods and techniques for solving pedagogical research and analytical tasks, the types and characteristics of which may change in the course of further work. In this regard, the process of preparing the future preschool teacher should be adjusted on the basis of feedback, ensuring the formation of his necessary logical knowledge and skills in accordance with the actual needs of pedagogical science and practice at the present stage.

2 Materials and Methods

The modern development of the system of preschool education involves the active introduction of innovations in the educational and upbringing process of preschool educational institutions, which affects the efficiency of its activities. In this case, the innovation processes in the framework of preschool education are an instrument for creating and developing a competitive educational environment aimed at developing the personality of the child.

In educational practice, in order to create favorable conditions for the development of children, not only the content is important, but also the technology of training and education. One of these innovative resources is information and communication technology (ICT), which contributes to the availability, variety of learning, increased activity and mobility of preschool children.

One of the main conditions for the use of ICT in the preschool educational process is that teachers should work with children who know the technical capabilities of a computer, know how to work with it, clearly follow sanitary standards and rules for using computers in preschool institutions, are well-versed in computer programs developed especially for preschoolers, who know the ethical rules of their application and know how to introduce children to new technologies. In addition, teachers should be well aware of the age-related anatomical, physiological and psychological characteristics of young children and the specifics of the diagnosis of educational activities in a preschool educational institution. Creative teachers, striving to keep up with the times, need to study the possibilities of using and introducing ICT into their practical activities, be a conductor for the child to the world of technologies, form the basis of information culture. (4-5)

The ICT competence of a teacher is understood as his willingness and ability to independently use modern information and communication technologies in pedagogical activity to solve a wide range of educational tasks and design ways to improve their skills in this area.

Improving the ICT competence of the teacher allows to intensify and facilitate his work, there is an opportunity for the development and self-development of the teacher, improving his educational and methodological activities.

For teachers, information and communication technologies have the following possibilities for using them in the educational process:

1. Stimulating interest in children's educational activities.
2. Continuous professional development of teachers.
3. Perception and creative implementation of existing non-standard approaches in education.
4. Increase the choice of means, forms, and pace of studying topics.
5. The use of free educational resources and heuristic programs of information and educational space.

Nowadays, only a few teachers of preschool institutions who have received special training use ICT in preschool education. This problem is being actively solved at all levels of education.

Consequently, professional qualification is an integral education, which includes experience, motivation, personal qualities, and other professional characteristics. It directly affects the quality and performance of the employee's activities, ensures readiness and ability to perform various professional tasks.

Qualification categories imply, first of all, differentiation of the level of complexity and quality of solving professional (functional) tasks facing the employee. Each teacher to confirm or improve their professional qualifications should be able to use modern technical means.

The main psychological and pedagogical conditions for solving this problem were identified. The system of work on the formation of ICT competence among teachers should be aimed at acquiring a new means of professional activity, that is, at mastering tools, techniques, methods and technologies that are significant for the pedagogical activity. Educators should be given opportunities to improve their skills and professional competence. To stimulate the increase of teachers' motivation for self-knowledge, building up their personal, general cultural and professional potential. Teacher training should be based on vigorous activity and a differentiated approach (work experience, basic education, age, etc.). Creating a situation of psychological satisfaction of teachers from the use of ICT in pedagogical activities and at the expense of the real needs of the pupils in these facilities. (6)

Educational activities using ICT allow for the integration of audiovisual information presented in various forms (video, animation, slideshow, music, etc.), stimulates children's involuntary attention due to the possibility of demonstrating objects and phenomena in dynamics. Possession of ICT teachers can increase the flow of information on the content and methods of working with children in direct educational activities, and also reduces the time required to prepare for it. (7)

Teachers should remember that the most important component of preschool education is the activity of the students. Different types of direct educational activities can complement each other, and they must change at all stages of the child's development. Thus, at the age of five years, the basis for such upbringing should be the learning nature of gaming activities using ICT. Inquisitive, emotional preschoolers can learn from the game on the computer. Children remember and reproduce only what is connected with their interests, therefore such an activity should be specific, concise and understandable. Mastering information should be based on the experience of the child.

Information and communication technologies as a phenomenon of modern education allow the modern teacher to modernize the teaching and educational process and have the quality advantage of an educator over colleagues who operate only within the framework of traditional technologies.

Thus, the formation of ICT competence among preschool teachers helps to feel comfortable in the new socio-economic conditions, and for an educational institution to switch to the mode of functioning and development as an open educational system.

In the professional activity of a teacher, the ability and desire to find new information, facts, materials, to use them in practice is important. This is especially true today when the timeframe for updating information is rapidly reduced, while its volume increases. The information society requires the emergence of a new type of education, in which study becomes an essential attribute of a person's entire life. Today, in order to become (and remain) a specialist, it is necessary to constantly assimilate new knowledge, not limited to those that were once acquired in an educational institution. The combination of qualities that allow to carry out this activity effectively indicates a high level of information culture.

The information culture is understood as the ability to work purposefully with information (search, selection, creation), use it for receiving, processing and transmitting information tools and information technologies. Information culture should be considered as a complex system of education, reflecting the integration of knowledge about man and the culture of mankind.

Information culture of the teacher includes the following characteristics:

1. In the intellectual sphere:

- thinking (ability to analyze information resources and identify their capabilities in solving the tasks of pedagogical activity, to show creativity, flexibility, criticality, systematic, mobility and quick thinking in situations of searching, transforming and transforming the necessary information);
- knowledge of information technology.

2. In the motivational sphere:

- the motivation for the development of information culture (the desire to master modern information technologies, the desire to learn best practices in the field of informatization of education, focus on achieving a high level of information culture).

3. In the volitional sphere:

- purposeful actions in the information environment (volitional resolution of contradictions, the ability to perform activities at the optimal level of activity, mental stability in relation to difficulties);
- patience and self-control in situations of information retrieval, its processing for educational purposes;
- perseverance in mastering new information technologies.

4. In the emotional sphere:

- the ability to understand one's own emotional states in situations of searching and processing information (focusing on the ways and means of obtaining information);
- the ability to adequately experience the lack of results, technical and other obstacles when working in the information environment;
- the ability to adequately assess their own achievements in the use of information technology, their level of information culture.

5. In the subject-practical field:

- the ability to reproduce and develop new knowledge, types, forms of activity in the information environment;
- readiness for collective activities using information technology;
- possession of operational skills (ability to work with software, make decisions, select the necessary information, generate ideas);
- possession of information processing skills;
- the ability to use information tools and technologies;
- the ability to navigate the information environment. (8-10)

In the conditions of informatization of education, the general complex of professionally important qualities necessary for the

success of a professional activity is complemented by specific qualities that characterize the level of information culture of the teacher. O.V. Krasnova (11) refers to them the following:

1. Aspiration:

- interest in modern methods of information exchange and the search for all new ways to intensify the educational process on an informational basis;
- the need for constant updating of knowledge about the possibilities of using information technologies in the professional and general cultural environment;
- professional mobility and adaptability in the information society.

2. Personal qualities:

- responsibility when working with technical equipment, a combination of personal freedom and responsibility for the information security of society and the individual;
- consistency in the formulation and sequential solution of pedagogical problems using information technology tools;
- confidence in the correctness of non-standard decisions.

3. Position:

- attitude to information, objects, and phenomena in a rapidly changing information environment, critical attitude to information consumption;
- style of pedagogical communication and interaction with people within the information environment, self-assessment, and reflection at the level of informational contacts;
- statement of morality and tolerance in computer communication.

The level of formation of the information culture of a teacher can be determined by the following set of criteria indicators:

1. The state of information identity of the teacher (general cultural and professional erudition; understanding and acceptance of the values of information activities; reflectivity of the professional position; use of information educational resources for self-education; consistency of real activities with values).
2. The development of information technology skills (the use of information technology in solving actual pedagogical problems; the availability of a flexible system of skills; participation in providing information interaction in an educational institution).
3. Creative activity and independence (participation in project activities, the creation of own information products; the presence of the author's position (methodology); the ability to make choices and attract the necessary information resources).
4. Emotional attitude to information activities (positive professional self-assessment; interest in information activities; satisfaction with the results of their own information and educational activities).
5. Success and effectiveness of information and educational activities (availability of achievements in the field of information and educational activities; recognition by the professional community; participation in joint projects with other specialists).

Information culture (IC) of the teacher is an integral part of the basic culture of the individual. In the context of the problem we are studying, the information culture of a teacher is defined by us as a system characteristic of a person, which allows him to effectively participate in all types of work with information such as receiving, accumulating, coding and processing, creating on this basis qualitatively new information and its transmission, practical use. In the conditions of the information society with the transition to the qualitatively new technologies of working with information, wide prospects are opening up to meet the information needs and requests of the individual, the requirements for the level of its information culture are significantly increased, the tasks of its formation are being updated. It is no longer enough for a specialist to possess multidimensional knowledge about information processes and to be able to apply them at a high professional level within the framework of their activities.

The information culture of a teacher in the framework of its formation and development in the system of additional education should be considered structurally at the following levels: conative-targeted (availability of motivation to achieve the goal, need and interest in obtaining knowledge and skills in the field of hardware, software, and information); cognitive (the presence of a set of social, natural and technical knowledge, reflecting the system of the modern information society, as well as knowledge, which constitute the informative basis of search cognitive activity); operational activity (activity on receipt, accumulation, coding and processing, creation on this basis of qualitatively new information, its transfer and practical use; estimated and reflexive (experience of searching activity in the field of software and technical resources, ensuring readiness for the search for the solution of the professional problems presented). Technological and didactic components of the information culture of the teacher are realized through the following functions: cognitive (it promotes the systematization of knowledge, perception, and self-knowledge by the specialist himself); communicative (allows for multidirectional exchange of information); adaptive (allows you to adapt to the conditions of life and activities in the information society); regulatory (implemented through following the system of moral and legal norms and requirements in the information society); evaluative (implies the ability to navigate information flows, identify and select known and new, evaluate relevant and secondary information); interactive (aimed at active independent and creative work of the subject of educational activity, leading to self-development, self-realization). (12-13)

It is proved that management informatization allows you to create an information and educational environment, which includes technical, software, telecommunications tools that provide access to information for children, teachers, parents, as well as create conditions for personality-oriented interaction of all participants of educational relationships. The unified informational and educational environment provides support for the educational process and automation of management activities, ensures an increase in the quality of education and the level of interaction of all participants in educational relations. The solution of the problem of informatization of education is possible within the framework of the formation of an information culture for all participants of educational relations. (14)

Currently, a new approach to personnel management has been announced; this is the management of the competence of the teaching staff, which includes comparing the needs of the institution with the available human resources and selecting the goals, content, forms, and means of activating the staff in accordance with the needs of the institution. (15) At present, there is a need for personnel able to navigate the information environment, able to communicate using information tools and technologies, and able to relate their activities, their level of information culture with social and professional experience.

Unfortunately, preschool educational institutions, teachers have found themselves in some isolation from the modern world of information technology. As the practice of management shows, the analysis of periodicals, heads of preschool institutions have serious difficulties associated with the introduction of information educational technologies in educational and management processes.

3 Results and Discussion

In the context of the modernization of the preschool education system, the introduction of the state educational standard for preschool education, there is a need to search for new modern technologies, including information technologies, to achieve qualitatively new educational results for the development of preschool children. (16)

Thus, there is a contradiction between the growing public demand for the quality of preschool education and the insufficiently effective organization of the informatization process in the preschool institution.

We highlight the following reasons for the poor organization of this process:

- low level of information culture of participants of educational relations in preschool institutions implementing the basic general educational program of preschool education;
- low level of motivation of teachers to use information resources in their professional activities;
- the presence of psychological fear of the computer, especially among older teachers;
- the lack of programs for the retraining of teachers. Traditional advanced training courses for teachers are aimed at the formation of computer literacy and do not orient teachers to the use of IT in their practical professional activities;
- lack of tools for determining the state of informatization of preschool institutions and self-analysis of the informatization of their professional activities;
- lack of computer programs designed for automated work.

In identifying the requirements for the implementation of pedagogical conditions for the formation of logical skills of future preschool teachers in the modern information environment, we considered the specific nature of logical skills, their relationship with the teacher's professional skills and the specificity of the information environment development from the standpoint of subjects of information interaction.

Solving the problem of considering the specifics of the formation of logical skills in the modern information environment, we proceeded from the fact that the process of the formation of logical skills is based on the inclusion of the teacher in various activities in conjunction with multidimensional computer training. The greatest attention should be focused on the strength of assimilation of the proposed information, therefore the situations for using the material should be problematic, based on the teachers' personal experience. (17-18)

The following requirements for the implementation of pedagogical conditions are substantiated:

1. A complex combination of professional and educational activities of the future teacher in the logic of the intuitive interface of the information environment, which implies the integrated use of computer technology based on the logic of the information algorithm.
2. Inclusion of active teaching methods in the process of formation of logical skills, which implies the use of various types of learning situations, considering the peculiarities of information interaction of the subjects of the future preschool teacher preparation process and considering the age characteristics of children.
3. The use of a system of formal logical exercises containing professionally significant educational material, which ensures the consistent formation of logical skills from individual logical skills to logical procedures. (19-20)

4 Conclusion

The study of the real state of the problem of the formation of the logical skills of preschool teachers in the modern information environment in the theory and practice of education revealed a number of unresolved issues. The educational process of preparing preschool teachers for professional pedagogical activity does not include preparation for the formation of logical skills among younger students, which, according to many scholars, is the basis for their intellectual development. A significant part of preschool teachers with different pedagogical experience is at a low level of preparedness for this type of activity. The need to solve this problem led to the study of pedagogical conditions conducive to the formation of the logical skills of future primary school teachers. The relevance of the study of the formation of the logical skills of future primary school teachers in the modern information environment is determined by the needs of the educational process at the present stage, its focus on the need to train a specialist working in an information society under construction, and insufficiently developed research problems in educational science.

At the present time, in the period of informatization of education, it is important for students to develop the skills not only to independently replenish knowledge but also to orient themselves in the rapid flow of information. At the same time, it is important for students to be able to isolate the necessary information from the entire flow, to cut off the destructive information.

In the modern information environment, the most important logical skills for a teacher are the skills of analyzing a specific learning situation.

The logical skills of the future preschool teacher in the modern information environment, on the one hand, are connected with the activity of processing pedagogical information, on the other hand, all of the school skills are based on them. The content of logical skills lies in the set of logical operations and procedures included in the teacher's professional skills, with various types of interrelations necessary for the formation of professional skills. (21)

Modern information environment gives a person great opportunities for creativity. However, their use requires the formation of logical skills. The formation of logical skills is influenced by the features of the information environment, which are significant for the leading actors in the process of preparing a future preschool teacher, including a teacher and children.

The formation of logical skills of preschool teachers in the modern information environment occurs sequentially from disparate logical operations to logical procedures and is ensured by the optimal combination of intuitive-logical and formal-logical activities of future teachers.

Pedagogical conditions have a scientific and theoretical significance and can find the practical application at all stages of vocational training of preschool teachers.

The process of formation of logical skills is traced only in the study of computer science, the issues of developing programs and teaching and methodological support of the processes of formation of logical skills of students and preschool teachers in the modern information environment in various disciplines of professional education remain relevant.

Literature:

1. Usova SN. Formirovaniye gotovnosti k professionalnoy tvorcheskoy samorealizatsii budushchego uchitelya [Formation of readiness for professional creative self-realization of the future teacher] [dissertation]. [Kazan]; 2002.
2. Talmanova TM. Formirovaniye issledovatelskoy kompetentsii uchitelya v sisteme nepreryvnogo obrazovaniya [Formation of the research competence of the teacher in the system of continuous education] [dissertation]. [Moscow]; 2003.
3. Abramyan GV. Teoreticheskiye osnovy professionalnogo stanovleniya pedagoga v informatsionnoy srede [Theoretical foundations of professional development of a teacher in the information environment] [dissertation]. [Saint Petersburg]; 2001.
4. Katz LG. Developmental Stages of Preschool Teachers. The Elementary School J. 1971 Oct; 1: 50-54.
5. Gazizova AI. Metod komponentnogo analiza kak sposob osushchestvleniya kontrolya urovnya sformirovannosti umeniy [Component analysis method as a way to control the level of skills]. Kazan: KGU; 2003.
6. Galkina YeA. Sistema kvalimetricheskikh izmereniy effektivnosti pedagogicheskikh innovatsiy [The system of qualimetric measurements of the effectiveness of pedagogical

innovations]. Metodologiya i metodika nauchnykh issledovaniy. 2000; 2:174-6.
7. Danilchuk YeV. Informatsionnyye tekhnologii v obrazovanii [Information technology in education]. Volgograd; 2002.
8. Zeyer EF. Psikhologiya lichnostno-oriyentirovannogo professionalnogo obrazovaniya [Psychology of student-centered vocational education]. Ekaterinburg: Izdatelstvo Uralskogo prof-pedagogicheskogo universiteta; 2000.
9. Rubin KH, Clark ML. Preschool teachers' ratings of behavioral problems: Observational, sociometric, and social-cognitive correlates. J Abnorm Child Psychol. 1983; 11(2):273-85.
10. Kiselev NN. Informatsionnaya potrebnost kak faktor sotsializatsii lichnosti [Information need as a factor in the socialization of the individual] [dissertation]. [Kemerovo]; 1998.
11. Krasnova OV. Razvitiye informatsionnoy kultury lichnosti kak kompleksnaya professionalno-pedagogicheskaya problema [Development of personal information culture as a complex professional and pedagogical problem]. Moscow: OIM.RU; 2000-2001.
12. Bogush AM. Predshkolnoye obrazovaniye: realii i perspektivy [Preschool education: realities and prospects]. Saint Petersburg; 2017:61-71.
13. Guo Y, Justice LM, Sawyer B, Tompkins V. Exploring factors related to preschool teachers' self-efficacy. Teaching and Teacher Ed. 2011; 27(5):961-8.
14. Kowalski K, Pretti-Frontczak K, Johnson L. Preschool Teachers' Beliefs Concerning the Importance of Various Developmental Skills and Abilities. J of Res in Childhood Ed. 2011; 16(1):5-14.
15. Pajares MF. 1992. Teachers' beliefs and educational research: Cleaning up a messy construct. Review of Ed Res. 1992; 62(3):307-32.
16. McMullen MB, Elicker J, Goetze G, Huang H-H, Lee S-M, Mathers C, Wen X, Yang H. Using Collaborative Assessment to Examine the Relationship between Self-Reported Beliefs and the Documentable Practices of Preschool Teachers. Early Childhood Ed J. 2006; 34(1):81-91.
17. Hsieh W-Y, Hemmeter ML, McCollum JA, Ostrosky MM. Using coaching to increase preschool teachers' use of emergent literacy teaching strategies. Early Childhood Research Quarterly. 2009; 24(3):229-47.
18. Gendina NI. Kontseptsiya formirovaniya informatsionnoy kultury lichnosti: opyt razrabotki i realizatsii [The Concept of Forming an Information Culture of a Person: Experience in the Development and Implementation]. Otkrytoye obrazovaniye. 2005; 6:74–82.
19. Gershunskiy BS. Filosofiya obrazovaniya dlya XXI veka (v poiskakh praktiko-oriyentirovannykh obrazovatelnykh kontseptsiy) [Philosophy of Education for the 21st Century (in search of practice-oriented educational concepts)]. Moscow: Sovershenstvo; 1998.
20. Karakozov SD, Nasyrova NKh. Informatsionnaya kultura v kontekste obshchey teorii kultury lichnosti [Information culture in the context of the general theory of personal culture]. Pedagogicheskaya informatika. 2000; 2:41–54.
21. Khutorskoy AV. Klyuchevyye kompetentsii kak komponent lichnostno-oriyentirovannoy paradigmy obrazovaniya. Narodnoye obrazovaniye [Key competencies as a component of the personality-oriented educational paradigm]. 2003; 2:58–64.

Primary Paper Section: A

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TYPOLOGY OF LARGE CITIES OF THE REPUBLIC OF KAZAKHSTAN BY THE LEVEL AND DYNAMICS OF SOCIO-DEMOGRAPHIC DEVELOPMENT

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Abstract: The purpose of the study: estimation of socioeconomic disparities on the basis of bivariate analyses at the example of large cities of the Republic of Kazakhstan; creation of a typology of cities in Kazakhstan with a population over 100 thousand people in the function of two interdependent variables – the level of development and growth. Research methods: the article uses the method of static-dynamic analysis of differences in the level of socio-economic development on the basis of the developed system of indicators and the typology of cities formed on its basis. This typology provides for the division of territories into four groups depending on the level of their development in statics and dynamics. The analytical base includes 16 statistical indicators on 8 blocks of socio-economic status for the period 1999-2016 (17 years) in the context of 22 major cities of the Republic of Kazakhstan with a population of more than 100 thousand people. Findings: results of the application of this technique on the example of large cities of the Republic of Kazakhstan in the study period allow us to conclude that the socio-economic indicators of many cities are significantly behind the national average for urban areas. Only 3 cities out of 22 studied are ahead of the average national values in terms of the level and dynamics of social, demographic and economic indicators, which indicates a significant differentiation of socio-economic development of cities during the study period. Application: use of the results of the static-dynamic analysis of differences in the levels of socio-economic development of cities covers the issues of socio-economic management of regional development, allows to accumulate and direct anti-crisis measures to support the most vulnerable areas of lagging and slow in the development of cities.

Keywords: Cities of Kazakhstan, Socio-economic development of cities, Typology of cities, Two-dimensional static and dynamic analysis, Typology, Classification, Level and dynamics of development, Urban development.

1 Introduction

Nowadays, the fact that the future of the inhabitants of the world depends entirely on the development of the city becomes uncontested.In this regard, the study of the socio-economic development of cities is of great interest. This interest is due to a number of circumstances, firstly, the city, this is the place of localization of production, financial, human, information flows and the center for the development of innovation; secondly, the cities are the centers for the development of economic, political, social, demographic and cultural processes; sustainable development of the state is impossible without sustainable development of cities.

The Republic of Kazakhstan occupies the ninth place in the world in its area. Its length is 2724.9 thousand km. In this fairly large territory, there are 87 cities. (1) About 57% of the population of the whole country is concentrated in the cities, most of the enterprises, organizations, scientific and educational centers.

The processes of urbanization and population concentration in large cities are typical for all states. The problems of large cities as centers of economic development are of special importance for Kazakhstan. According to the enacted State Programs, large and large cities as agglomerations should provide a "breakthrough" in the development of the country's economy and as hub cities, become "centers of economic activity of macro-regions, concentration of capital, resources, advanced technologies and services." (2) From this, it follows that the state considers these cities as a territorial-economic system of special rank and functional orientation.

In the Forecast Scheme of Spatial Development of the country until 2020, tasks are set to increase the competitiveness of the regions, the formation of an optimal system for organizing economic potential and the resettlement of the population. (3)

This implies the development and support of settlements, taking into account their economic potential and development prospects, demographic trends.

In the conditions of the dynamically developing economy of Kazakhstan, the problems of the development of large cities acquire a special urgency, and their solution is also a key factor in the balanced development of the economy as a whole.

The problem of the survey of the socio-economic condition of settlements is primarily related to the problem of developing an adequate system of indicators or indicators that allow to form a full-fledged management cycle and ensure the adoption of adequate management decisions.

Since the 1990s, in many countries of the world, national systems for examining the social and economic development of cities, municipal districts, regions, etc. began to develop intensively. This was due to the progress of information technology, which made it possible to more quickly collect, group and analyze large amounts of statistical information at various levels of government.

In 1989, the European Network for Urban Research (N.U.R.E.C.) (4) was established to create a unified database of indicators for the analysis of the current development of cities in the European Union and other regions of the world. Within the framework of this network, during the 1990s, several major projects for the development of integrated urban development indicators were implemented: the EUROPOLIS Database, the Large Cities Statistical Project, the Structural Change of the European City System.

In response to the growing demand for versatile comparative information on European cities, among the developers of social and economic development programs for urban areas in Europe, in 1996 the European Commission decided to launch a program to establish a system for regular monitoring of urban development in the countries of the European Union. Within the framework of this program, the “Urban Audit” project was launched, which aims to measure the quality of life in urban settlements in the European Union through a set of relatively simple and intuitive indicators. The system of indicators of the project "City audit" consists of 333 indicators, resulting in approximately 270 indicators in 9 directions. (5)

Among the wide variety of national urban development survey systems, the system developed by the Department of Transport, Local Government and Regional Development of Great Britain (DTLR) stands out. Its task is to evaluate the existing system of public services in a city with the help of a specific set of indicators and thereby assess the effectiveness of local government activities. Within the framework of this system, Best Value Performance Indicators was developed in an effort to reflect the resources involved in the provision of services, the effectiveness with which these resources are used, the quality of services, and the users' impression of the result.

In 1990, the NORDSTAT project (Nordic major cities statistics) was launched, the goal of which was to create a database of indicators that could be compared. When developing this project, the Habitat methods were taken into account. The advantage of this system was that it took into account the difference between compared objects, to this end, when selecting indicators in the NORDSTAT database, all city indicators were divided into three groups according to the degree of adequacy for cross-country comparisons: sizeable indicators - easily calculated indicators such as population size, the number of facilities, schools, hospitals, etc.

Doubtful indicators are indicators that can be easily compared, but require preliminary analysis before comparison, for example, labor market or environment indicators; disparate indicators - indicators are not suitable without analyzing the differences in the socio-economic systems of countries, for example, indicators of welfare, income.

Leading research organizations of the world have not developed a unified approach to assessing the level of development of urbanized areas, each of which offers its own index and its system of calculated indicators. The systematization of the indices most often used for the level of urban development is given in Table 1. (6)

Table 1. Indices of Assessing the Level of Urban Development

Authors	Index	Considerations
McKinsey, Global Institute	Urban Sustainability Index (USI)	Society Economy Environment Urban planning environment Resources
UN	City Prosperity Index (CPI)	Productivity Quality of life Infrastructure Environment Inequality
UN	City Development Index (CDI)	Volume of production Health Education Infrastructure Amount of waste
The index of quality of life in the cities of the world	Mercer Human Resource Consulting	Political and social environment The economic environment Socio-cultural environment Health and sanitation Education and training Utilities Transport Recreation and entertainment Common consumption goods Housing and infrastructure Natural environment and climate

A lot of modern scientific research is devoted to the problems of urban development. (7-14) In particular, the McKinsey Global Institute (MGI), a division of McKinsey & Company, has developed the Urban Sustainability Index (USI). The main provisions of the MGI study were published in 2010 in the report "The Urban Sustainability Index: A New Tool for Measuring China's Cities." The index allows you to quantify the dynamics of urban growth by 18 factors, combined into the following 5 groups of criteria: the degree of satisfaction of the basic needs of the population, the efficiency of resource use, environmental cleanliness, urban infrastructure and the orientation toward sustainable development in the future. (15) In the 2011 report, this system of factors was changed. Experts proposed 17 factors and combined them into 4 groups of criteria: social sustainability, economic sustainability, environmental sustainability, resource resilience. When calculating the index of sustainable development of cities, the McKinsey Global Institute takes into account the characteristics of the urban environment, relating to them the population density, the intensity of public transport use and the area of landscaping of public space. Experts assess the social infrastructure that is an element of the urban development environment on the basis of an analysis of public spending per capita, which, in our opinion, cannot objectively characterize the quality of the social sphere of life in connection with the different basic levels of development of the social sphere in different cities. The choice of a small number of indicators characterizing the complex component of the urban development environment is due, apparently, to the limited statistical data. In our opinion, the list of these indicators should be considered in more detail.

The calculation of the index of sustainable urban development has been carried out since 2010 for China, whose economy is one of the most dynamically developing in the world. (16) However, McKinsey Global Institute plans to conduct research in other developing countries.

Another important indicator of development is the City Prosperity Index (CPI). To calculate this index, five indicators are used: productivity, quality of life, infrastructure development, the state of the environment, material and social inequality. (17) The indicator of the quality of life, in this case, is a combination of the level of education, health, public safety, the level of human potential and the development of public space. The categories characterized by the CPI index are similar to the USI index categories. However, the partial indices of the two indices do not coincide. Thus, the CPI index does not take into account the density of the urban population, energy efficiency of buildings, the intensity of public transport use, but takes into account life expectancy, infant mortality, the number of AIDS cases and those infected with HIV, incidence, and nutritional status.

Another indicator that characterizes the level of urban development is the City Development Index (CDI). (18) This index is calculated as the arithmetic average of five indicators characterizing the volume of production produced by the city, public health, education, the state of the infrastructure and the amount of waste.

The transnational consulting group Mercer Human Resource Consulting assesses the quality of life in the world's largest cities. (19) The company annually calculates the quality of life index in 420 cities on the basis of 39 indicators, grouped into 10 groups.

In the Republic of Belarus, the Habitat II methodology developed a system of statistical indicators for the sustainable development of human settlements, designed to create an information base, taking into account the international system of statistical indicators for the sustainable development of human settlements. The structure of the methodology consists of seven modules: infrastructure, socio-economic development, transport, environmental protection, local governance, acceptability and adequacy of housing, provision of housing.

The system of indicators for the populated are a development of the Republic of Belarus, created in this way within the framework of the Habitat II methodology, provides a quantitative research tool that provides a comparative assessment

of initial situations and starting conditions for the development of various settlements in Belarus. (6)

In the Russian Federation, the methodology of the integral indicator is widely used, which is the total value of indicators for various blocks of socioeconomic status. Ranking of territories according to the level of social and economic development is based on the principle of the maximum value of the integral indicator, which corresponds to the highest level of social and economic development.

In the Russian practice, many researchers identify the following approaches to the typology of regions according to the level of economic development: politico-social (A. Lavrov, I. Zaslavsky, F. Prokopov), functional, cost-function, investment approach (K. Guseva, O. Gritsay and A. Treivish), offered by the Novosibirsk regional school (M.K. Bandman), the approach from the point of view of the quality of the entrepreneurial climate (A.M. Lavrov), the approach from the point of view of innovative attractiveness. (20)

E.A. Zvyagina offers a cluster of regions in five areas of social and economic development: industrial, innovative, tourist, infrastructure, educational. (21) The TACIS project "Analysis of the development of Russian regions" used 11 indicators of 6 groups: general, demographic, living standards, economic, financial, structural economic.

The classification of the INDEM regions is based on an analysis of 230 indicators of socio-economic development grouped into the following blocks: mineral resources, geographical complexity, infrastructure, social ulcers, welfare, health, cultural characteristics, specialization of regions, economic potential of regions, budget subsidies, foreign economic relations, patriarchy, organization of power, institutional climate.

In the Republic of Kazakhstan, scientists in the framework of the scientific project "Perspectives of the socio-economic development of the cities of Kazakhstan in the context of the ten global challenges of the 21st century" conducted a grouping of cities in Kazakhstan on development potentials. The main city-forming factors of the cities of Kazakhstan and the direction of their development were identified. As well as monitoring of external and internal resources, and the conditions for the development of big and large Kazakhstan cities. The prospects of resource support for the development of Kazakhstani cities have been determined. (22)

As a result of research work on the project of the Ministry of Education and Science of the Republic of Kazakhstan "Development and creation of an electronic atlas of socio-demographic development of the regions of the Republic of Kazakhstan using GIS technology and information protection", the Atlas of Socio-Demographic Development of the Regions of the Republic of Kazakhstan was developed. In the course of the research, a typology of the regions of Kazakhstan was carried out, including cities of republican importance, such as Astana and Almaty in terms of socio-demographic development. (23)

It should be noted that the use of the classification of the ratio of regional development indicators of a single territory with average values across the country is practiced by few authors: one - in the form of rationing when calculating synthetic indicators, others - while tracking the development trends of problem regions. But a number of indicators do not allow to demonstrate the similarity and difference in the development trends of the economy and social sphere of the territories. And most researchers artificially narrow the set of social and economic indicators of the regions, carried away by building multi-level synthetic indicators, which does not allow using their methods to monitor the current state of regional development and to formulate the basis of regional policy, by clear and transparent principles.

Having considered the most common methods for examining the socioeconomic status of settlements, it is possible to draw a conclusion on the applicability of these techniques for use in the Republic of Kazakhstan. One of the problems in some of the techniques that limit the use of certain techniques may be the lack of statistical data on certain indicators. The urban development index takes into account the differences between cities, but only contains a limited number of subindices, which cannot give full coverage of the socio-economic status of settlements.

Thus, in order to conduct a socio-economic survey in the Republic of Kazakhstan, a methodology should be developed that takes into account the specific characteristics of the country, but takes into account the world methodologies for surveying the socioeconomic status of settlements.

The Republic of Kazakhstan, being in the center of Eurasia, from the very first days of its independence raised stability and security to the rank of the most important state policy. The crisis was a serious test. But thanks to the timely and consistently implemented strategy of economic modernization, the country has come out of the crisis with honor. (24) According to the classical theory, in the process of urbanization, there are several stages - from origin, development and to the subsequent transformation of cities (Gibbs, 1963). (25) In Kazakhstan, the process of urbanization is at this stage characterized by a significant increase in the urban population in the largest cities. (26)

2 Materials and Methods

As of the beginning of 2018, there are 87 cities in the Republic of Kazakhstan, where 10,423.6 thousand people live. Of all cities, 2 cities (Almaty and Astana) are cities of republican significance, i.e. populated areas of special national importance or having a population of more than one million people; 38 units are cities of regional significance, i.e. settlements, which are major economic and cultural centers, have developed industrial and social infrastructure and population of more than 50 thousand people; 47 units - cities of regional importance - settlements with industrial enterprises, communal services, public housing stock, developed network of educational and cultural, educational, medical and trade facilities, with a population of at least 10 thousand people, of which workers, employees, and their families make up more than two-thirds of the total population. (27) Since June 19, 2018, Shymkent has been given the status of a city of national importance, so at present, there are 3 cities of republican significance, 37 regional and 47 regional significance in Kazakhstan by administrative-territorial division.

In the Program for the Development of Regions of the Republic of Kazakhstan until 2020, a special place is given to cities as centers of economic growth. (2) The population of the city of Kazakhstan is divided into large and small. The number of large cities is 22, where 8358.2 thousand people live, or 80.2% of the total urban population of the country. In 18 cities, the population ranges from 100 to 500 thousand people. Among the large cities of Almaty, Astana, and Shymkent with a population of more than 1 million people, Karaganda with a population of 501.2 thousand people (Figure 1). The object of this study is the above-mentioned 22 large cities of the Republic of Kazakhstan with a population of more than 100 thousand people.

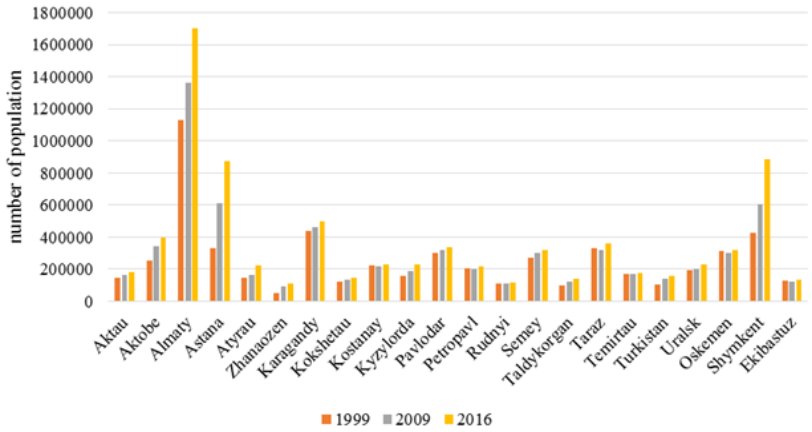

Figure 1. The Population of the Major Cities of the Republic of Kazakhstan, for 1999, 2009, 2016 Years
Source: compiled by the authors on the basis of data from the Committee on Statistics of the Republic of Kazakhstan.

For this study, Russian economists Morozova E.A. and Mukhacheva A.V. (28) developed methodology and algorithm for constructing a typology of cities in two-dimensional space "level of development - the dynamics of development" and adapted to the Kazakhstan cities on social, demographic and economic indicators.

In order to typify the major cities of Kazakhstan in terms of the level and dynamics of socio-economic development, the method of two-dimensional static-dynamic comparative analysis was applied based on the established database of statistical data on social, economic and demographic indicators. Having processed a large amount of official statistics, proposed by the statistical services of the Republic of Kazakhstan for 1991 (partly), 1999, 2009, 2016, a system of key indicators was formed that most accurately characterizes the level of socio-economic development. (27, 29) All these indicators were grouped according to the following 8 blocks:

Economic indicators:

- Investments in fixed capital per capita, thousand tenges;
- Volume of industrial production per capita, thousand tenges;
- Retail turnover per capita, thousand tenges;

Demographic indicators:

- Natural increase / decrease per 1000 population;
- Migration growth / decrease per 1000 population;
- Life expectancy, years;

Standard of living:

- Average monthly nominal wages of employees, tenge;
- The amount of the subsistence minimum (ASM) on average per capita, tenge;

Unemployment (according to the methodology of the International Labor Organization):

- Unemployment rate, in percent;

Health protection:

- Number of doctors per 10 thousand people;
- Infant mortality rate per 1000 live births;
- The incidence of tuberculosis, the number of cases per 100,000 of the population;

Education:

- Gross enrollment in higher education of the population aged 18-22, in percent;
- Coverage by preschool education and training, in percent;

Housing and utilities:

- Provision of the population with housing, m2 for one person;

Offenses:

- The level of crime, the number of cases per 10 thousand people;

The system of indicators that we have identified is well known since all its components are used to some extent in other methods of assessing the level of socio-demographic development, as well as the quality of life of the population. However, the integration of these indicators gives great advantages in identifying the level and dynamics of urban development:

1. accommodates a maximum of non-overlapping indicators from publicly available sources of official statistics in the context of cities, different time periods;
2. corresponds to the classification standards of the Committee on Statistics of the Republic of Kazakhstan. All this allows us to use the proposed system of indicators of socio-economic development in analytical frameworks.

The formed system of social, demographic and economic indicators of the cities of the republic consists of absolute indicators having different dimensions and their units of measurement. For the convenience of calculations, the selected data were standardized and given in relative indicators, which subsequently allowed the calculation of integral indices.

The indicators for which there is no publicly available complete database in the context of cities due to the inapplicability of calculations for this methodology were excluded from consideration.

Thus, the list of indicators for calculating integral indices of socio-economic development was formed on the basis of accessibility, comprehensiveness and sufficiency of reflection of the main key indicators of social and economic development.

3 Results and Discussion

After the list of social and economic indicators of the cities was compiled, some of them were converted from an absolute relative by means of corrections for the population for the convenience of further comparison. Thus, each indicator has the same "dimensionality" and numerical order at the regional level, which allowed to carry out their comparative analysis. Also, the indicators were divided into two blocks, depending on whether their decline or growth would be regarded as positive for the social and economic development of cities.

The technique of two-dimensional static-dynamic comparative analysis that we use provides for several stages. Static comparative analysis based on the ratio of socio-economic development indicators in cities with an average republican indicator for urban areas, which characterizes the situation as a whole at the moment in the country, allows to get an objective real picture of the situation of each city. It includes:

- calculation of the ratio (in percent) of the average indicators of the socio-economic development of individual cities for the period under consideration with the average republican indicators in the context of urban areas (determined by the ratio of regional indicators to the average in the country);
- ranking of standardized relative indicators on a five-point multidirectional scale (from -2 to +2) for 2016 for 22 major cities of the republic;
- calculation of integral indexes of scores based on the results of a static comparative analysis of social and economic development indicators for 2016.

To calculate the scores for each of the indicators of the average deviations of regional assessments of the socio-economic situation from the average republic in the framework of static analysis, a translation system is used. With respect to indicators that directly correlate with the analyzed complex variables (the growth of which is accompanied by an increase in the level of social and economic development of cities), the translation system is shown in Table 2.

Table 2. The System for Translating the Deviation of the Regional Level Indicators From the Average Republican Level According to the Results of the Static Analysis

Deviation, %	**Number of points**	**Meaningful interpretation**
more than 50	2	Significant lead
from 15 to 50	1	Notable lead
from -15 to +15	0	Differences are not significant
from -50 to -15	-1	Significant underrun
less than -50	-2	Notable underrun

For indicators that are inversely related to assessments of socio-economic development (whose growth leads to a decrease in the last one), the system of conversion into points will be the mirror opposite.

The static comparative analysis of indicators of social and economic development of large cities of the Republic of Kazakhstan was carried out in the following sequence:

1. The ratio of socio-economic development indicators of individual cities with average republican indicators for urban areas for 2016 was calculated in order to identify the level of deviation (in percent) from the indicators for the republic.
2. The results of calculating regional deviations from national indicators were ranked on a five-point, multidirectional scale (-2 to +2). Thus, for example, deviations of regional indicators from national average values of more than 50% corresponded to +2 points and were interpreted as "significant advance", and deviations of less than -50% corresponded to -2 points and were interpreted as "significant lag".
3. By calculating the arithmetic mean of the points assigned to each city for the demographic, social and economic indicators considered, a final score was obtained, on the basis of which the leading regions and developmental outsiders regions were identified.

Dynamic comparative analysis suggests the ratio of the growth rates of urban indicators to the average republican indicators in the context of the urban area by analogy with the static method. It includes:

- calculation of the growth of indicators of socio-economic development of individual cities on the basis of the statistical database of each city for 1999, 2009, 2016. for 22 large cities of Kazakhstan as a whole and deviations in the growth of absolute and relative indicators at the regional level in dynamics that revealed a negative and positive increase in individual cities;
- ranking of the increase in indicators at the national and regional levels for the analyzed period in order to bring their values to a single five-point multidirectional scale (from -2 to +2) by analogy with the results of a static analysis in dynamics for 1999-2016 in the context of 22 cities of the republic;
- calculation of integral indexes of scores based on the results of a dynamic comparative analysis of socio-economic development indicators for 1999-2016.

The system of transferring percentage deviations to points for the purpose of dynamically analyzing indicators that have as a direct correlation with the level of socioeconomic development has been slightly corrected due to the fact that the variance of values turned out to be significantly lower than in the case of static analysis and the use of a wider scoring scale would not give objective and comparable results.

In Table 3, points are not the current position of a particular city in Kazakhstan, but the rate of change.

For indicators that have an inverse relationship to the overall orientation of socio-economic development (the growth of which leads to a decrease in the latter), the scheme of conversion into points will be the mirror opposite; high indexes of the level of a certain indicator show low values of the considered index, and vice versa the lowest indices will mean an increase in the value.

Table 3. The system for translating deviations of regional level indicators from the average republican level according to the results of the dynamic analysis

Authors	Index	Considerations
McKinsey, Global Institute	Urban Sustainability Index (USI)	Society Economy Environment Urban planning environment Resources
UN	City Prosperity Index (CPI)	Productivity Quality of life

		Infrastructure Environment Inequality
UN	City Development Index (CDI)	Volume of production Health Education Infrastructure Amount of waste
The index of quality of life in the cities of the world	Mercer Human Resource Consulting	Political and social environment The economic environment Socio-cultural environment Health and sanitation Education and training Utilities Transport Recreation and entertainment Common consumption goods Housing and infrastructure Natural environment and climate

Dynamic comparative analysis of social and economic development indicators for major cities of the Republic of Kazakhstan was carried out in the following sequence:

1. The growth rates (in percent) of the indicators of social and economic development of cities and Kazakhstan were calculated in the context of the urban area as a whole based on the database created for each city for 1999, 2009, 2016.
2. The calculated rates of growth in the indicators of social and economic development of cities were correlated with the average republican urban values to identify deviations in the growth rates for each of the city indicators.
3. In order to identify regions that are developing faster or lagging behind the average urban level in the country, a ranking of deviations in the growth rates of regional indicators for 1999-2016 was conducted. on a single five-point multidirectional scale (from -2 to +2) by analogy with the results of static analysis.
4. By calculating the arithmetic mean of the points assigned to each city, the final score was obtained based on which the leading regions and outsider growth regions were identified (Table 4).

Table 4. Results of Static and Dynamic Comparative Analysis of Cities in the Republic of Kazakhstan

Interpretation of results	**Static evaluation**	**Dynamic estimation**
Significant lead	-	-
Notable lead	Astana	Atyrau
Differences are not significant	Almaty Aktau Atyrau Aktobe Zhanaozen Karaganda Kostanay Kyzylorda Pavlodar Uralsk Ust-Kamenogorsk Shymkent Ekibastuz	Aktau Astana Kokshetau Kyzylorda Pavlodar Petropavlovsk Ore Taldykorgan Taraz Turkistan Shymkent Ekibastuz
Palpable lag	Kokshetau Petropavlovsk Ore Semey Taldykorgan Taraz Temirtau Turkistan	Aktobe Almaty Zhanaozen Karaganda Kostanay Semey Temirtau Uralsk Ust-Kamenogorsk
Significant lag	-	-

The results of a static comparative analysis of the cities of the Republic of Kazakhstan, i.e. the ratio of indicators of social and economic development in cities with an average republican index for urban areas made it possible to get an objective picture of the situation of each city. According to 2016, a noticeable lead (from 15 to 50%) of the average republican indicators was revealed only in Astana, which is explained mainly by the capital status of the city. In most of the studied cities (13 out of 22), there were minor deviations in the indicators (within + 15%), these are the cities of Almaty, Aktau, Atyrau, Aktobe, Zhanaozen, Karaganda, Kostanay, Kyzylorda, Pavlodar, Uralsk, Ust-Kamenogorsk, Shymkent, Ekibastuz. A significant gap in the level of development from the average republican urban indicators was in the cities of Kokshetau, Petropavlovsk, Rudnyi, Semey, Taldykorgan, Taraz, Temirtau, Turkestan. It should be noted that in general, there was no significant lead or lag behind cities with a large gap from the average republican indicators.

Dynamic comparative analysis, which involves a ratio of the growth rates of urban indicators to the average republican indicators in the context of urban areas for the period 1999-2016. revealed the following groups of cities: developing at an average republican pace (12 cities out of 22 surveyed), significantly ahead (Atyrau) and slightly behind (Aktobe, Almaty, Zhanaozen, Karaganda, Kostanay, Semey, Temirtau, Uralsk, Ust-Kamenogorsk). It is noteworthy that according to the results of the dynamic assessment, as well as in the static assessment, cities with a significant level of anticipation or lagging behind the average republican pace of development have not been identified.

5 Theoretical and Practical Implications

The results of this study can be applied to further diversify the economy of large cities.

The findings and results of the study can be used in the activities of the city government bodies covered by this study.

Classification of types of social and economic development of large cities, depending on the dynamics of social, demographic and economic indicators, allows to predict with greater certainty the state and structure of the future economic and social space of the country.

The resulting typology of cities with a population of more than 100 thousand people can serve as a basis for a deeper analysis of the links between demographic, social and economic processes in Kazakhstan cities with different types of dynamics during the period under study.

4 Conclusion

Comparison of the results of static and dynamic analysis of 16 indicators of the database on 8 blocks of demographic, social and economic trends made it possible to carry out the typology of large cities of the Republic of Kazakhstan for 1999-2016 in terms of the level and dynamics of social and economic development. Classification of cities by socio-economic situation in the context of two parameters: static (position within the country) and dynamic (assessment of the rate of change relative to the average republican), resulting in the following types of cities in the Republic of Kazakhstan in terms of socio-economic development:

a) leaders of growth and development - cities that have higher current estimates and rates of socio-economic development relative to the average republican: Astana, Atyrau, Aktau;
b) growth leaders, outsiders of development - cities that have current socio-economic assessments that are slow in relation to the average republican, but which are developing at a faster pace, which causes a high potential for their development: the cities of Taldykorgan, Taraz, Kokshetau, Shymkent, Ekibastuz, Pavlodar, Turkestan, Kyzylorda;
c) development leaders, outsiders of growth - cities that have high current assessments of the socioeconomic situation, but have slowed down their development in comparison with the average republican pace: the city of Almaty;
d) outsiders of growth and development - cities characterized by a low current socio-economic situation and low growth rates of key indicators (it is also theoretically possible to single out separate intermediate groups of cities if the regional values correspond to average republican): the cities of Aktobe, Uralsk, Ust -Kamenogorsk, Karaganda, Zhanaozen, Kostanay, Petropavlovsk, Rudny, Semey, Temirtau. It should be noted that in many cities of this group, the indices of difference from the average republican level are not significant, and are classified in the group of outsiders conditionally.

Using the data of static and dynamic comparative analyzes, the position of each city is graphically represented by the point of intersection of the corresponding values of the static and dynamic estimates on the coordinate plane. Graphical expression of the results is shown in Figure 2.

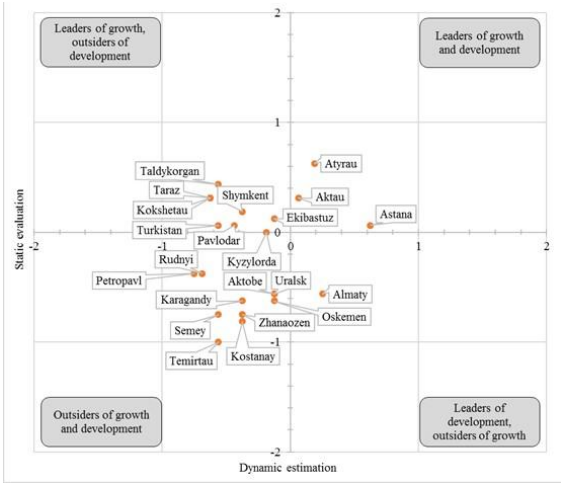

Figure 2. Integral Assessment of the Level and Dynamics of Socio-economic Development of Large Cities of the Republic of Kazakhstan on the Basis of Two-dimensional Static-dynamic Analysis for 1999-2016
Source: compiled by the authors.

The main idea of this typology is that there are 4 samples, according to which the large cities of the country conditionally develop.

As can be seen from Figure 2, based on the results of the two-dimensional static-dynamic comparative analysis, the cities of Astana and Atyrau are in a leading position in comparison with the city of Aktau, which is also classified as a leading group.

In the group of growth leaders, outsiders of development are ahead of time in comparison with other cities in terms of dynamic assessment values - Taldykorgan, Taraz, and Kokshetau; according to the values of the static estimation, the cities of Ekibastuz, Kyzylorda, Shymkent, Pavlodar are less lagging behind. It should be noted that the Kyzylorda city is included conditionally in this group, as the growth rates correspond to the average republican urban indicators, and the level indicators of development are insignificantly different from the average indicators.

Most of the cities in this typology found themselves in a group of outsiders of growth and development, as in many respects they had values below the national level. Among them, it is worth mentioning the cities of Temirtau, Rudny, and

Petropavlovsk, whose indicators are the lowest compared to other cities in this group.

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Literature:

1. Committee on statistics of the Republic of Kazakhstan [Internet]. Administrative-territorial units of the Republic of Kazakhstan at the beginning of 2018; 2018. Available from: http://stat.gov.kz/faces/wcnav_externalId/publicationsPage?_afrLoop=4882498676170353#%40%3F_afrLoop%3D4882498676170353%26_adf.ctrl-state%3D2x67zfys3_93
2. Regional development program of the Republic of Kazakhstan until 2020 approved by the Government of the Republic of Kazakhstan (Jan. 22, 2015).
3. Forecast scheme of territorial and spatial development of the country until 2020 as amended by the Decree of the President of the Republic of Kazakhstan No. 73 (Aug. 25, 2015).
4. Network on urban research in the European Union [Internet]. Institute; n.d. Available from: http://nurec.net/ en/projects/
5. EUROSTAT [Internet]. Geodatabase on project Urban Audit; 2018 [cited 2018 July 10]. Available from: http://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/urban-audit
6. Ovsyannikova TU, Preobrazhenskaya MN. Index approach to assessing the quality of life of the population and the level of development of urban areas. Vestnik Tomskogo gosudarstvennogo universiteta. Ekonomika. 2014; 1(25):30-46.
7. Escudero Gallegos CA. The city from complex system theories. An approach to the study of Malaga urban area. European Journal of Geography. 2017; 7(5):162-174.
8. Mirehe IM, Hajilou M, Lotfi F. (2017, December). Introducing and understanding theoretical foundations of urban geography in the middle east: theory of rent capitalism. European Journal of Geography. 2017 Dec; 8(5):33-42.
9. Nyussupova G, Kalimurzina A. The dynamics of sex-age structure of the population in urban and rural areas in the Republic of Kazakhstan in the years 1991-2013. Bulletin of Geography. Socio-economic Series. 2016; 31: 87-111.
10. Nyussupova G, Brade I, Tazhiyeva D, Aubakirova G. Problems and Prospects of Sustainable Development of Largest Cities of the Republic of Kazakhstan: Case of Astana. 4th International Geography Symposium: GEOMED 2016; 2016; Antalya; 915-925 p.
11. Nyussupova G, Kalimurzina A, Kelinbayeva R. Social and geographical research in the Republic of Kazakhstan with the use of GIS technologies. European Journal of Geography. 2017 Jul; 8(3):109-125.
12. OECD Publishing [Internet]. OECD Urban Policy Reviews: Kazakhstan; 2017. Available from: http://dx.doi.org/10.1787/9789264268852-en
13. Rosu L, Corodescu E, Blageanu, A. Does geographical location matter? Assessing spatial patterns in perceived quality of life in European cities. European Journal of Geography. 2015 Jun; 6(2):15-34.
14. Urban Eurasia. Cities in Transformation. Berlin: DOM publishers; 2017.
15. Lin Ding, Zhenfeng Shao, Hanchao Zhang, Cong Xu, Dewen Wu. A Comprehensive Evaluation of Urban Sustainable Development in China Based on the TOPSIS-Entropy Method. Sustainability. 2016; 8.
16. Urban China Initiative [Internet]. The China Urban Sustainability Index 2016; 2016. Available from: http://www.urbanchinainitiative.org/en/resources/report.html
17. UN-Habitat. The Human Rights-Based Approach to Housing and Slum Upgrading. Nairobi. The Human Rights in Cities Handbook Series, Vol. I; 2017.
18. Moreno EL, Murguía RO, Lavagna G. Global City Report [Internet]; 2015. Available from: https://unhabitat.org/wp-content/uploads/2016/02-old/CPI_2015%20Global%20City%20Report.compressed.pdf
19. European Commission [internet]. Quality of Life in European Cities 2015; 2016. Available from: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/urban/survey2015_en.pdf
20. Mottaeva AB. Features of classification of regions for the purposes of forming the strategy of development of tourist systems of the region. Naukovedenie. 2014; 3.
21. Grinchel BM, Nazarova EA. Typology of regions by the level and dynamics of improving the quality of life. Ekomicheskie i sotsialnie peremeny: facty, tendentsii,prognoz. 2015; 3(39).
22. Rahmetova RU. Prospects of socio-economic development of cities of Kazakhstan in the ten global challenges of the XXI century: report on research (interim). Almaty: Universitet Narhoz; 2016.
23. Atlas of socio-demographic development of the regions of the Republic of Kazakhstan [Internet]; n.d. Available from: http://atlassd.kaznu.kz/
24. Tatimov M, Tatimova M. Globalization of Demography. Almaty: Tipographiya TSAU; 2010.
25. Gibbs HS. The Evolution of Population Concentration. Economic Geography. 1963; 2.
26. Nurlanova NK. Cities as points of the economic space of Kazakhstan: Trends and development prospects. Problemi razvitiya teritorii. 2016; 5.
27. Committee on statistics of the Republic of Kazakhstan [Internet]; n.d. Available from: http://stat.gov.kz
28. Morozova EA, Mukhacheva AV. Assessment of differences in the level of economic development and quality of life of the population of the regions. National Interests: Priorities and Security. 2017; 13(2).
29. Information-analytical system "Taldau" [Internet]. Committee on statistics of the Ministry of national economy of the Republic of Kazakhstan; n.d. Available from: https://taldau.stat.gov.kz/ru

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TEXTUAL STUDY OF ABAY'S FIRST PUBLICATIONS

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Abstract: The article discusses the theoretical basis of textual criticism and provides a scientific substantiation of the study of the text history; expounds basic principles of modern textual criticism as well as initial textual experiments in Kazakh literature, promoting the systematization and publication of Abay's books. We analyzed the first collection of Abay's works and his poems' textual researches.

Keywords: Textual criticism, Transformation of text, Divergence of reading, Manuscript fund, Abay studies, Reformer of culture, Canon, Edition.

1 Introduction

It is known that textual studies' issues are directly related to a text. The problem of text origin, making adjustments, various text transformations, different options and forms of its functioning are the whole range of issues connected with the text and textual study, the main task of which is to identify the source (original) text or restoring it as close as possible to the original one.

Textual criticism also studies various methods of text analysis in order to establish their authenticity, notes about additions, changes, and corrections. B.V Tomashevsky (1) emphasized that textual criticism is defined as "a system of philological methods" for the publication of textual monuments and is known as "Applied Philology". Textual studies take a well-defined and independent position in the system of philological knowledge. It is closely related to the theory and history of literature and it is the basis for studies of literary and historical sources.

The text is the main subject matter of textual criticism and has an incredibly rich heuristic potential. Textual criticism studies the place and role of sources in the creative history of works: their manuscript, lifetime editions, publications, reviews of contemporaries and critics, as well as examines the historical and literary sources; provides a scientific substantiation of studying the history of the text in its movement, storage, and usage. These are all a concretely historical, objective and factual basis of folklore, modern literature and applied linguistics. Varieties of philological aspects basically rely on the analysis of manuscripts and prepared textual materials. Any literary work is not just a monument of an era but also a national cultural heritage and a cultural heritage of mankind, which should be preserved in its original form. According to textual researches of Kazakh literature monuments, publishers aspire for external features of text lists to find their historical (in the broad sense) explanation. A real story of texts is understood as a story of a people who created the text but not as an imminent movement of lists in their divergence. This approach primarily draws the attention of textual critics. One of the basic principles of modern textual criticism is that textual fact cannot be used without explanation. There is no textual evidence out of their interpretation. In addition, there is another binding principle: all the facts are unique; each has its own explanation. Finally, the last principle is the principle of a comprehensive study of textual evidence. There is the matter of not only individual facts but also their combination and system. Discrepancies list is a specific system based on and explained by textual critics as a whole, primarily due to the conscious activity of scribes. The history of text works is studied comprehensively. It is being studied as part of codes and collections, due to the literary tradition. The changes to the text are not done in isolation; therefore, everything in a text history finds its explanation in literature, manuscript author and in general phenomena of literary history and history of society.

In fact, such text studies in Kazakh literature became an independent science neither in the beginning nor in the middle of the XX century. Tasks of the text study were limited to purely practical requirements. Actually, textual criticism took the role of auxiliary discipline necessary for the publication of literary works.

Abay Kunanbayev is a great poet, a writer, a public figure, the founder of modern Kazakh literature, a culture reformer, a supporter of the rapprochement with Russian and European culture on the basis of enlightened liberal Islam. (2) The rich heritage of Abay is a remarkable phenomenon in the history of native culture, the study of which gave rise to a branch of literary science known in Kazakhstan as Abay studies. (3) Today we have a variety of works in this field, which allows us to draw some conclusions in Abay studies and to identify issues that require the attention of researchers.

2 Materials and Methods

The first textual experiments in Kazakh literature can be considered as "correction", i.e. the systematization and the publication of Abay's books. The articles on this topic were edited. His works were distributed in a manuscript form and published in the press. This was the basis for the study of the poet. Some poems of Abay were printed in "Dalaualayatynin gazeti" ("Kyrgyz steppe newspaper") sometimes signed by his friend Kokbay like the poem "The general view of Ibrahim Kunanbayev's village of Chingiz volost in Semipalatinsk uyezd at the moment of his arriving at the site called Kopbeit near Bakanas River" which was later named "Summer". Another poem of Abay without signature was printed in the same newspaper on March 24, 1889.

The creative works of the poet were not published as a separate book during his lifetime. The first collection of poems was released under the pseudonym "Abay". It is known that before the release of the collection a series of the poet's works was published under this pseudonym. This was indicated by Zeynil Gabiden Amr ibn al Zhauhari al Omsk, one of the first researchers of Abay. His book "Nasikhat Kazakyia" was published in 1909 in the city of Ufa. In this book, the author appreciates the work of the poet. According to Gabiden (4), the verses of Abay shine like jewels in the Kazakh poetry. This emotional poetic comparison is directly related to the wonderful Abay's metaphor "poetry must be externally bordered with silver, and internally contain a gold core".

Abay's works were first published as a collection in 1909 in St. Petersburg. This collection was prepared for printing by his son Turagul Abayuly (1875-1934) and his cousin Kakitay Yskakov (1868-1915). The book was called "Poems of the Kazakh poet Ibrahim Kunanbayev" (140 verses and the poems "Iskander" and "Masgut"). Next editions were based on recordings of Abay's poems made by Murseit Bikeuly as the poet's manuscripts themselves did not survive and his poems were distributed among the people orally. The collection includes a brief biography of the poet. For connoisseurs and researchers, this collection of poetry has remained a valuable tool in promoting the works of Abay for a long time.

Kakitay Iskakovich Kunanbayev (1868-1916), the nephew of Abay, did the foremost contributions in systematization; studying and publishing of Abay'sworks. He wrote a detailed article "Abay (Ibrahim) Kunanbayev", printed in "Notes of the Russian Geographical Society" that published the poet's works for the first time at St. Petersburg in 1909. The collection of

poems was published in the Kazakh language in Arabic script in 1000 copies.

The first collection of Abay's poems and his biography were published in St. Petersburg thanks to the efforts of Ilya Murza Baragansky (Boragansky), who received secondary education in Istanbul and was teaching Turkish language and calligraphy at the Faculty of Oriental Languages of St. Petersburg University at that time, i.e. from 1898 to 1908. Although the collection is not without flaws, it had great importance being the first edition of Abay's works and containing the first information from his biography. It seems that this collection could provoke any feedback responses. A search in this direction can enrich Abay studies with new materials.

In those same years, the works of Abay were published in the collection "Nasikhat Kazakiya" and in the newspaper "Kazakhstan" (1911-1913), which was issued in Orda and in the Urals (Teke). In the article "Edebiettany" ("Dawn of literature"), which raised the questions of the necessity of a permanent systematization and publication of literary works and studies on literature, excerpts from Abay's poems were printed ("Esempazbolmaernege").

In 1914, the book "Oriental Collection" was published in Moscow with materials about Abay's life and work as well as translations of his poems into Russian. In 1916, the book of Samat Abishuly "Abay's Terme" was published in Orenburg. Literary and critical publications appeared at the beginning of the XX century. Sidelnikov (5) described Abay as a representative of a new trend in Kazakh literature: "Finally, as a representative of the new trend in Kyrgyz (Kazakh) poetry, mention should be made of Konombay (Abay) (in Semipalatinsk uyezd), the author of many verses, elegant in form and poetic in content (especially descriptions of nature). This author also made good translations of Eugene Onegin and many poems by Lermontov (which turned out to be the most understandable for the Kyrgyzes), thus, for example, the "Letter of Tatyana" can be heard by Semipalatinsk "olengchi" (singers) that they sing, of course, in their own way."

A. Baytursynov (6) in his article "Kazaktin basakiny" ("The main poet of Kazakh people") in the newspaper "Kazakh" praised Abay: "In each period, among all well-known Kazakh poets there was no one better than Abay". Following A. Bokeikhanov, A. Baytursynov and M. Dulatovsuch such writers as N. Ramazanov, G. Sagdi, I. Mustambayuly, N.N. Beloslyudov and others wrote about the creative way of Abay.

The love of Kazakhs to literal expression played an exceptional role in preserving Abay's heritage. Youth memorized and popularized many poems of Abay and those people, who understood the importance of preserving the works of such a great poet for posterity, wrote them down, classified them and distributed their copies. Murseit Bikeuly (1860-1917), an admirer of Abay's talent, did a great deal for preserving Abay's works. He collected and recorded three hand-written collections of Abay's works, which became the basis of the subsequent editions of the poet's works.

Very often, the study of a text is changed by its "correction". The study was conducted in extremely inadequate forms necessary for a "cleansing" from the "mistakes" of later changes. (7)

The Kazakh literary principles of a serious textual study evolved gradually. One of the first theoretical aspects of textual criticism was written by I. Zhansugurov in his article "The Book of Abay" published at Tashkent in 1923. It is valuable because it contains reflections of I. Zhansugurov about the corrections made by editors. I. Zhansugurov (7) wrote that "Abay was writing not according to traditional canons, he is a poet of modern times, so the verses of Abay were corrected; entire lines were corrected because of the novelty and obscurity of individual poems". I. Zhansugurov pointed out 21 undue corrections made by editors.

If a textual critic manages to restore an original reading of a fragment, the rest, i.e. a story of a fragment, and sometimes a text as a whole is no longer the points of his interest. From this point of view, textual criticism has long been considered not as an independent science but understood as a system of techniques to restore an original text, followed by its publication.

I. Zhansugurov (7) wrote, "Abay paid a great attention to the sound of his verses and poems. In his poetry, it is difficult to change anything. He does not use the words of everyday communication; he is not chasing beauty for external harmonies. This should be remembered when working with the texts of Abay." Abay enriched Kazakh poetry with new forms; in particular sestina and ottava rima, (his poems written about the seasons are rightfully considered masterpieces of the poet's lyric poetry). (8) It should be remembered that Abay'screativity was formed and firmed up during the period of the so-called "literature of modern times." At the same time, Abay mastered the universal artistic heritage, starting with the works of Firdausi and Nizami and ending with those of M. Lermontov and A. Pushkin. Therefore, adaptations, translations ("Iskander", "Masgut", "Azim"), creative stylization ("Edifications"), the transformation of certain literary images (Iskander, Aristotle, Masgut) occupy a significant place in his work. Although in general terms M. Auezov, A. Zhirenshin, K. Satpayeva, M. Myrzakhmetov, and other scientist said about the above. (9) Abay not only embodied the humanistic and Enlightenment ideas of other literature in his work but also introduced the classical metric of versification system called aruz into Kazakh written poetry. He used it throughout his poetic activities. Kazakh literary scholars are unanimous that it was thanks to Abay that aruz took root in Kazakh poetry. Abay not only use daruzin his work but also acted as an innovator, being the creator of new forms unknown earlier in Kazakh poetry created by him on the basis of acquaintance with the world literature. (10) Abay composed many songs, most of which were not written and lost forever. Today some of Abay's songs are perceived as folk creations. Abay's children also loved songs and sought to learn to play musical instruments. His sons Akylbay, Abish, and Magash, as well as Shakarim, the son of his elder brother Kudayberdy, friends and pupils of Kokbay Zhanatayuly such as Arip Tanirbergenov and Aset Naymambetov and others, were representatives of the poetry school developed under Abay. (11) Shubar (Abay's brother) was the most educated master of improvisation and good speaker among all the sons of Kunanbay. He knew by heart all the verses and songs of Abay. If necessary, he recited from memory all Abay's creations. (12)

The first textual research of Abay's poems was conducted for the simple reason that the discrepancy was dramatically evident between a general feeling of individual poems and the sound of Abay's poetry. Various lists of Abay's poems, which are available in public, such as a collection of the poet's works published by K. Iskakov at St. Petersburg in 1909 and a reprinted collection of Murseit, were a prerequisite for the study of Abay's textual heritage. The collection of the poet's works is often accompanied by textual errors. M. Auezov wrote in 1940: "It is necessary to collect all the verses attributed to Abay. It is one thing to collect them and quite another to publish them. In this case, a desire is not enough and you need to study. In pursuit of collect a big number of Abay's poems they can lose quality." (13)

The idea expressed by M. Auezov is important; it must be taken into account when reading the textual verses of Abay. The caution of M. Auezov is true until now. The main reason is the lack of Abay's manuscripts.

In order to determine the canonical texts of the poet's works, scientists and admirers of his poetry had done a great and laborious work. M. Auezov himself "tried not to use alien elements in texts", "he marked incomprehensible words with a special sign, gave his own understanding of them and was against any wording in Abay's verses" while collecting and analyzing the poems of Abay. This fact was mentioned by. Myrzakhmetov (14).

The first collectors of Abay's poems were Kakitay and Turagul who were passing lists for publication Murseit and made their

corrections to the poems. Kakitay was a corrector of Abay'spoems published in 1909. The typed texts were sent by mail to Kakitay in Shyngystau and then were returned back after corrections were made. M. Auezov called Kakitay "the first person who has made a significant contribution to the publication of verses of Abay", and at the same time pointed out that "from the scientific point of view his editing and split of Abay's poems is imperfect." M. Auezov (15) laments that "The book of Abay is a truly historic event, but the goals are not met in full." "The re-edition of Murseit's version could be a reliable basis for us," M. Auezov said (15).

Nevertheless, noting the importance of the manuscripts written by Murseit in 1905, 1907 and1910, M. Auezov points to the fact that Abby's poetry from the editions made by Murseit also has stylistic errors.

The researcher of Abay's works M. Myrzakhmetov (14) makes the point that "In Murseit's handwritten versions from the collection published by him there is not "Abay's sound". The reason is that collectors and distributors of Abay's poems failed to understand and maintain the novelty that Abay had brought to the traditional Kazakh poetry. Creations of Abay sounded in its entirety only in 1933, when M. Auezov prepared and published the first complete collection of the poet's works but even in that edition, the researcher noted some mistakes in stanza, rhythm, and hyphenation. Another distributor of Abay's heritage, G. Sagdi (16), also pointed this out.

"The importance of a two-volume collection of Abay's poems prepared and published under the edition of M. Auezov in Moscow, in 1957, cannot be overestimated in terms of the scientific study of Abay's heritage. When preparing for the publication of Abay's poems and prose all known recordings were comprehensively considered and only after such a thorough study many corrections were made," said the academician Z. Akhmetov (17), who led the work on the study of preparing textual publication.

The article of K. Mukhamedkhanov "Textual works of Abay" published in 1959takes a special place among the articles and papers written over the years by researchers of Abay's works. The articles and research of B. Kenzhebayev, and T. Abdrakhmanova's research "On textual works of Abay" published in the newspaper "Sotsialistik Kazakhstan" on July 23, 1953, the article of R. Syzdykova "About heritage of Abay" published in the newspaper "Kazakh adebieti" on August 13, 1965, are important for the study and publication of the Abay's heritage.

It can be noted that modern Kazakh Abay studies are based on the fundamental works of the writer and philologist scholar Kayum Mukhamedkhanov. It was he who began the first archival research to create a scientific biography of the poet, was looking for documents directly related to Abay, his ancestors, descendants, disciples, and followers. Later, these searches will lead to the writing of the work "The Poets of the Abay's environment." Back in the late 1930s, he began a scrupulous work on the textuality of Abay's poetic heritage. The memoir materials collected and written by Mukhamedkhanov in the homeland of Abay. The merit of the scientist is that he was the first who formed and substantiated the very existence of the literary school of the followers of Abay. The scientist conducted painstaking and tremendous textological work so that the poetic and philosophical heritage of Abay and his followers was read and understood reliably. (18) Aygul Ismakova (19) writes that Kayum-aga, who studied textology all his life, was able to give exact scientific comments to the works of Abay. Moreover, thanks to the scientific arguments of Kayum Mukhamedkhanov, those poems that for a long time were regarded as translations from Russian poetry were returned to Abay. Kayum-aga fought for every word of Abay, not being afraid to enter into a dispute with eminent academicians. People listened to him with gratitude, took his scientific position, recognizing that Mukhamedkhanov's comments are unique scientific facts. (19)

In 1940, Mukhtar Auezov appealed to the scholars of Abay's heritage through the Semipalatinsk regional newspaper "Ekpindi." He pointed out the need for further collection and writing Abay Kunanbayev's works from the mouth of the people and at the same time stressed the need for careful selection of new poems in order to establish the identity of their author. (20) Together with the oral popularization of Abay's works, some of his talent's admirers were eager to publish his poems in newspapers and magazines. However, they were published not in the author's lists, but from the manuscripts of admirers and performers, through their oral perception, the oral distribution of the poet's works that was a unique phenomenon in world literature, which characterized the Kazakh poetry of the early 19th century. In a number of cases, oral versions of texts and especially the texts printed in newspapers and magazines published in Ufa and Kazan were used to clarify the original. In the textological sense, they are doubtful, since they were published on the basis of records of their oral variants. Nevertheless, such a researcher as M. Auezov used them as one of the sources for clarifying the text and restoring many already forgotten lines. The comparison of several works from the collection published in Ufa in 1919 made it possible to clarify the text of the poem "We have grown old, sorrow in our thoughts". For reasons unknown so far, these poems have not been included in his complete collection of works for a long time, only recently they appeared in the publications of Zeynel Gabiden, in a refined form. (21)

Along with this, Abay's poems were printed in one more original way: new versions of his poems and songs were created by individual singers and poets, which were then recorded. For example, a manuscript of a book called «Khikayat» found in 1947 in Akmolinsk evidences this. (22)

In the preparation and publication of Abay's works in 1977 a major role was played by painstaking textual work performed by a group of scientists under the direction of Dyusenbayeva and including Z. Akhmetov, M. Myrzakhmetov, M. Zharmukhamedov, M. Magauin, and K. Syzdykova. They took into account all the comments made in connection with the previous editions of the poet's works and expressed a responsible attitude to the compilation and publication of the collection. Z. Akhmetov (23), K. Mukhamedkhanov (24), M. Myrzakhmetov (14), K. Omiraliyev (25), G. Belger (26) indicate textual errors and shortcomings between 1980 and 1990s. The academician S. Kirabayev (27) wrote about priorities of the textual study of Abay's poetry in his book "Abay and the Present" published on the eve of the 150th anniversary of the poet. However, this work has no end. The books of the poet were reprinted mainly for anniversaries, and this was done in a hurry. There was not enough time for the comparison of manuscripts and book editions, so errors in the editions of Abay persist.

3 Results and Discussion

The desire to embellish Abay's works and attribute a deeper meaning to his works can also lead to misunderstandings. The purity of thoughts and caution are required for scientists and all admirers of his poetry.

Abay combines a truly artistic vision of the surrounding world with what is called understanding life in all its complexity and contradictions. At the same time, Abay avoids external comparisons, allegories, conventions, that the lyric poetry of the eastern poets of the pre-Abay period is usually abounded with. A high professional culture permeates the form of Abay's poetry, which constitutes his classical heritage. Kazakh verse is syllabic, built on the principle of uniformity of syllables in the lines. Abay also went on to boldly break the old canons, introducing mixed, complex lines and stanzas, in other words, introduced a syllabo-tonic verse, capacious, elastic and melodic at the same. It is interesting that Abayas a composer also turned to syllabo-tonic verses created by himself and used them as a text for musical works. (28)

According to Auezov (29), Nurushev claimed that Abay became a poet at the age of 37, and before that, he had not been engaged in poetry and that his poetic biography should, therefore, begin in 1882 when he wrote a poem "A horseman with an eagle riding in early snows." Nurushev suggested not to take into account Abay's poetry, written before that year because these works allegedly did not belong to Abay. Auezov, criticizing the false defender of "purity" of Abay's poetry, wrote about the misunderstanding of specific features of creative activity by this scientist. Any poet, no matter how great he is, certainly becomes a poet not in one day. Until 1882, of course, Abay was in creative search.

The formation of Abay as a truly national poet was closely related to his realistic descriptive mastery. Abay's greatness is not connected even with the chanting of the people's life. The poet who had his origin in the ruling elite nevertheless was together with the people, and whatever topic he raised, he did not deviate from the aspirations and needs of the people, from its historical destiny and future. Thus, Abay was a folk poet in the true sense of the word. (30)

Abay knew all the secrets of poetic mastery. Therefore, his poems are perfect from either side. There is only one drawback: the liberty in constructing certain strophes, which makes reading difficult and especially difficult to set to music. Violation of the alternation of verse lines affects the elegance of the whole work. It is like changing from a smooth trot toa gallop. However, this drawback is correctable. It is enough to group and rearrange three-line and four-line strophes. Some speak of "heavy" words, but this opinion has arisen not because of weakness or inability to use the word, but because they were new in sound, form of presentation, significantly differing from traditional forms, and as soon as the reader becomes accustomed to Abay's innovation, all falls into place. (6)

4 Conclusion

Abay opened the world to Kazakhstan. We must know and take care of his work. His works have always struck a chord in the soul of every person who opens a book of Abay in different parts of the world. Citizens of Kazakhstan should know the wisdom of the poet for holding a decent cultural dialogue on an equal footing with the rest of the world. It is necessary for any citizen of Kazakhstan to preserve the words of the poet and be proud of them. Abay is the spiritual and moral support in the life and deeds of contemporaries. Discovery of Abay's works happens every day and year after year. His works are great, inexhaustible, wise and timeless. We are always at the beginning and attached to eternity by studying and popularizing the work of Abay.

Unfortunately, these conceptual positions, which have become indisputable, still has not internalized properly.

Literature:

1. Tomashevsky BV. The writer and the book. Outline of textual criticism (2nd ed.). Moscow; 1959.
2. Kalmyrzayev AS. The aesthetic in the works of Abay. Almaty; 1979.
3. Batyrbekova R. Study of Abay'sheritage at the beginning of the XX century. Kazakhstanskaya Pravda. 1995 Jul 26.
4. Gabiden Z. Nasikhat Kazakiya [Teaching Kazakh people]. Ufa; 1909.
5. Sidelnikov A. Russia. The geographical description of our homeland. St. Petersburg; 1904.
6. Baytursynov A. The main poet of Kazakh people; 1913.
7. Zhansugurov I. The book of Abay. Tilshi; 1923.
8. Gorkin AP. Contemporary illustrated encyclopedia. Moscow: Rosmen; 2006.
9. Nuraliyev A. Tajik-Kazakh literary connections of the second half of the XIX and XX centuries [Internet]. Available from: http://cheloveknauka.com/tadzhiksko-kazahskie-literaturnye-svyazi-vtoroy-poloviny-xix-i-xx-vv
10. Mirzoyev G. Abay. Encyclopedia. Alma-Ata: Atamura; 1995.
11. Maytanov B. Abay: History, personality, time. Almaty: Aruna; 2004.
12. Auezov M. Collection of twelve volumes. (Vol. 6). Alma-Ata; 1968.
13. Academy of Sciences of the Kazakh SSR. Collection of articles dedicated to the sixtieth birthday of Auezov. Almaty: Publishing house of the Academy of Sciences of the Kazakh SSR; 1959.
14. Myrzakhmetov M. M. Auezov as a collector and textual critic of Abay's works. Almaty: Sanat; 1994.
15. Auezov M. Compatriots in flashback. Almaty: Zhazushy; 1972.
16. Sagdi G. Abay. AkZhol; 1923.
17. Akhmetov Z. Poetic world of Abay. Almaty; 1995.
18. Abay Studies 1990-2005 [Internet]; National Academic Library of the Republic of Kazakhstan. Available from: http://www.abay.nabrk.kz/index.php?page=content&id=193
19. Ismakova AS. Kazakh artistic prose: poetics, genre, style. The beginning of the XX century and the present. Ghylym; 1998.
20. Tayzhanov AT. M.O. Auezov as a thinker. Alma-Ata: Ghylym; 1991.
21. Auezova LM. Historical foundations of the epic "Abay's way." Nauka; 1969.
22. Shakhmardanuly, K. Children reading books. Kazan; 1898.
23. Akhmetov Z. Poetics of the epic "The Way of Abay" in the light of the history of its creation. Nauka; 1984.
24. Mukhamedkhanov K. Abay as an akyn and poet. Almaty; 1994.
25. Omiraliyev, K. Genres and style of Kazakh poetry (First half of the 19th century). Alma-Ata: Nauka; 1983.
26. Belger G. Brother among brothers: articles-reflections, literary portraits. Zhazushy; 1981.
27. Kirabayev S. Modern world and Abay. Almaty: Nauka; 1994.
28. Alimkulov T. The herald of truth. In honor of the 125th anniversary of Abay. Kazakhstanskaya Pravda. 1971 May 22.
29. Auezov M. Abay Kunanbayev. Alma-Ata; 1967.
30. Nurkatov A. The way to oneself. Poetic traditions of Abay. Moscow: Khudozhestvennaya Literatura; 2014.

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FACTORS DETERMINING DEVELOPMENT AND FORMATION OF MUSIC EDUCATION IN KAZAKHSTAN

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Abstract: In the article we presented the history of formation and development of music education in Kazakhstan while special attention is paid to the period of independence, beginning from 1991 to the present day. In the article, we consider the main factors that determine the development and formation of musical education in Kazakhstan at independence. On the basis of these factors, we propose our periodization. We also note that modern education, oriented to universal human values, today requires a radical revision and improvement of the entire education system in Kazakhstan. In this regard, the music education that promotes the harmonious development of an individual, the formation of his or her musical taste, aesthetic needs, spiritual and moral qualities cannot remain aloof from the large-scale transformations taking place in the country in recent years.

Keywords: Musical education, Musical pedagogy, Development trends, Kazakhstan.

1 Introduction

Today, Kazakhstani education is undergoing significant changes, and, first of all, this is due to changes in the educational structures that are aimed at involving Kazakhstan in the world educational space. In the context of the general restructuring of the learning process associated with the entry of Kazakhstan into the international educational space and conditioned by the adoption of the Bologna Convention, there is a need to revise a number of basic provisions of the previous system of national general and higher professional education. These processes gain a particular urgency and, at the same time, debatableness, in the field of the development of national musical pedagogy.

The accession of Kazakhstan to the Bologna process has determined the process of reforming higher and post-graduate education with the expansion of access to European education, further improving the quality of education, increasing the mobility of students and academic staff, which facilitates integration into the European higher education zone, the process of its internationalization and the active realization of ECTS. (1) One of the conceptual tasks of the higher musical and educational system is to teach future music teachers to think unconventionally, to solve creative problems, to possess scientific and professional skills that will allow them to adapt without stress and shocks to rapid changes in the social, informational, technological and all professional environment, the reorganization of which is actively provided for in the Kazakh system of musical education. (2) The reliance on the individualization of the educational and professional activities of students, which is one of the foundations of the credit system of education, one of the conditions of the European integration process and an important sign of its humanization contributes to a qualitative improvement of the general cultural and professional level of future bachelors and masters in the Kazakh system of musical education and changes the entire system of relations in the process of learning, which leads students to creative self-realization necessary for an educational result. (3)

At present, the world community recognizes Kazakhstan as a country with a market economy. During the short period since Kazakhstan has gained independence, it has achieved stability of growth in the economy by integrating with the world community.

Today, when turning to market relations, overcoming the spiritual and moral stagnation of society as well as orientation to universal values require a radical revision and improvement of the entire education system in Kazakhstan.

The relevance of this research arises from the need to give a scientific meaning to the nature of the formation of the substantive and procedural basis of musical education in school, the identification of scientific and pedagogical prerequisites, factors, the conditions for the formation of musical education in this period. In other words, the need to study the formation and development of music education in Kazakhstan is explained, on the one hand by the necessity of a deep scientific understanding of the path traversed by Kazakh musical pedagogy and on the other hand by the growth of national self-awareness, the increasing interest in national culture and history, the desire to determine the measure of influence that musical education exerts on the humanization of society.

Higher musical and pedagogical education is, in essence, an indicator of the spiritual state of society, a fundamental factor in its humanization. We define musical and pedagogical education as an integrative educational system, as a process and result of a spiritual and practical comprehension of the creative and humanistic functions of music, aimed at optimizing the personality, which fully expresses its values, effective aesthetic attitude to culture and society. (4)

Musical education is often defined as "musical-aesthetic", which emphasizes its connection with aesthetic education and development: "Musical education as a facet of aesthetic education provides for a purposeful and systematic development of the musical abilities of children, the formation of emotional responsiveness, the ability to understand and deeply feel the content of art. The most important result of musical education is the formation of the general culture of personality." (5) Osenneva and Bezborodova (6) emphasize the mutual consistency of methodology with aesthetics: “the points of contact of these scientific fields are the conceptual positions about the aesthetic essence of musical art and its significance in the development of schoolchildren.”

Archazhnikova (7, 8) is convinced that a music teacher should know the basic laws of the development of art as a form of social consciousness that reflects life from the standpoint of national spirit, the moral and aesthetic ideal of the artist; understand the essence of the phenomena of musical art; be able to use in his or her work the educational impact of music to form students’ high moral qualities and an active position in life. She attaches particular importance to the emotional side in the professional activity of a music teacher, associates it with the ability to respond sensitively to everything beautiful in life and art, to create a sense of beauty for students, to maintain their passion for music art.

The positioning of music and pedagogical education within the movement towards a single European educational space determines the number of features regarding the content expansion of musical pedagogical education and improvement of the determinative pedagogical attitudes. The processes of integrating Kazakh higher education into the world educational process have already demonstrated, quite evidently, at the level of structural changes related to musical pedagogical education.

The need to educate a new constructive generation of the XXI century able to think creatively and having a developed imagination determines the role of musical culture and education in the changing status of cultural values of contemporary musical and artistic thinking.

The current state of the national musical culture requires a certain update of the training of professional musicians. This, first of all, concerns the problem of ignorance of the language of Kazakh music, which was repeatedly discussed at conferences and published in the press. The issues of preservation and further

development of the Kazakh musical language are acute and timely in the works of A. Mukhambetova and G. Begalinova (9).

The solution of the main questions of the methodology of musical education by moving beyond the formal occupation-specific framework in order to make an exhaustive assessment of the influence of musical pedagogy on the formation of the moral and aesthetic guidelines of modern society, while recognizing the leading role of musical art in the system of cultural values is particularly relevant to the realization of the educational potential at the present stage of the development of Kazakh science. Domestic music education in the independent Republic of Kazakhstan has a number of characteristics that can be assessed as basic at all levels of education and upbringing (both general and professional). The importance of a comprehensive study of the historical and methodological patterns of the formation and development of Kazakh musical pedagogy, the specifics of its interaction with the leading trends of contemporary European music and education, as well as the degree of correlation between the stages of the development of pedagogical theories and leading pedagogical ideas in the formation of the educational system in the independent Republic of Kazakhstan (from 1991 to 2017) determines the vision of our research.

2 Materials and Methods

The review of the literature on this topic shows that interest in historical and pedagogical research as a whole increased at the end of the twentieth century. Comprehending the path traveled, humanity realizes that the history of education and pedagogy makes it possible to establish the effectiveness of pedagogical theories, orientations, systems. Mechanisms of mental development of a person basically remain constant throughout many centuries, therefore studying of the history of pedagogics is of great value regarding problems in present and future. The experience of previous generations, both positive and negative gives us answers to the questions posed by today's pedagogical reality.

The peculiarity of the history of music education is its inter-scientific character: it is closely connected with history, pedagogy, and musicology. In the domestic literature, the most widely spread opinion is that the history of pedagogy is both a historical and pedagogical science. This suggests, in the opinion of the Russian scientist G.B. Kornetov, the study of the historical and pedagogical process through the prism of the problematics of the pedagogy of music education, which determines its connection with musicology.

The place of music pedagogy in the system of sciences as viewed by most scientists (Fig.1):

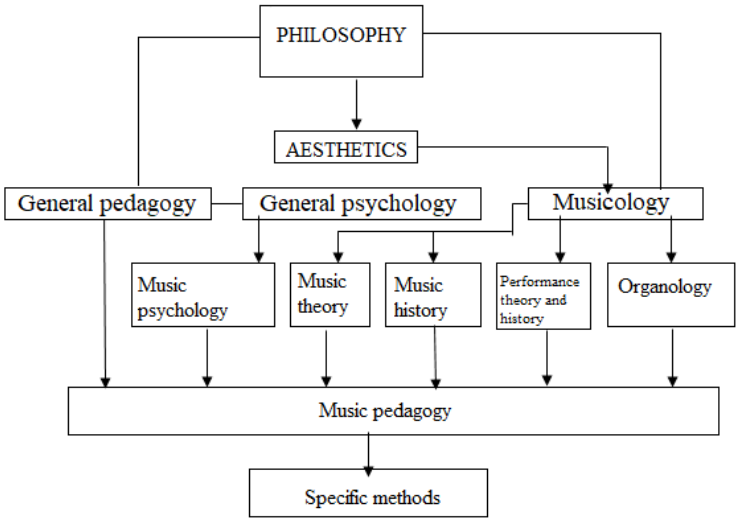

Figure 1. Music Pedagogy in the System of Sciences

It is well-known that the history of musical pedagogy is a part of the world-historical pedagogical process, as the history of pedagogy considers the world-historical pedagogical process as an integral part of the historical cultural process. The emergence and existence of the historical pedagogical process are associated with the emergence of a system of social inheritance that differs from the system of biological inheritance and builds upon it. (10, p10) The system of social inheritance, in turn, emerged and functions on the basis of structures united in the concept of culture. (10, p12) Culture exists only in human society, arising simultaneously with it.

As pointed out by the Russian pedagogue G.B. Kornetov (10, p13), social inheritance is carried out within the framework of processes much broader than education. These are the processes of socialization of an individual. However, the system of social inheritance contains a fundamental contradiction: spontaneous socialization does not ensure the formation in people of all those qualities and properties that they need and that change in the course of historical development of society. This makes it possible to define the historical and pedagogical process as a means of understanding and more or less successfully resolving the contradiction between the ideas of society, its groups, individuals about the properties that a person must possess and the inability to ensure their formation neither genetically nor in the course of spontaneous socialization.

The concept of the universality of historical pedagogical process expresses its unity and integrity, being the initial concept for understanding local historical phenomena. The variability of human conditions determines the diversity of specific historical forms of existence of historical phenomena. (10, p13)

The history of musical education as a part of the world-historical pedagogical process possesses both its inherent properties and specific features. (11) Generalities and peculiarities in the ratio of the world-historical pedagogical process to the history of musical education define three basic approaches to the study of the history of music pedagogy, namely:

1. The civilizational approach, allowing to consider the process of musical education depending on the type of a specific civilization and in a broad socio-cultural context. The civilizational approach, which is philosophical and historical in general, is characterized by analysis and historical comparison of

the content and forms of music education in different epochs and in different conditions, in states and pre-state formations.

2. The paradigmatic pedagogical approach, which allows periodizing the history of musical pedagogy by revealing the changes of the leading musical and pedagogical paradigms. An invariant basis of musical and pedagogical concepts unified in one idea but different in its concrete implementation as a particular model of music education offered by a music teacher or by a community of teachers is considered as a musical pedagogical paradigm. (12)

Thus, the pedagogue Y.V. Nikolayeva (13) defines three possible levels of realization of the paradigmatic pedagogical approach to studying the history of music education:

- study of the main historical stages of music education;
- studying each of the main areas of music education such as folk, religious and secular ones considered within a particular period;
- study of particular musical pedagogical concepts. (13, p89)

The paradigmatic pedagogical approach concretizes the general historical paradigmatic approach in relation to the content of the history of education and pedagogy.

3. The intonational approach, according to which the periodization of music education is based on revealing the cardinal changes in the types of intoning that affects not only the content of the music proper but also the goals, content, and methods of education.

The intonational approach considers musical education as a set of its constituent orientations, types, kinds, branches, determined by the intonational nature of music and the peculiarities of its intonational comprehension. (13) The intonational approach considers the issue of the correspondence of musical pedagogical systems to a musical style on the development of which they are oriented. (13, p88)

The possibilities of each of these approaches apart are limited, therefore, in order to reconstruct an integral picture of the history of musical education, their mutually complementary application is necessary.

One of the features of musical education is the simultaneous existence and development of its two main branches: general and professional. This feature is explained by the fact that, on the one hand, musical education should encompass all as, without it, the harmonious intellectual and moral development of a personality is impossible; on the other hand, mastering a musical profession requires mastering a significant amount of knowledge, skills, and early specialization. The content and forms of professional music education differ significantly from the content and forms of general music education even at the earliest stage of education.

This difference is determined by the goals of professional and general education: the training of professional musicians in the first case but general musical and cultural development in the second case. In modern musical and educational practice, there is an organizationally fixed delimitation of general and professional music education. Mass training in music and training of professional musicians are carried out in different educational institutions; there is also the differentiation at the level of training of pedagogical personnel for the two branches of music education.

The study of the history of musical education based on the civilizational, paradigmatic pedagogical and intonational approaches and also taking into account the peculiarities of the formation and development of its two main branches, i.e. general and professional ones, allowed leading pedagogues (10, 12, 13, 14) to identify the main stages in the history of music education in accordance with historical periodization, namely:

1. Music education in the Ancient World.
2. Music education in the Middle Ages.
3. Musical educational institutions and musical pedagogical concepts of the modern era.
4. Music education in the XX century (general and professional).

When offering historical periodization, these approaches also do not deny the possibility of determining the stages of the history of music education in accordance with the cultural periodization: music education in the Ancient East, Antiquity, Middle Ages, Renaissance, Enlightenment, musical styles of the XIX and XX centuries.

3 Results and Discussion

Proceeding from the above, in our study we tried to identify the major milestones in the history of the formation and development of music education during the independence of the Republic of Kazakhstan. It is necessary to note that the formation and development of music education in Kazakhstan has developed in a unified manner with the development of Russian music education. This was due to the objective historical, geopolitical, economic and socio-cultural factors related to the time when the Republic of Kazakhstan was part of the USSR. Indeed, if we look back, we find that until the attainment of independence, musical education in Kazakhstan was formed along the same lines as the Russian education system. Let's designate the main factors that determined the development of music education in Kazakhstan, starting from the 1920s. (15)

In the 1920s, various types of schools of first and second education stages operated in Kazakhstan, such as primary schools, school-communes, factory schools, seven-year schools and other general and secondary education schools. The curricula of such schools provided for singing lessons once a week.

Cultural and educational amateur societies and circles at schools, as well as out-of-school institutions, played a positive role in the musical and aesthetic education in the 1920s. A network of music schools and music colleges in such cities as Verny, Akmolinsk, and Orenburg began to expand along with the development of a network of educational institutions of various types. Professional training of music teachers for schools of first and second education stages was carried out in the newly created pedagogical colleges and at short courses. Basics of choral music and new revolutionary songs were taught there.

Despite some positive changes in music education, the overall state in Kazakhstan was extremely unsatisfactory. The main reasons for it were the absence of methodological provision, lack of material resources and qualified pedagogical personnel.

The beginning of specialized musical education took place in the 1930s. The Kazakh musical drama college and a choral school were opened in Almaty in 1932. They prepared music performers and qualified music teachers for general education schools. The formation of musical education in the republic was headed by Akhmet Zhubanov, a graduate student, recalled for the guidance of the Kazakh musical drama college from the Leningrad Institute of Music Sciences. Training of singing teachers for schools in the republic was part of the task of the conducting and choir department of the college. (16) In that period general education schools, nine-year schools, and experimental exemplary schools used the music curricula of Russian Soviet Federative Socialist Republic. However, general education schools did not have necessary textbooks, teaching aids, readers. The issue of staffing was acute.

In the 30s and 40s of the 20th century, classical works of Kazakh opera art were created: “Kyz Zhybek” by Y. Brusilovsky, “Abay” by A. Zhubanov and L. Khamidi, “Birzhan and Sara” by M. Tulebayev. Their dramatic and musical basis was the inexhaustible riches of Kazakh folklore and oral professional music. (17) Consultations for novice authors were held at the Union of Composers organized in 1939. This work was carried out, in particular, by the Ukrainian composer Mykhailo

Skorulskyi, who was evacuated to Kazakhstan. It should be noted that during the war years, Sergey Prokofiev also worked there. (18)

In the 1940s, the Great Patriotic War adversely affected the development of music education. The most intensive development of music education began in 1943. Many cultural institutions were evacuated to Kazakhstan. The number of musicians and pedagogues increased. Music schools were opened in many principal cities of Kazakhstan.

The Almaty State Conservatory opened in 1944 played a great role in the training of professional musicians and music teachers for general education schools. In addition, musical departments were opened at pedagogical higher education institutions. Thus, those conditions favored the development of music education.

In the 1950s, the main difficulty of musical education was the deficit in the educational and methodological sources and teaching staff. The order of the Ministry of Education No. 509 of August 2, 1957 "On improving the dissemination of textbooks, teaching aids on music and musical repertoire" played an important role; some measures have been taken to improve musical and aesthetic education. The Institute of Art Education of the Academy of Pedagogical Sciences established in 1947 in Moscow provided considerable assistance in the development of curricula, textbooks, and teaching aids.

Teaching musicians made a great contribution to the development of music education. During this period B. Gizatov, Ph.D. in Art history, published his "Dombra playing school", developed in cooperation with L. Khamidi, a methodical manual "Singing and music lessons in school", textbooks "Musical primer" for grade 1, "Singing and music lessons" for grades 2-4.

In the 1954-1955 school year, in general, education schools, music lessons were conducted according to the adapted version of the curriculum of the Russian Soviet Federative Socialist Republic.

In the 1960s in music education, significant changes occurred. The establishment of the music department of the Kazakh State Women's Institute, which later became an independent faculty, marked the beginning of the professional training of future music teachers for general education schools in Kazakhstan. Kazakhstani composers created many children's songs. A textbook of O. Baydildayev and a methodical manual of B. Gizatov were published.

Further, in the 1970s, the network of educational institutions was significantly expanded. The number of children's music schools and higher music schools increased. New pedagogical higher education institutions where musical and pedagogical faculties functioned were created. A wide discussion of curricula began. The appearance of the curriculum "Music" created by a group of employees of the Research Institute of Schools of the Ministry of Education of the Russian Soviet Federative Socialist Republic under the leadership of the Academician D.B. Kabalevsky was the beginning of a new approach to the problems of musical education. This period is characterized by an economic crisis, which led to reduced funding for educational institutions and their decline in number.

In the basic curriculum for general education schools, music lessons were reduced to a minimum. Teachers and school administrations tried to make up the deficit in the familiarity of schoolchildren with music by adding facultative courses and organizing circles. Against the backdrop of socio-political and socio-economic crisis, innovative processes began to develop in this period. An example is innovations in various branches of education, including the creation of alternative music education curricula.

In the 1970s in the general education schools with Russian as the main language of instruction music lessons were conducted according to the all-union curriculum, while schools with Kazakh as the main language of instruction used curricula that partially included the most popular samples of folk music and works of Kazakh composers, wherein general principles and criteria for selecting the content of education were not always complied with.

In the 1980s, D. Kabalevsky's curriculum was widely disseminated in general education schools in Kazakhstan. A lot of preparatory work related to the implementation of the new music curriculum was done in the republic in that period. Advanced training institutes organized systematic courses aimed to retrain music teachers, various theoretical and practical seminars were held. Prominent innovative teachers such as A.P. Ivanov, G.M. Samotokina, T. Daumetov and many others worked at that time. Kazakhstani teaching musicians also contributed to the methodical provision for the implementation of the new curriculum. An author team was organized under the leadership of B. Gizatov and included R.R. Dzherdimaliyeva, G. Karamoldayeva, L.P. Mamizerova, G.M. Samotokina and others. Thus, in 1984 an adapted version of a new music curriculum for schools with Russian as well as those with Kazakh as the main language of instruction appeared.

The content of the adapted curriculum published in 1984 was made according to the traditional scheme, i.e. singing, listening to music, musical literacy. The author team supplemented the "three whales" of D.P. Kabalevsky's curriculum (singing, dancing, and march) by the fourth genre of instrumental music of the Kazakh people called kuy.

Akyns, zhyraus, salys, seres and kuyshis had a great influence on the development of musical education. They visited villages, propagandized the musical culture of the Kazakh people, taught young people and children to play musical instruments and sing. The entire process of mastering of repertoire and musical knowledge occurred "from mouth to mouth." It should be noted that songs, various competitions of singers and musicians that took place at populous fairs, developed an interest of children in the art of music. Kuys were preceded by a story about the author of the work, the circumstance in which the work was composed. Thanks to this detailed story, the music became more intelligible and accessible for listeners. (19) At the heart of every creative process is a passion, which, of course, does not rule out the enormous work of the mind (Vinogradovskaya, 1976). (20)

At the same time, the adapted curriculum still did not satisfy the needs of studying Kazakh musical art. The students had a fragmentary view of folk songs and kuys, while the richness and originality of traditional musical culture in their entirety could not take a worthy place in music lessons.

In the 1990s, socio-political changes in the republic significantly influenced the development of music education. At independence the growth of national self-consciousness, the revival of cultural and spiritual traditions, language and religion, it became necessary to thoroughly acquaint schoolchildren with the spiritual values of their people, with their national culture and traditions.

When telling about the talent of the Kazakh people, a great Russian scientist A.I. Levshin, called “Herodotus of the Kazakh steppe” by S. Valikhanov (21), aptly pointed out that Kazakhs present new evidence that a person is born a poet or a musician. (22) A. Eichhorn (23) wrote in the introduction to his work on the music of the Kazakhs: “Sometimes carelessly childish and merry, like foals on green pastures, sometimes strong and cheerful, powerful and free, like an eagle, rising to the blue sky in the steppe, Kazakh songs performed by everyone, from boys to old men and from girls to women are the people’s untouchable treasure, as if an exact cast from the people.” "If you want to know how the country is managed and what is its morality, listen to its music" - wrote Confucius 25 centuries ago. (24)

It was in the 1990s that the curriculum "Elim-ay" based on the traditions of popular pedagogy was developed by the author team of teaching musicians under the leadership of the professor M.K. Baltabayev. The developers of the curriculum took into

account the ethnic specifics of art, the forms of its existence, the worldview processes of transfer and preservation of national spiritual values. The goal of the curriculum "Elim-ay" is the formation of a musical, aesthetic and artistic culture that is an integral part of the spiritual culture.

Proceeding from the goals of the curriculum which consists in the formation of the musical culture of schoolchildren and is an integral part of the spiritual culture, its tasks were to awaken and develop an interest in music, music lessons; develop a conscious perception of music, artistic thinking, versatile aural skills (related to intonation, rhythm, timbre, mode, harmony). (25)

The curriculum "Elim-ay" represents the integration of various types of folk art such as musical, oral and poetic, decorative and applied arts, dance, etc.

The content of the curriculum is aimed at ensuring the integrity of students' perception of Kazakh traditional artistic culture. The developers of the curriculum introduced an additional type of activity, i.e. playing on dombra. The curriculum "Elim-ay" is based on such principles as integrity and complexity of musical-aesthetic education; connection of musical and aesthetic activity with the surrounding life and modernity; substantial unity of creative cognition, associative thinking, and heuristic activity of students in music lessons. These principles find their vivid expression in the thematic content of the curriculum "Elim-ay". There are the themes, logically and successively connected among themselves, mutually developing and mutually complementary, called «Sary-arka» (Golden steppe), «Tulpar» (Fast horse), «Akku» (Swan), «Elim-ay» (My country).

Today, the discipline of ethnosolfege (previously called dombra solfege) gives knowledge of the foundations of traditional musical culture and develops a musical ear on the basis of Kazakh music. Ethnosolfege based on Kazakh traditional music is a discipline that forms the totality of musical knowledge and skills on the basis of which the Kazakh musical language functions in folklore, amateur, and professional music. The purpose of the ethnosolfege course is the familiarization with the Kazakh musical language in reliance on the understanding of the system of its logical and structural regularities. (26)

Unfortunately, despite the highly artistic content, which allows restoring the natural process of transfer and preservation of national spiritual values, the curriculum was not able to ensure its widespread dissemination in Kazakh schools due to the unpreparedness of the staff. This required high-level professionalism in terms of musical, choreographic, philological, artistic and graphic education.

In 1994, another curriculum called "Murager" appeared and viewed the folk art of the Kazakh people in the interrelationship of various genres. The main goal of this curriculum was to educate a Kazakh patriot, a citizen who sees himself as an heir of national richness, knows the traditions and customs, art and language of his or her people. A distinctive feature of the curriculum "Murager" is a methodology based on teaching to play dombra in an oral way without using notes. In order to achieve the goal of the curriculum, the following tasks were set:

- formation of skills of playing dombra (performance of kuys, singing with an accompaniment) and other folk musical instruments, acquaintance with the best examples of folk decorative and applied art, the formation of artistic thinking of students;
- development of creative abilities, imagination, spiritual and moral qualities of students by means of traditional art culture of Kazakhs.

At the same time, as noted by Sholpan Burmanovna Kulmanova, a prominent Kazakh theorist and practitioner specializing in problems of music education, as well as one of the authors of the current textbooks for schoolchildren, this curriculum is closer to a learning circle for dombra playing in structural terms.

Proceeding from this, in that period there was a need to create a new curriculum capable of solving the problems of educating a person who has a high level of culture, familiar with the achievements of the national and universal spiritual cultures. In accordance with its goals and objectives, the authors of the new curriculum singled out the principles and criteria for selecting the content of the educational material developed in a spiral way of drawing up a curriculum: “En-kuy khalyk kazynasy” (Songs and kuys are a treasure of the people), “Charming melody sounds”, “Silvery sound of kuy”, “Song and kuy are the soul of the people”, “Ancient tunes of an epic”, “Wisdom of song-stories”, “Art of aytys”, “What is kuy-tartys?”, “Two streams or can song and kuy find a new life?”, “Folk music in the works of composers of the world.”

During that period, at the beginning of the republic's independence the textbooks "Music", methodical aids, readers, and phonoreaders were created. They were aimed at providing knowledge about the foundations of the Kazakh culture, broadening the understanding of the Kazakh people’s history, a way of life, traditions, promoting education and development of schoolchildren, developing national and citizen self-awareness. To find spirituality means to realize that the whole Universe is a single symphony, in which each individual is a "note", and his happiness is to become perfectly tuned to the harmony of the Universe. (27)

At the same time, it cannot be asserted that the curriculum, which existed in those years, solved completely all the problems of general musical education. A number of questions related to the content of the educational material intended for singing and listening to music arose at that time.

Thus, in the system of general musical education, both positive and negative trends are traced.

Positive trends include:

- development of alternative and standard curricula of the discipline "Music";
- updating educational and methodical resources for the discipline "Music";
- the appearance of a brand-new textbook for the discipline "Music";
- expanding the network of extracurricular institutions.

Negative trends include:

- minimizing, in basic curricula, learning load regarding the discipline "Music";
- lowering of the social status of a music teacher, low prestige of music teaching in society;
- low-quality musical training of entrants and students;
- the insufficient material, technical and information support on music lessons.

In accordance with the above, the task of training pedagogical personnel is one of the most important components of the development of music education. In this regard, positive results have been achieved during the period of independence.

Today, the preparation of future music teachers is carried out in 29 higher education institutions of Kazakhstan. Many higher education institutions, including music pedagogical faculties, have switched to a credit system that allows them to assess adequately levels, stages, academic degrees in the educational sphere of the Republic of Kazakhstan, make them transparent, recognizable and acceptable, which is one of the main conditions for entering the world educational space.

Thus, music education has stepped to the inevitable need for the greatest possible convergence and alignment of the evaluation scale of national systems in accordance with the European pattern.

In the state experiment project "Development of Music Education in the Republic of Kazakhstan" for 2007-2011, the content of the problem of musical education is specified as

follows: "Contemporary sociologists and political scientists are concerned about the negative processes taking place in society. One of the reasons is a lasting underestimation of art as a means for the formation of the emotional and moral culture of the population. Musical education in Kazakhstan has rich and deep traditions, but today it needs to develop a concept of modern development based on the synthesis of the existing national educational system and the recognized experience of world musical institutions." (28)

Now in the Republic of Kazakhstan scientific and methodical conferences, seminars, training, pedagogical competitions of future music teachers dedicated to perfect pedagogical skills, professional development and exchange of experience are conducted. A Republican educational methodological association was created under the leadership of the Professor R.R. Dzherdimaliyeva and included prominent teaching musicians of metropolitan and regional higher education institutions. This team applied efforts to develop standards, model curricula, solved problems of introducing a credit technology. Kazakh teaching musicians, in whose scientific works theoretical and practical problems of musical education are being discussed, make a significant contribution to the development of music education.

In general, summarizing the above, we believe that the existing experience does not sufficiently solve all the problems of general musical education.

Today, many issues related to the goals, content, structure, and technology of future music teachers training are awaiting their solution taking into account the tendencies of fundamentalization, humanitarization, differentiation, informatization, technological development of the education system in general.

One of the main tasks of our research is the definition and justification of the theoretical and methodological foundations of the development of musical education in the period of Kazakhstan's independence, so we examine the main political, socio-cultural, psychological and pedagogical factors that influenced the formation and development of musical pedagogy in Kazakhstan in the period from 1991 to the present. Our periodization of the history of the development of musical pedagogy is primarily connected with the adoption of such important governmental documents as the Education Act in the Republic of Kazakhstan (1999, 2007), the State Program "Education" (2000), the State Program for the Development of Education in Kazakhstan for 2005-2010 and 2011-2020. In this connection we distinguish such stages:

1. Formation and development of musical pedagogy in the period from 1991 to 2000.
2. Formation and development of musical pedagogy in the period from 2001 to 2010.
3. Formation and development of musical pedagogy in the period from 2011 to 2020.

In the following table, we tried to identify the historical factors that influenced the development of music education in the republic in the years of independence (See Table 2).

Table 1.

Stages	**Historical background**	**Measures for the development of the musical and cultural heritage in the Republic**
1 (1991-2000)	- 1990 – International Music Festival "Aziya Dauysy / Voice of Asia" was held for the first time; - 1991 - Establishment of the independent Republic of Kazakhstan; - Kazakh broadcasting system has started to work; - 1991 – The 1st Republican contest of performers "Zhas Qanat" was held; - 1997 – International Festival of Creative Youth "Shabyt" was held; - 1999 – The State Choir has been named after B. Bayqadamov; - 1999 – The Kazakh State Academic Folklore and Ethnographic Orchestra of Folk Instruments "Otyrar Sazy" has been named after N. Tlendiyev; - Independent Kazakhstan's accession to the Bologna process and transition to a credit system of education; - 1997 – Adoption of new normative documents on the development of education in the republic; 1999 – Adoption of the Education Act in Kazakhstan	- The emergence of creative groups in the field of folk art; - Familiarization of not only children but also able adults with music; - The publication of a textbook on folk music; - Creation of a professional ensemble of dombra players; - Creation of the National Orchestra; - Opening of new musical schools and philharmonias; - Creation of the National Choir;
2 (2001-2010)	- 2003 – Adoption of the State Program "Cultural Heritage"; - 2004 – Definition of the concept of the development of education in the Republic of Kazakhstan until 2015; - 2007 – Amendments to the Education Act in the Republic of Kazakhstan; - Adoption of the State Program for the Development of Education in the Republic of Kazakhstan for 2005-2010; - Introduction of the policy of innovative professional education in the system of music education;	- Invitation of famous musicians and music educators from other countries; - Possibility to receive a professional musical education in the republic; - Film studios have started to work; - Publications of textbooks, educational and musical aids;

	- Introduction and development of modern electronic musical instruments: synthesizers, multimedia computers, etc. - Learning to play the above instruments;	
3 (2011-2020)	- Adoption of the State Program for the Development of Education in the Republic of Kazakhstan for 2011-2020; - Adoption of the State Program for the Development of Education and Science in the Republic of Kazakhstan for 2016-2019; - Intensification of the work on the spiritual and moral education of youth; - Development of musical education in the context of the European integration process; - The professional training of future specialists in the field of music education is aimed at preserving the synergy of the national and person-oriented culture and in concert with public creative associations; - Introduction of updated content of secondary education.	- The appearance of operatic works, symphonies, cantatas in the republic; - The Congress of the Composers' Union of Kazakhstan was conducted; - Holding a ten-day festival of Kazakh orchestras from all the regions in Astana;

4 Conclusion

Thus, the transformations taking place in the country in the last few decades have a significant impact on the educational process in all spheres of education, including the pedagogy of music education. It should be specially noted that the main trend of the development of music education in independent Kazakhstan is the need for a more thorough and deep familiarization of students with the spiritual values of their people, national culture, traditions and customs. (29) The issue of a bold and radical revision of the education system is closely connected with changes in all spheres of our state. (30)

In order to update the educational potential of the people, as we see, the state has adopted legislative projects and concepts of new content that determine the goals and objectives of the education system. Favorable conditions for the development of the people's spiritual richness, the flowering of the national language and history, religion and culture were created. The state documents of the Republic of Kazakhstan repeatedly and comprehensively consider the use of the national musical pedagogy's heritage in the education of an individual, in the training of highly qualified specialists and increasing educational attainment in conformity with the requirements of modern society.

Literature:

1. Zhakypova FN, Kobenova GI, Smagulova GM. Academic Mobility: Organizational Aspects and Mechanism for Implementation: Scientific, Practical and Methodical Manual for Higher Education Institutions. Astana: Editorial and Publishing Service of the NTsOKO; 2011.
2. Salmi J. Creation of world-class universities. The whole world. Moscow; 2009.
3. Khusainova GA. Some aspects of the development of the Kazakh system of higher musical and pedagogical education at the present stage. In: Chegasheva, editor. Professional education: modernization aspects. Vol. 1. Rostov-on-Don: Scientific cooperation; 2013. p 189.
4. Terentyeva NA, Kabalevsky DB, Kritskaya YD, Shkolyar LV, editors. Musician – educator – enlightener. Traditions and innovation in musical and aesthetic education. Theory and practice of musical education: the historical aspect, the current state, and prospects for development; 1999. Moscow.
5. Khalabuzar PV, Popov VS. The methodology of musical education. 2nd ed. St. Petersburg; 2000.
6. Osenneva MS, Bezborodova LA. The methodology of musical education of younger schoolchildren. Moscow; 2001.
7. Archazhnikova LG. The profession of a teacher of music: a book for the teacher. Moscow; 1984.
8. Archazhnikova LG. On the New Frontier. Music in School. 1986; 4:14-18.
9. Mukhambetova A, Begalinova G. Kazakh musical language as a state problem. Kazakh traditional music and the twentieth century. Almaty; 2002.
10. Kornetov GB. World historical and pedagogical process: concepts, models, historiography. Moscow; 1996.
11. Fedorovich YN. History of musical education. Yekaterinburg; 2003.
12. Nemykina IN. Fundamentals of musical pedagogy. Yekaterinburg; 1993.
13. Nikolayeva YV. A conceptual approach to studying the history of national musical education. The methodology of musical education: Problems, orientations, and concepts. Moscow: MPGU; 1999.
14. Razhnikov VG. Reserves of musical pedagogy. Moscow; 1980.
15. Zhumabekova DZ. Prominent performers and personalities of Kazakhstan. Astana; 2005.
16. Aydarbekova L. The methodology of musical education in Kazakhstan. Almaty; 1998.
17. Sanatqyzy A. Modern musical culture in the Republic of Kazakhstan: trends, problems, and perspectives. The international scientific conference No. 3 "Interdisciplinary research" of the Scientific community of students; 2017. Available from: sibac.info/sites/default/files/conf/file/stud_3_2.pdf
18. Khasanova R. (December 4, 2014). The sources of the national repertoire. Kazakhstanskaya Pravda [Internet]. 2014 Dec 4. Available from: http://www.m.kazpravda.kz/fresh/view/u-istokov-natsionalnogo-repertuara/
19. Smetova A., Mukasheva A. History of the development of musical education and upbringing in Kazakhstan. Astana; 2011.
20. Vinogradovskaya I. Life and work of K.S. Stanislavsky. Vol. 4. Moscow; 1976.
21. Valikhanov CC. Collected works. Kazakh Soviet encyclopedia. Vol. 1; 1984.
22. Vishnevetskaya VA., Levshin AI. An explorer of Kazakhstan. Brotherhood of peoples, brotherhood of cultures. Almaty; 1985.
23. Eichhorn. Music of Kazakhs. Tashkent; 1964.
24. Yankovskaya LV, editor. Living stones of the spiritual temple. The scientific public international conference "Art as a way of knowing"; 1999; Moscow: MTsR.
25. Kargapoltsev SM. Musical perception as a factor of education: theory, history, and practice. Chelyabinsk; 2002.
26. Alpeisova G. Theoretical and practical aspects of ethnosolfege in Kazakhstan [dissertation]. [Almaty]; 2003.
27. Khazrat Inayat Khan. Mysticism of the Sound. Moscow; 1998.
28. Mukasheva AB. The history and trends of development of higher music education in Kazakhstan. Bulletin of the Kazakh National University, series "Pedagogical sciences." 2011; 3(34).

29. Bayulov GB. Pedagogical possibilities of youth education with the help of materials of the Kazakh musical pedagogy. The Way of Science, International Journal. 2016; 8(30):71-74.
30. Bayulov GB. The philosophical bases of formation and development of musical pedagogy in independent Kazakhstan. The international scientific and practical conference "Modern preschool and elementary education: theory, methodology, and practice" dedicated to the 80th anniversary of the Doctor of Pedagogical Sciences, Professor Qazyna Aymaghambetova; 2017 Apr 28; Almaty.

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FINANCIAL LITERACY: THE CASE OF KIMEP UNIVERSITY STUDENTS

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Abstract: This article analyzes the financial literacy of students by using the questionnaire method at KIMEP University. The purpose of the study is to assess the level of financial literacy of students and their attitude to teaching the basics of financial literacy in institutions of higher education. The following tasks were accomplished to achieve this purpose: 1. The level of financial literacy of students was assessed. 2. The students' demand for knowledge about the financial market, financial institutions and the services provided by them were revealed. 3. The existing ways of getting information by students about financial institutions and services were studied; the opportunities for self-education in this area were studied.
The study analyzed the subjective assessment of the level of financial literacy, the understanding and use of contemporary financial services by students, as well as the students' level of trust in financial institutions. The ways of increasing the financial literacy of higher education students are suggested proceeding from the analysis.

Keywords: Financial literacy, Development, Economic information, KIMEP University, Questionnaire research, Personal finance, Students, Financial institutions.

1 Introduction

Recently, more attention has been paid to the problem of increasing the financial literacy of the population. Financial literacy is necessary for people of any age. Pensioners need it to manage skillfully the accumulated funds, not to lose money in pyramid schemes, to learn to use those financial instruments that save time and effort. Financial literacy allows middle-aged people to work out the right strategies of saving for old age, enables to manage available financial resources effectively. Financial literacy allows young people to gain an understanding of finance, to build skills in planning budgets and savings, to solve the problems of financing education and housing. (1, 2)

Financial literacy is usually defined as knowledge about financial institutions and the products they offer, as well as the ability to use them when necessary and the understanding of the consequences of one's own actions. Financial literacy as a concept is divided into three interrelated parts such as attitudes, knowledge, and skills on the basis of which the index of financial literacy is calculated. (3)

The first part, i.e. attitudes, is the basis of financial literacy. It is concerned with the formation of financial behavior that begins with family budget planning for a long term, and the development of a strategy for satisfying the needs of the life cycle. The life cycle of any person includes certain events, which must be approached with good financial skills. This is the creation of a family, the birth of children, the purchase of an apartment or a house, the education of children, a pension. The solution of all these tasks is impossible without the use of financial market instruments such as savings, credits, and investments. At the same time, the distrust of the population to financial institutions is an important attitude, which often hampers the development of people's financial activity.

Although it is necessary to emphasize that the inclusion of attitudes in the concept of financial literacy is a very controversial issue. The attitudes related to long-term financial strategies is not always a sign of financial literacy and their lack is not a sign of financial illiteracy. It is possible that, on the contrary, the lack of long-term strategies and of confidence in financial market institutions when these institutions are weak and subject to crises and when regulatory legislative framework is not keeping up with the development of the market is a financially competent attitude, which results in the refusal to use financial instruments. Why does someone need to start saving for retirement from a young age when the probability is high that in the conditions of high inflation or instability of the financial market these savings will depreciate or even disappear? Why does someone need to be insured if, in the case of an insured event, it will be difficult to receive payments? Why does someone need to get a credit for education if it is not really education but the right connections allow to qualify for prestigious jobs with high salaries? It turns out that the inclusion of such attitudes in the definition of financial literacy makes this definition, rather normative. In other words, it is accepted as evidence only in the system of liberal economic views. However, even if we leave aside the discussion about the soundness of the liberal approach, it should be recognized that individualism, personal responsibility for financial decisions and long-term financial strategies could be justified for the population only if there are clear and strict rules for the financial market participants dealing with the population's money, which they will have to respect.

When developing financial literacy programs, it should be borne in mind that it is impossible to form "correct" attitudes without corresponding changes in the institutions of the financial market. For example, it makes no sense to form a credit culture and the confidence towards banks without providing the full cost of credit and the opportunity for borrowers to compare the conditions of different banks with each other. It is impossible to teach people to read credit contracts if banks hide essential information behind incomprehensible wording and multi-page texts. It is impossible to expect that people will make long-term savings or invest in the stock market if their savings are depreciated or even completely lost as a result of inflation or financial turmoil. In addition to attitudes, financial literacy presupposes a certain level of knowledge and practical skills in the field of finance. When developing test questions for measuring the index of financial literacy, we tried to make sure that the questions were focused on fundamentally important financial competencies, the absence of which currently leads people to financial losses or lost profits.

When the concept was operationalized, we did not include the preference assessment in the index. For example, if a person is attracted to risk, this does not increase or decrease the assessment of his level of financial literacy, because risk appetite per se does not say anything about financial literacy or illiteracy.

The issue of financial literacy and its importance for the economic well-being is discussed widely worldwide. Numerous researchers raised this issue during different periods of time and the studies took place in different countries. (4, 5) Numerous authors mentioned this topic in their papers at conferences. However, a very small amount of authors discussed the applicability of this particular topic in such CIS country as Kazakhstan. This paper attempts to discuss the issue of financial literacy and its applicability among Kazakhstani youngsters, who are current students.

As it was defined by Lusardi and Mitchel (6), financial literacy is an ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions. Such type of knowledge helps physical entities to invest intelligently, take loans at cheaper costs and to accumulate wealth in shorter periods of time. Physical entities are similar to companies and they also strive for wealth accumulation. They also do borrow and do invest and achieve their goals throughout their lives. The paper is devoted to the issue of financial literacy in Kazakhstan and it evaluates the knowledge of financial literacy among certain categories of Kazakhstani population.

At the same time, the paper strives to identify whether Kazakhstani youngsters need any training in the area of financial literacy and personal finance. For this purpose, the survey was conducted among young people, who are KIMEP University students in 2017. Questionnaires were distributed among KIMEP University students during daytime in 2017.

Two main research questions are as follows:

1. Are KIMEP University students financially literate?

2. Do people of our country need any training in the area of personal finance (financial literacy)?

The literature allows us to review papers related to the issue of personal finance. By summarizing any previous research done on this particular topic, we may focus on what remains to be explored. The paper further contributes to the issue of financial literacy in Kazakhstan and provides both theoretical and practical implications of the study.

2 Literature Review

The traditional economic theory postulates that forward-looking individuals maximize expected lifetime utility using economic information to build retirement assets over their working lives (Behrman et al., 2012). The popular microeconomic approach to saving and consumption decisions in the area of personal finance postulates that a fully rational and well-informed individual will consume less than his income in times of high earnings, thus saving to support consumption when his income falls. During the years of high earnings, an individual accumulates wealth in order to spend it during the years of low income. Individuals do consume and do invest and their decisions affect the whole economy. Throughout their lifetime, individuals make different decisions about saving, investing and consumption both in the short run and in the long run. Such authors as Modigliani and Brumberg (8) and Friedman (9) discussed the issue of financial literacy as the consumer is posited to arrange his optimal saving and decumulation patterns to smooth marginal utility over his lifetime. Such microeconomic models generally assume that an individual can formulate and execute saving and spend down plans, which requires them to have the capacity to undertake complex economic calculations and to have an expertise in dealing with financial markets. Keown (10) described key issues of financial literacy and pointed out the importance of personal finance in his textbook "Personal Finance: Turning Money into Wealth". The author scientifically described such issues as the personal financial planning process, mortgage loans, consumer loans, investment in stocks, bonds etc. Financially educated individuals in the sphere of personal finance usually make wise decisions about housing, mortgage, short-term and long-term investment. They push demand on particular financial products such as deposits, loans, and also on financial instruments such as stock and bond. During the economic recession, they may influence the economy counter-cycle way by investing in stock or bonds. Using this strategy they may facilitate economic growth, increase Gross Domestic Product of their country. As it is universally accepted, consumption and investment are significant parts of Gross Domestic Product and they are managed by physical entities. By investing their excess funds into stocks, bonds or placing them in bank deposits, they may facilitate economic growth during the period of the recession of an individual.

Lusardi and Mitchell (6) mentioned that despite the rapid spread of such financially complex products as student loans, mortgages, credit cards, pension accounts, and annuities, many of these have proven to be difficult for financially unsophisticated investors to deal with. Such developments have their advantages, they also impose on households a much greater responsibility to borrow, save, invest and decumulate their assets sensibly by permitting tailored financial contracts and more people to access credit. (11) Such authors as Lusardi and Mitchell (12) have found low levels of financial literacy in the US population, an inability to understand basic financial concepts, such as the importance of retirement savings and poor judgment in borrowing decisions. At the same time, Cole, Sampson, and Zia (13) found out that there are very low levels of financial literacy for households in India and Indonesia. Lusardi finds widespread lack of financial literacy among people with low levels of education, women, and minorities. This lack of financial literacy is associated with poor financial making, in particular, regarding retirement planning. (14)

Yet despite the strong association between financial literacy and a range sure of financial well-being, little is known about the efficacy of financial training programs in improving these outcomes. Bernheim, Garrett, and Maki (15) studied variation across states and time in mandatory financial education for high school students and find that mandates increased exposure to financial curricula asset accumulation. Cole, Sampson, and Zia (13) randomized evaluation of a financial education program in Indonesia.

In terms of training in the sphere of financial literacy, many researchers analyzed whether there is a causal link between literacy and individual outcomes. In their studies, Garrett (16) and Lusardi (17) provide survey evidence that attendance of financial counseling programs does positively affect those attendees with low income and that education effects of the programs are large; however with self-selection into an upward bias. In contrast, Duflo and Saez (18) conduct exposing employees to a benefit fair that raises awareness, but they find only a small effect on savings plan enrollment.

3 Materials and Methods

In order to understand fully the level of financial literacy of the population, it seems necessary to gather additional sociological information on the current state, development trends, problems, and needs of the people under research. First of all, information on the financial literacy of young people is necessary, as they are the most promising segment of users of financial services in the country.

There are two research questions of the study. The first is about the knowledge of financial literacy and the second one is about the need for training in the sphere of personal finance. First of all, it should be studied whether students know the basics of financial literacy. (19) In addition, the second issue is whether they need any training in the sphere of financial literacy. The survey took place at KIMEP University, which is located in Almaty, Kazakhstan. Respondents were asked about their perception of their knowledge of personal finance. Also, they were asked anonymously about their current financial position, in terms of wealth they own. The wealth of respondents includes deposits, stocks bonds, real estate, gold, and other assets. Respondents also were asked whether they need any training in the area of personal finance (financial literacy). The sample includes 300 students from different specializations. Majority of students, which is 89% of respondents agree that financial literacy training are needed for every citizen of Kazakhstan. Only a few of them (21% of respondents) believe that they are knowledgeable enough in the area of personal finance. In terms of the wealth they own, respondents mostly named a few assets such as deposits, cars, and certain personal belongings. A very small percentage of respondents (1%) do own real estate. The age of respondents varies from 17 to 24 years old. Majority of them are a nonworking population of youngsters. Majority of respondents were female (51%) and the rest (49%) were male respondents. Respondents were asked to fill in a questionnaire on the campus of KIMEP University during the daytime, after their classes. Majority of respondents were willing and able to fill in the questionnaire.

As a way to improve the knowledge of basic issues related to financial literacy, respondents were asked to agree or not agree to introduce basic financial literacy courses. Majority of respondents (82%) agree that such a new course will help to obtain basic knowledge of financial literacy. Respondents were asked about the ways to improve their knowledge of basic finance. Majority of respondents (78%) agree that internet and self-study are helpful in this case. Almost all respondents (97%) agree that financially literate people make sound financial decisions during their lifetime and it helps them to accumulate wealth on time. Such people achieve their goals, accumulate enough for retirement and can easily get rich. Respondents realize the importance of financial literacy knowledge in their practical life.

Below this is the questionnaire used in the research.

Good day! Through this brief survey, your answers will be helpful. Your response will be used only for survey purposes. Thank you very much for your time and suggestions.

1. What is your age?
2. Specify your gender
3. Specify your status
4. Name all assets which you personally own
5. How wealthy are you?

A. Very wealthy
B. Wealthy
C. Average
D. Below average
E. Poor
F. Other

6. Are you financially literate?

A. Yes
B. No

7. In your opinion, are you knowledgeable enough in the area of personal finance?

A. Yes B. No C. I do not know

8. Do you need any training in the sphere of personal finance?

A. Yes B. No C. I do not know

9. In your opinion, is it helpful for Kazakhstani citizens to pass training in the area of financial literacy (personal finance?)

A. Yes B. No C. I do not know

10. Do you believe that financially literate people make sound financial decisions during their lifetime and it helps them to accumulate wealth on time?

A. Yes B. No C. I do not know

3 Results and Discussion

The study took place on the campus of KIMEP University in Almaty, Kazakhstan. The sample employed includes 300 students, who are KIMEP University students. Respondents were kindly asked to fill in their questionnaires and based on their answers, the results were interpreted. Two basic research questions of the study are about respondents' financial literacy and the need for any training in this area. Only 21% of respondents consider themselves as financially literate enough. In terms of training, almost 90% of respondents agree that financial literacy training is needed for our population. Almost all respondents (97%) agree that financially literate people make sound financial decisions during their lifetime and it helps them to accumulate wealth on time. Such people achieve their goals, accumulate enough for retirement and can easily get rich. Limitations of the study are that it only employed 300 students of young age (17-24), which is not representative.

Theoretical implication of the research is that the sample size may be increased and may employ not only students but all employees of the University. The survey may be expanded and implemented in other countries as well. The practical implication of the study is that there is a need for training in the sphere of financial literacy in Kazakhstan. At least, youngsters, who represent KIMEP University, agree upon this issue. Such training will help people to learn basic financial literacy and may help them to accumulate wealth, make wise decisions in the area of personal finance. People will be knowledgeable enough to invest intelligently, to borrow cheaper and will be able to accumulate enough wealth for their retirement. The need for such training does exist in Kazakhstan and other ways of learning basic financial literacy include internet and self-study as per respondents' answers.

To increase the financial literacy among the youth, the authors of the article believe that the main focus in the development of new curricula or the modernization of existing ones should be given to the information resource in the global network, since, for example, the educational and practical literature on this subject has already reached a significant quantitative and qualitative development. However, websites on this subject already exist and, according to the above research data, they are in demand. Despite this, the general level of financial literacy of students who are not specialized in economics needs to be increased. (20)

However, there are some reasons for the insufficient efficiency of websites at the current stage. Ironically, most sites devoted to financial literacy do not contain relevant financial information necessary for making decisions in the area of personal finance, such as currency rates, interest rates, financial forecasts, although such information is often found on other sites. Another popular element of such sites is training videos. On most sites, this element is present to some extent. On the other hand, here comes the question of its relevance and ability to interest the target audience. As a rule, such videos are aimed at already working citizens and are not quite suitable for students.

The existence of such a problem is logical. Since students consider lectures and training to be a sought-after means of communication that contribute to increasing the financial literacy of this target group, we also interviewed experts and representatives of companies engaged in organizing educational activities to improve financial literacy. Such companies do not currently consider students as the main target audience for lectures and seminars, as well as training courses in general. There are two reasons for this. First, from the point of view of the companies organizing seminars and training, students showed insufficient solvency, and this is a key factor for a commercial organization. In addition, very often training videos concerning personal finance management are derived from offline training. Accordingly, the lack of orientation towards students in offline mode entails a lack of specialized courses on the Internet. The second reason for the lack of attention of commercial training organizers to students is that students are still recognized as more financially literate than other categories of the population. It should be noted that these companies conduct, for example, training and seminars at the invitation of institutions of higher education (in part for advertising purposes), which subjects are both business coaching and general financial literacy.

It is important to point out that although there are a lot of such programs on the market and some of them are free, not every user who does not have experience in maintenance of housekeeping accounts is able to choose a program most suitable for him or her.

An insufficient desire of commercial companies to develop programs to increase financial literacy among students has an economic justification. However, these methods of increasing financial literacy retain their effect independently of their initiator. In current conditions, when particular programs and the selection of projects to increase financial literacy exist, an institutional program would be possible, implying, among other things, the creation of such an online platform. Taking into account this opportunity, we attempt to formulate new approaches to increasing the financial literacy of students who are not specialized in economics.

1. A website should be the main platform for teaching financial literacy. This may be an already existing resource, modified in accordance with the proposed specificity, or a new portal created with the involvement of public funding. At the same time, a resource on the Internet should have both a mobile version and a mobile application capable of running on major mobile platforms. Access to all information resources is offered only to registered users. A registration should be free but should require general information about a user to track statistics about the use of site resources and, as a consequence, about the practical implementation of the program. Taking into account the wishes of students, the current financial information should be posted on this site. This can be not only the exchange rate but also the most favorable offers of banks concerning deposits and credits. Such a solution will not only increase the information content of the site but also will attract various financial institutions to cooperation. The site must contain a section with a training video. The basis for this should be a video created specifically for the chosen target audience. Since the creation of videos can be quite costly, the best option at the initial stage is the creation of such videos with the

involvement of the students themselves. It can be students who are specialized in economics and who have theoretical knowledge and personal practical experience. The advantage of this approach is that the development and implementation of a project for the creation of such a video can be realized as a project in one of the academic disciplines or within the framework of the competition of student works. Subsequently, with sufficient funding, the involvement of professionals in this field is also justified. The site should provide an opportunity to consult on personal finance issues. To do this, it is possible to create a forum with assigned topics within financial literacy, in which users can ask questions of interest to them, receive answers from specialists and exchange opinions among themselves. In the future, it will be possible to create a database of frequently asked questions and to place corresponding answers into a separate section. An active participation in a project, high results in testing, the victory in a quiz or an online game could be rewarded with a coupon for a free individual consultation. This practice is quite standard in the West, where Amazon coupons play the role of reward for such actions.

2. Since the basis for personal financial planning is keeping personal records of income and expenses, it is necessary to take charge of the availability of a program and a mobile application for these purposes, both within a possible site and for isolated use. It is possible to provide an overview of available programs with user feedback and expert comments directly on the site. It should be recognized that most of the existing programs are either unjustifiably expensive, or not very convenient to use, or require access to personal information and watching an advertisement. Proceeding from the fact that most students do not have enough opportunities to pay for software products, attention should be paid to the development of a free or shareware program when financing such a development by the initiator of the program. Such a program should be understandable and convenient for students, it should be able to synchronize mobile devices with a personal computer. The main problem in keeping records of income and expenses is the complexity of entering information on expenses because they occur much more often than income is generated. To solve this problem, it is possible to propose, when creating an expenses accounting program, the possibility of importing information on expenses made through bank cards and through a direct data recording of cheques (through QR codes, for example). Similar applications targeted for payment are included, for example, in the Samsung Pay system but they have been developed most in China, where a significant (if not overwhelming) portion of small payments is made through the service WeChat. (21) The creation of a free program, as well as of a video, requires the involvement of specialists, and, therefore, some costs. However, such costs can be justified even from the point of view of a private investor, if such a program is not free but a shareware one. Expanded program functions such as expenses analysis, charting, technical analysis and forecasts and recommendations based on it should become available under certain conditions (for example, an increase in the level of financial literacy due to passing tests, participation and victory in online quizzes or games devoted to financial literacy, participation in surveys that improve the work of the site).
3. Any training, as well as the consolidation of the knowledge gained, is more effective if game methods are used for this. An online game could be one of the elements of the site. The development and popularization of such a game is a matter of specialists. Meanwhile, the students themselves could be involved in this work. Furthermore, already today a considerable number of various quizzes and Olympiads on financial literacy are held. It is possible to continue holding similar events as part of the work of the online portal as well as separately. It is possible to use external resources when working with the website.
4. Before the completion of the creation of the Internet portal, related software products, monitoring, and incentive systems, it is expedient, from our point of view, to attract commercial organizers of training activities on a reimbursable basis within the public procurement system. Such actions, although they involve additional financial costs, will increase the coverage of the program. In addition, as noted above, there are facts of the organization of seminars, lectures, and training in higher education institutions by such companies on a non-reimbursable basis, for advertising and reputational purposes. One of the drawbacks of the activities carried out was the fact that such training is more often held in economics higher education institutions and faculties, whereas, as was noted above, the students who are not specialized in economics have the greatest need for them. The lack of contacts between these companies and the leadership of institutions of higher education and their units, which are not specialized in economics, is also a kind of problem. It seems useful to instigate the interaction of non-economic and economic faculties of versatile institutions of higher education in order to connect the non-economic faculties with the organizers of training. Attention should also be paid to the fact that the representatives of the event organizers confirmed their readiness to work with higher education institutions, provided there is an external solvent customer, including a public and municipal procurement. The direct work of institutions of higher education including commercial projects of departments and faculties within the framework of extra-budgetary activities would be logical here.
5. Finally, for students who are not specialized in economics, it seems appropriate to make some modification of the economic courses, which they study in their first years as part of their general education curriculum. It seems that the purely academic content of economic disciplines is not of sufficient use, both practical and theoretical, because, as a rule, students who are not specialized in economics, do not use such knowledge to a sufficient extent and, as a result, forget it. In this regard, part of the time of the courses they attend could have a more applied nature, for example, in the form of an explanation of the principle of the functioning of credit and deposit products and their risks. The implementation of the proposed activities, especially at the initial stage, will require costs, which, depending on the scale of the project, can be significant. Before the start of a large-scale program to increase the financial literacy of students who are not specialized in economics, it may be expedient to create a pilot project and its approbation on a small group of students of one of the universities. This will avoid errors when expanding the target audience. In addition, it should be borne in mind that current measures to increase financial literacy also receive government funding (reaching tens of millions of dollars), but not always achieve the desired effect. (22, 23) In addition to this, teaching the economy in the current form to students who are not specialized in economics requires a substantial expenditure of teaching hours for teachers, and therefore corresponding funding, which can be applied more effectively in this area. For the purposes of financing the mentioned project, it is possible to involve non-state institutions. However, their participation is fraught with the danger of having an excess of information of an advertising nature. Unfortunately, very many Internet resources devoted to increasing financial literacy today openly advertise certain financial institutions or financial services, which is not always justified. Since the issue of increasing the financial literacy of the population as a whole has already been made at the state level, it is logical that the major share of the costs of implementing this project should be borne by the state budget.

4 Conclusion

After graduating from a university or a college, when starting their working life, very few people are able to devote much time to self-education, especially if this is not related to their professional activities. In addition, already during the studies in a university, a citizen, as a rule, becomes fully capable. In this regard, when talking about the choice of the target audience in

terms of increasing the level of financial literacy of the population, special attention should be paid to students. This group being the most receptive to new knowledge is able not only to obtain the proposed knowledge about finance but also to start applying them from the first days of independent life. At the same time, when talking about students, it should be remembered that some of them, in accordance with the chosen higher education institution and specialty, directly study blocks of economic disciplines, gaining an economic or "near-economic" specialty, which is also likely to increase the level of knowledge in the field of personal finance.

Based on the above data, we can conclude that students really need to increase their level of financial literacy and are willing to give it their own time and energy. On the other hand, while students who are specialized in economics have the opportunity to raise their level of financial literacy by studying the disciplines of the main course of their curriculum, students who are not specialized in economics have fewer opportunities for this. (24)

To date, financial literacy is defined as knowledge about financial institutions and products, as well as the ability to use them when a need arises and understanding the consequences of their actions. (25) The effectiveness of the population's participation in the modern economy directly depends on an understanding of how you can profitably use new financial products. (26) Reliable use of knowledge is impossible without basic knowledge and skills. (27, 28) The task of increasing the level of financial literacy of the population is stated among the top priorities in the Concept of Long-Term Social and Economic Development of Kazakhstan for the period until 2020. In addition, the need to increase financial literacy is determined by a number of international agreements.

In conclusion, we would like to state that today the universities pay great attention to the theoretical aspect of studying economic disciplines, while the level of practical skills of students remains extremely low. It is necessary to establish interaction with financial structures, which will create the possibility of obtaining information and experience "at first hand."

Literature:

1. Leontyev AA. Revealing the potential of educational technologies. World Economic Forum: A new look at education; 2015; Geneva.
2. Leontyev AA. Educational system "School 2100". Pedagogy of common sense. Moscow: Balass; 2003.
3. Demidov DN, Zelentsova AV, Bliskavka YA. Increase of financial literacy of the population: international experience and Russian practice. Moscow: Tsipsir Knorus; 2012.
4. OECD. PISA 2015 Assessment and Analytical Frameworks: Science, Reading, Mathematics and Financial Literacy [Internet]; 2016. Available from: http//dx.doi.org/10.1787/9789264255425-en
5. OECD. PISA 2012 Results: Students and Money: Financial Literacy skills for the 21st century (volume VI) [Internet]; 2014. Available from: http//dx.doi.org/10.1787/9789264208094-en
6. Lusardi A, Mitchell OS. The Economic Importance of Financial Literacy: Theory and Evidence. Journal of Economic Literature, American Economic Association. 2014; 52(1):5-44.
7. Behrman JR, Mitchell OS, Soo CK, Bravo D. How Financial Literacy affects Household Wealth Accumulation. The American Economic Review. 2012; 102(3):300–304.
8. Modigliani F, Brumberg RH. Utility analysis and the consumption unction: an interpretation of cross-section data. In: Kurihara KK, editor. Post-Keynesian Economics. New Brunswick, NJ: Rutgers University Press; 1954. p. 388–436.
9. Friedman MA. A Theory of the Consumption Function. Princeton University Press; 1957.
10. Keown. Personal Finance: Turning Money into Wealth. The Prentice Hall; 2009.
11. Johnson E, Sherraden MS. From financial literacy to financial capability among youth. Journal of Sociology and Social Welfare. 2007; 34(3):119-145.
12. Lusardi A, Mitchell OS. Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education. Business Economics. 2007; 42(1):35.
13. Cole S, Sampson T, Zia B. Prices or knowledge? What drives demand for financial services in emerging markets? The Journal of Finance. 2011; 66:1933-1967.
14. Stango V, Zinman J. Exponential Growth Bias and Household Finance. The Journal of Finance. 2009; 2807-2849.
15. Bernheim BD, Garrett DM, Maki DM. Education and saving: The long-term effects of high school financial curriculum mandates. Journal of Public Economics. 2001; 80:435-465.
16. Garrett DM. Public and Private Retirement Programs in the United States [dissertation]. Stanford University; 1996.
17. Lusardi A. Financial Education and the Saving Behavior of African American and Hispanic Households [Internet]. Report for the US Department of Labor; 2005. Available from: http://www.dartmouth.edu/~alusardi/Papers/Lusardi_pdf.pdf
18. Duflo, Saez. Participation and investment decisions in a retirement plan: the influence of colleagues' choices. Journal of Public Economics. 2002; 85:121–148.
19. Drexler, Fischer, Schoar. (2014). Keeping It Simple: Financial Literacy and Rules of Thumb. American Economic Journal: Applied Economics. 2002; 6(2):1-31.
20. Babushkina OV. Formation of functional literacy of general education school students: theory and practice of international studies [Internet]. Available from: http://journal.preems tvennost.ru/arkhiv/year-2015/50-nomer-8-04-2015/946-formiro vanie-funktsionalnoj-gramotnosti-obuchayushchikhsya-osnov noj-shkoly-teoriya-i-praktika-mezhdunarodnykh-issledovanij
21. Zhilyuk DA. New approaches to increasing the financial literacy of students who are not specialized in economics. In: Ivanova NG et al., editors. Management of public finances: topical issues, new solutions and development strategies. Saint Petersburg; 2016. p. 61-69.
22. Ivanova NG. Finance: manual. Saint Petersburg; 2016.
23. Kuzina OY et al. Financial literacy guide. Moscow: Tsipsir Knorus; 2010.
24. Yermolenko VA. Development of the functional literacy of a student: the theoretical aspect [Internet]. Electronic scientific edition "Almanakh Prostranstvo i Vremya", 1; 2015. Available from: http://cyberleninka.ru/article/n/razvitie-funktsionalnoy-gramotnosti-obuchayuschegosya-teoreticheskiy-aspekt
25. Stakhovich LV. The need to increase the financial literacy of youth as the most important priority of public policy [Internet]; n.d. Available from: http://www.ecsocman.edu.ru/text/3337 2918/
26. Kiselevskaya YY. Analysis of financial literacy of university students [Internet]. Molodoy uchenyy. 2016; 10:733-736. Available from: https://moluch.ru/archive/114/30207/
27. Paatova ME, Daurova MS. Financial literacy of children and youth as a current challenge of modern education. Vector Nauki TGU. 2014; 21:73–75.
28. Maksimenko AA. How the Russian youth intends to "make" money. Sotsiologicheskiye Issledovaniya. 2005; 7:131-133.

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CONCEPT AS A WAY OF CODE PERCEPTION OF THE WORLD

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Abstract: The surrounding world is modeled with the help of concepts that form the national code of a people. The cultural code refers to a set of signs (symbols) and a system of certain rules by which information about the objects and phenomena of the surrounding reality is expressed, human properties are characterized and value related to the objects of reality are determined. Concepts form a conceptual model of the world. This model is individual and specific to each native speaker, that is, it represents a unique phenomenon, which is called the spirit of the people. This explains the relevance and validity of the topic of this study. This article is devoted to the study of the concept phenomenon and its deep structure. The deep structure of the concept is represented by gestalts as units of the code expression of the world. This scientific work reveals gestalts in the structure of the concept of Destiny (Sudba in Russian / Tagdyr in Kazakh) in the Kazakh and Russian language pictures of the world, their universal features and national-specific features are determined. Based on the identified gestalt, a model of the code perception of the world is represented by a carrier of a certain language.

Keywords: Concept, Conceptual model of the world, Gestalt, Cultural code, Natural code, Subject code, Code expression of the world.

1 Introduction

Today, Kazakhstan as a multicultural state is on the path of evolutionary development. So-called spiritual modernization of the country (“rukhani zhangyru”) proposed by the Leader of the nation N. Nazarbayev (1), is being realized. The growth of the spiritual culture of the whole society is seen only in the love of the native land, in the knowledge of its history, language, customs, and traditions. Therefore, the preservation of the language, national culture, the cultural and genetic code of the people is an important condition for the spiritual modernization of the country, a platform on the way to the modernization of the state as a whole. In this context, the preparation of this scientific work is timely and necessary.

The content of culture is represented by different areas: morals, traditions, and customs, language and writing, clothing, education and training, economics, social and political structure, law, science, art, religion, manifestations of the spiritual development of the people. In language, all these areas are implemented in the form of a system of culture codes. A cultural code is a kind of conceptual grid using which the native speaker categorizes, structures and evaluates the world around him and his/her own inner world.

Cultural codes are manifested in the processes of categorization of the world. The categories themselves are not given to us “from above”, but “are formed in our minds in accordance with the specific requirements of the environment and surroundings. At the same time, any language adequately serves its culture, providing at the disposal of the speakers the means for expressing culturally significant concepts and relationships.” (2, p233) The basis of categorization, viewed as a process, is the similarity and difference in the objects of the external world or the phenomena of the inner world.

The ability of a person to correlate phenomena from different areas, singling out common signs in them, forms the basis of the existing system of codes in each culture, among which are anthropic, somatic, zoomorphic, phytomorphic, objective, natural, temporal, spatial, spiritual, etc.

The study of linguistic consciousness of the representatives of different ethnic groups has been widely practiced in the last decades in the West and in Russia, but no one has specifically dealt with the problems of linguistic consciousness of the Kazakh people. Some works by E.D. Suleymenova (21, 22), N.Z. Shaymerdenova (23, 24, 25), A.E. Karlinsky (26), G.G. Gizdatov (27), N.V. Dmitryuk (28, 29, 30), Z. Dzhambayeva (31) and others have the character of either pioneer or pilot prognostic studies.

2 Materials and Methods

Destiny is an important element of culture, which, despite the development of history and changes in a person's ideas about the world, does not disappear from mental and semantic space. The security from the influence of time is a characteristic feature of keywords in culture and universal concepts.

There are various interpretations of the phenomenon of destiny as an abstract concept, which were characteristic and remain relevant to a representative of any culture. There are three interpretations of destiny as a linguistic and cultural phenomenon.

The first position is mythological fatalism, which incorporates predestination as an irrational action, the unknown as an image of the dark principle. The second position is rationalistic, which interprets predestination as a linkage of causes and effects. Here some lack of freedom does not appear as a myth or an image but as a result of the system of human actions. The third position is the theological, i.e. the doctrine of absolute predestination, which is identified with the almighty will of God (14, p. 225).

Depending on the era and historical development of humankind, destiny was interpreted through the prism of these positions. The rationalist position was considered by many philosophers of the Renaissance and representatives of German philosophy (such as G. Simmel and O. Spengler). In the opinion of O. Spengler, destiny is "the inner logic of life itself, its deep regularity that flows from life itself" (15, p. 156).

Theological teaching is associated with the religions of different nations (Orthodoxy, Islam, Catholicism etc.). In this position, a person's life is controlled by divine power. In this position there is no understanding of destiny as a predetermined entity, there is only a divine principle, which predetermines life. In religious texts, destiny is understood not as a certain force that governs but as a synonym for the word "life", which depends on God.

The most interesting from the point of view of cultural knowledge is the transformation of the position of mythological fatalism. This interpretation of the category of lack of freedom was developed long before the emergence of religion and of the ability of humanity to have a rational vision of the surrounding world. This idea was formed during the period of paganism, the characteristic feature of which was the worship of the gods, each of which performed a certain function and required its ritual. The functions of destiny as a mythologem are found in myths that tell us about deities. S.S. Averintsev (16) describes fate as "a mythologem expressing the idea of determination as non-freedom."

In the Slavic mythology, the destiny was controlled by the goddess Mokosh, who spun the threads of destiny and, among other things, patronized female handicrafts on the Earth. She was assisted by two sisters whose names were Dolya and Nedolya. They were celestial spinsters who spun the thread of each person's life. Dolya embodied happiness and luck, whereas Nedolya (Likho) embodied grief, misfortune, and trouble.

In the ancient cultural tradition, destiny appears primarily as the expression of the will of an individualized deity. Nevertheless, over time, the worldview of ancient people changes, the consciousness gets less mythologized and gradually an individual comes to the definition of destiny as an impersonal force; the fatalistic tendency sharply increases. The power of

destiny is universal; it applies to everyone without exception. The core of the conceptual content of the mythologem "destiny" is the idea of predestination.

What is important here is that the concept of destiny emphasizes the moment of the fundamental independence of a person's will from his/her position in relation to life circumstances and the unknowability of the deterministic forces of a person's destiny that generate fear and its consequences. Destiny is insurmountable, so it was often perceived by our ancestors as a "villain."

Belief in destiny as the supreme force is connected with the ancient, archaic ideas of humankind about the existence of gods that controlled the life of people. Senses of destiny as mythologems are found in myths narrating about spirits and deities personifying the forces influencing human life.

In the X century, the adoption of Christianity in East Slavic lands took place, which was reflected in the transformation of the concept of destiny by the people. Christianity counterposed the idea of destiny to faith in one God. Destiny was already understood as the "providence" of the one supreme God. In Soviet times, in connection with the abdication of the church, interest in destiny as some inexplicable force was lost. At present, there is an increasing interest in the concept of destiny as an irrational entity.

Destiny is identified with the actions of God, with his providence. "Providence is the participation of God in people's lives directing them to a specific goal." (17, p. 120) It is interesting to oppose this understanding of destiny as the supreme will of God to an understanding of destiny from an atheistic point of view. In the atheistic dictionary, there is another interpretation of the essence of destiny: "destiny, fate, or lot is an antiscientific idea of the supernatural predetermination, the inevitability of events and actions of a person." (18, p. 215)

According to etymology, the word “fate” goes back to the Latin word "fatum", from "fari", which means "spoken." This is very close to the Russian word “rok”, which, by analogy, comes from the Slavonic root "rok", which means “speech.” (19) In the semantics of words, the significance of the activity of some categorical and irreparable force is present. Perhaps this is due to the category of gender in the lexemes presented. The lexeme “fortune”, close to the word “fate”, is borrowed and is also associated with a mythological idea. Fortune in Roman mythology was the goddess of the harvest, then the word “fortune” acquired the meaning "luck", which occurs at the behest of the gods. As a result, the lexeme has retained positive semantics and is used when it comes to some kind of happy event.

When considering the synonymic series of the lexeme “destiny,” we find the variability of use, which is associated with stylistic differentiation, a semantic dependence on the situation at which an unconscious, intuitive choice of a suitable word between all presented similar words occurs; which is also characteristic of synonyms in the English language.

The concept of destiny is present not only in mythological, religious, philosophical and ethical systems. It is the core of national and individual consciousness. This concept belongs to the number of "active principles of life, which are mysterious and inevitable." (20, p137)

In modern linguistics, there is no single classification of cultural codes. However, at the heart of each proposed classification is one basic coding system based on the laws of objective reality.

Units of the code representation of the world cannot be observed in “pure form”, they are amenable to certain analysis only in deep, “folded” structures – gestalts. Gestalts form the inner form of the concept.

The object of our research is the concept of Destiny (Sudba in Russian / Tagdyr in Kazakh) in the Russian and Kazakh mentality.

The choice of this concept is due to the fact that it is one of the key and unique concepts of the Russian and Kazakh mentality. The key concepts are the basic units of the worldview that have significance both for the individual linguistic personality and for the linguistic community as a whole. The peculiarity of the analyzed language phenomenon is the complexity of its deep content, which includes both general mental principles and attitudes, and personal and individual worldview. This is what determines the relevance of the conceptual phenomenon.

Knowledge of the world is carried out from the known to the unknown. In this case, the subject is guided by the principle of meeting their needs. Needs act as a force that motivates a person for development, creativity. The structure of needs in psychology was classified by A. Maslow on the principle of hierarchy of values (3):

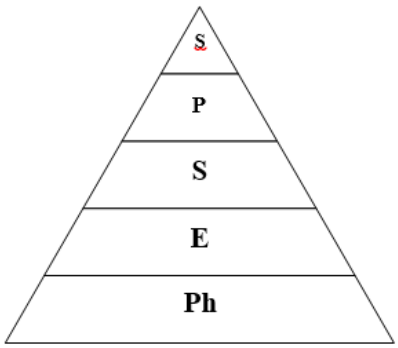

Figure 1. Figure 1. The Pyramid of A. Maslow

Notes: Spiritual needs (S) = self-affirmation, self-expression, self-development through creativity; prestigious needs (P) = respect, self-respect, recognition, status; social needs (S) = belonging to a team, communication, spiritual closeness; existential needs (E) = security, safety, freedom, sense of ownership, stability of living conditions, awareness, etc.; physiological needs (F) = hunger, thirst, rest, etc.

In the gestalt approach, a person operates in three modes: “id”, “ego” and “personality”.

The “id” function is related to the fact that the subject compares the previously obtained information through sensory, perceptual channels with the information necessary for the organization of actions to meet this need; it looks for opportunities to meet or interprets the impossibility of satisfying the need.

The “Ego” function is an active function of choice or conscious refusal: the subject chooses one of all hypotheses based on his own needs.

The function of "personality" is the development of a person through creativity, the formation of personality. Man manifests himself not just as a living (animate being), but as a socially active, thinking person; he does not just see, listen, remember, but thinks, believes, considers. The characteristic of the subject, you can add a sign of creativity, as "it performs, creates, determines action." (4, p235) The sign of creativity is inherent in the semantic subject, which is reflected in the concept of "agents" in the language representation.

One of the needs that most acutely requires satisfaction, dominates at a given time, becoming a figure. Others temporarily recede and become a background influencing figure.

In linguistics, the term "gestalt" was introduced by J. Lacoff. "Gestalt is a deep meaningful unit of language, manifested at different levels and realized as different meanings. It is beyond the scope of express but directly associated with it." (5, p78) Therefore, between consciousness and reality, there is a "yawning gap of meaning".

Gestalt as a holistic structure is similar, we would say, to the search for a person by fingerprint (italics – N. Sh.). Gestalt is an experience "you will not leave me" (italics – N. Sh.).

Language, therefore, as a whole, is nothing more than the satisfaction of certain human needs or it is in connection with certain challenges that nature and society pose to man.

Thus, gestalts form the basis of the human perception of reality, determine the specifics and nature of motor acts and direct cognitive processes on the activity. Gestalts have all the same characteristics as the concept. They form the cognitive model of the concept.

3 Results and Discussion

The objects and phenomena of reality are one of the components of the conceptual picture of the world in which they acquire a certain value as a result of their involvement in one way or another in the spiritual and practical activities of man. Subject-object attitude implies the presence of the subject's attitude to the object, which occurs only in the process of human activity in the cognitive-practical development of reality.

The world in which a person lives consists of inanimate and living nature. Inanimate nature is represented by signs of elements, matter, products, and objects. Living nature is represented by plants, animals, birds, insects, and humans:

a) the object-person: slave / bondwoman – Out of the sea of tears, the sea of anguish / your Fate is pure and clear (A. Beliy); Eccentric Eugene, poverty ashamed / Petrol inhales and the fate of the curse! (O. Mandelstam); It is perceptible the fate of the autocracy, / We give all his hopes and desires; I scheduled the lonely path / He is strictly cursed by fate; Learn, what is destined to fate / Wither silently in a tight circle / Jealous rudeness slave / Among the cowardly and cold / fake Friends and enemies / Fear and hope is barren, / Empty and painful labors; I hear-and I submit to the fate of the terrible, / Long time I said to myself: do not contradict (A. Fet); He is like a shot bird / wants to rise – and can not do it (F. Tyutchev); Curse of the century – it's a hurry, / and the man, washing sweat, / life rushes like a pawn / having got hunted in time trouble (Ye. Yevtushenko); slave – in this room – there are three destinies, three People, / Like sparrows sitting in a cage. / Three people are not different but one illness, One trap had confused six feet; the Way my long does not assemble, that's why I worried about the fate. / The future of life pulling and pushing past, / Pushes to the edge; Daily hectic life... / Hectic life, hectic life/ work hectic life too bad!; What would you have done if it hadn't been born, / Believe... / What would you do if you didn't believe? No grams will not get even with the lake; That would make native? / Having been a slave to his fate, / If he walked tiredly to get to me. / Like the horse escaped from the pole / Inspired by the young portions (M. Makataev); Burning with frost, burning with heat, / one joy, the second sorrow. What will give birth to the unknown like a pregnant woman / who knows what will be fate! When the gut itself on fire, / Turning and scraping yourself / I'm like jaundice suffering person / Waiting for hope from today and tomorrow; to be afraid of a quick lift on top of that / Patterned decorating patterns: though still twitching on the ground / Who did not agree with the government's harsh environment; Entered into life, then became brutalized (F. Ongarsynova); if you agree the mood is normal, / Quit, the trouble is, / whether the dog will be an insulted man / Poor man, in this mortal world; Not finding soul you can rely on, / it ought to be heart of a dog. / Unable to get enough of life once, It's that kind of tramp (Abay).

It is important to note that from the point of view of the problem of interest to us, the process of forming the category of animation in Russian occupies a special place. So, for example, in Ancient Russia in XI century a slave, a lackey was called a free adult man. Perhaps this explains the presence of the word rok (fate in Russian) in the sense of "age" in the Dictionary of ancient languages. (6, p165) Moreover, the words slave and lackey were used in the form of dative and genitive.

Thus, apparently, the concepts of "intelligent being" and "free adult man", if not covered each other, were in that period in a different ratio, which led to the possibility of the above-mentioned meanings of the word "man".

The outstanding scientist-linguist V. V. Vinogradov in his work "History of words" writes about this the following: "In the old language until the XVII century, there was no need for a word that would correspond, although remotely, to modern ideas and concepts about personality and individuality. In the system of the old worldview, the signs of an individual were determined by his attitude to God, community or world, to different layers of society, to power, state, and homeland, native land from other points of view and expressed in other terms and concepts. Of course, some characteristics of the individual (e.g., singleness, isolation or separateness, the sequence of nature, which are recognized on the basis of certain signs, concentration, or motivation of actions, etc.) was alive, obvious to the consciousness of ancient man. But they were scattered by different designations and characteristics of man, human species (man, people; servants, face, soul, being, etc.), and in General the social and artistic consciousness of the Russian people until the XVII century was alien to the concept of a separate human "I" as a carrier of social and subjective characteristics and properties" (for example the lack of such genres autobiography and portrait techniques in ancient literature). (7, p271–272)

In the XII and XIV centuries the forms of dative and genitive are obtained by nouns that denote adult men, especially in those contexts where their personal character is emphasized, that is, first of all, their own names: "A sy posada v Novgorod Vsevoloda" (in Old East Slavic) (Novgorod Synodal chronicle).

Since the end of XV and XVI century forms of dative and genitive start to include the names of persons of the female gender (the appearance of the noun is feminine bondwoman).

Since the end of the XVII century, the new form has been extended to the names of animals and small children. In short, at the same time, each individual, regardless of gender, age and social status is endowed, according to the grammatical rules of language, the property of "animacy". Moreover, the spread of the sign (+ animacy) to the designations of any person was the result of evolution both in the language and in the worldview, which was represented by the Russian people.

The formation of the gestalt of slave (kul in Kazakh) in the Russian and Kazakh mentality is determined by the attitude of man to freedom: man is completely dependent on someone for something, limited in their actions and behavior.

The state of a person who is dependent on someone for something in the language is expressed by comparative turnover. Therefore, the cognitive basis for the explication of the object-person is a comparison.

In the structure of linguistic comparison there are the following elements:

1) what is compared, or the subject of comparison (A);
2) what is compared, the image, the standard of comparison (B);
3) on the basis of what is compared, the basis of comparison (tertium comparationis – C);
4) what is compared, the comparison index (m) (in Russian – comparative conjunctions as, if, exactly, as if, grammatical forms – the degree of comparison of adjective, noun in the form of ablative case; in the Kazakh language – postpositions are analogous, alike, similar, like, affixes -dai/-dei, -tai/-tei -, sha/-she-, -daiyn-/-taiyn-).

The second element in the structure of linguistic consciousness (B) is called the standard of comparison.

The standard – "the measuring instrument or their complexes, providing storage and playback of legalized units of physical quantities and their size means in other dimensions." (8 p28).

The standard at the socio–psychological level is a manifestation of normative ideas about the phenomena of nature, society, about the person, his qualities and property.

The standard is the result of national-typical world measurements. This is what figuratively measured the world in the human mind.

Standards of comparison form the basis of the formation of cognitive structures in our study, gestalts, reflecting the national specificity of culture and especially the thinking of a people. For example, the standards of a man-servant in the language picture of the world stands for birdshot, bondage – wilting flower, plants, close range, in Kazakh picture of the world – the sick, the pregnant woman, the dog; the subjects of economic activities – seine net, pole with a running noose.

The imprisonment of man is like the withering of a plant, a flower. It is the gradual dying of man. Before us is an example of an implicitly expressed comparison, more precisely, a phyto-morphic metaphor: Learn, what is destined to fate / Wither silently in a tight circle / Jealous rudeness slave / Among the cowardly and cold / fake Friends and enemies / Fear and hope is barren, / Empty and painful labors (A. Fet).

A bird is primarily a vertebrate animal with a beak, limbs and, of course, wings. The wings serve as the aircraft for a bird, they bird freely hover in the air. This means that the shot bird loses the ability to fly, therefore, is in captivity. It turns out that we have an example of visual comparisons characteristic of Russian self-consciousness.

As our research shows, the source of visual comparisons are the actions of the compared objects. The comparison of the type He is as a shot bird / Wants to rise but can not do it (F. Tyutchev) arose on the basis of a comparison of movements of the standard (B) and the subject of comparison (A), so that the comparative design becomes dynamic, creating a figurative picture of a moving man and animal (birds). Here we are talking about a specific action, the image and the subject of comparison are specific, and this specificity serves as the basis for visual comparisons. On the essence of visual comparisons, D. S. Likhachev writes: "For comparisons of modern times (XIX and XX centuries), it is typical to convey the resemblance of the compared objects, to make the object visual, easily imaginable, to create the illusion of reality. Comparison of the new time based on diverse experiences from the objects that draw attention to the characteristic details and secondary signs, as if removing them to the surface and delivering to the reader the "joy of recognition" and the joy of direct visibility." (9, p194)

The visual comparison is based on the movement of the element, are verbal, and the item B – adverbial. They, by the nature of comparative semantics, express the meaning of the identity.

In the Kazakh language picture of the world we reveal psychological comparisons of two types: 1) comparisons, in which the image (B) is concrete, and the subject (A) is abstract: What would my soul do? Being a slave to fate, / If I walked panting, tired of reaching me, / Like a horse escaped from the pole, / Inspired by the young portions (M. Makataev). The desire of a man to escape to freedom characterizes his inner world and is compared with the caught colt; 2) comparison, in which the image (B) based on a specific action, with specific actions: Burning with frost, burning with heat, / one joy, the second sorrow. What will give birth to the unknown like a pregnant woman / who knows what will be fate! When the gut itself on fire, / Turning and scraping yourself,/ I'm like jaundice suffering person / Waiting for hope from today and tomorrow; (F. Ongarsynova). As can be seen from these examples, the causator of the human condition is doubt, unbelief. Disbelief in a happy fate lives in a person for a long time, then weakening, then intensifying. The second example shows the moment when this feeling is enhanced. It is covered with a new line: disappointing (destiny disappoints), it is vile and disgusting (disgusting from the own fate).

By the nature of comparative semantics, they, like the visual ones, express the meaning of equality.

These comparisons, in our opinion, are truly psychological, as they reflect in the Kazakh language the extreme complexity of the inner world of man.

b) the object-animal (zooonym): bull – Take the fate of the horns; dog – Fate, like a dog – one may lick, another may bite; horse (steed) – The horse was rearing on its hind legs, so that you, a military camp, seeing from the heights of destiny (B. Pasternak); Horse – Recently sat pulling the mane, / Noisy wild horse named life (M. Makataev); snake – Did not let go the remnants of good, / Slander or your left order? / Constricting like a snake saying I'm/ doing everything the opposite (M. Makataev) The world is a once-turned snake. The snake then stings then bites (M. Auezov); fox – Relatives are whole, thoughts are fine, / will miss the joys of fun / Seducing like a Fox / one day of the world will pass; one day of life will pass, / the mood left in the dark, / the world is like a fox (Singing five years).

The spiritual world of any nation is determined by the surrounding nature, which is sometimes more important than many other factors.

When they talk about the difference between the conceptual model of the world and the linguistic model, about the specifics of the national pictures of the world in different ethnic groups, they usually mean first of all the conceptual representation of nature: natural phenomena, landscape, climatic features, flora and fauna reflected in the language. Understanding of the importance and role of nature in his life was carried out by a man in the primitive era, the results of this formed the basis of his archaic ideas about the world as a whole. "People's dependence on nature was felt by them so much that the image of the world created by them included many features that testified to the inability of a person to clearly separate himself from the natural environment." (10, p. 58)

At the heart of the gestalt fate-animal (horse, steed, dog, snake, fox) are ideas about animals. "The cult of animals is the first line that the first man draws between himself and the world of nature. As the role of animals in spiritual culture would later declined, animism remains the semantic background on which linguistic and religious stereotypes, poetic images and so forth are formed." (11, p. 123)

The horse in the Slavic tradition is one of the mythologized sacred animals. The horse is an attribute of the higher pagan gods and chthonic at the same time, the animal associated with the cult of fertility and death, the world beyond the grave.

In Russian fairy tales familiar to us since childhood, we read: "The horse is running – the earth trembles, the flame breathes from the nostrils". A. N. Afanasyev draws a horse such way: "As

the embodiment of impetuous winds, storms, and volatile clouds, fairy horses are endowed with wings that spring with mythical birds. The fiery, fire-breathing horse serves as a poetic image of the light-bearing sun, the lightning-shining clouds... In general, the heroic steeds of our folk tales and fairy epic so easily jump across the sea, lakes and rivers, differ in such magnitude and force that are not in the least conceal their mythical origin and affinity with the deified elements." (12, p. 147) In the expression sivka–burka prophetic kaurka epithet 'prophetic' means that the horse can talk, he is astute and intelligent, gives reasonable advice to his master. Moreover, the things of horses could predict the future, therefore the rite of divination is associated with them. At the time of divination, people blindfolded a horse's eyes, sat on it backwards and watched where it would go, – there a girl will marry.

The horse was at ancient Slavs also a symbol of stars, a moon. This is evidenced by the following riddles: The guests came, dismissed the horses all over the world (Stars); Sivko sea has jumped, and hooves have not wet (Moon).

Thus, a horse in the Slavic tradition symbolizes life and death, good and evil, fire and water at the same time. The view of the Slavs about the horse is ambivalent, has a dual nature, so to get in touch with him both positive and negative connotations, for example, in idioms to work as a horse ('about someone or something hard, usually servile work'), dark horse ('unknown individual representing a particular interest', 'objectionable person').

A horse in the understanding of the Kazakh people is the embodiment of socially valuable, beautiful and moral, the beauty of soul and flesh. The horse in the Kazakh tradition is the symbol of the upper world. A horse leaves the ground (mane = wings) and flies (Qobylandynyng Tayburyly, Akhan serining Qulageri - in Kazakh). Therefore, it is not accidental that the people have a proverb "At – er qanaty" (in Kazakh) (horse – wings of the hero). It is no accident that the winged horse is an element of the state emblem of our country.

In the life of the Kazakh people, an unwritten law had been living: in the form of parables to prepare kin, family for the sad event. The sad news in poetic form is called "estirtu" (in Kazakh). The example of "Tuyaghy bütin tulpar zhoq, ölgenning songynan ölmek zhoq, ölgen qaytyp kelmek zhoq" (in Kazakh), horse – tulpar is a symbol of deity. Perhaps, such an interpretation is connected with the idea of the soul in the Kazakh tradition.

In the interpretation of Kazakhs, argymak (or symbatty da zhürdek zhylqy) should have fifteen qualities: three qualities from men; three qualities from women; three qualities taken from a fox, a hare and a donkey.

Qualities of men: masculine character, cheerfulness, strength.

Quality of women: lush silky mane, beautiful figure, smooth, flexible movement.

Qualities of a fox: straightforward walking, even ears, conical the position of the tail.

Quality of a hare: wiry head, wide field of view, speed.

Quality of a donkey: cast hooves, dry cheekbones, wide yawn.

Thus, a horse in the understanding of the Kazakh people is the embodiment of the beauty of soul and flesh. The horse is the cosmos of the nomad, its unity, deity, hung all the attributes of existence and the universe. The steed causes the nomad to reverence, is the "body of reference" in the world of moral maxim and abstract concepts." (13, p. 67) Therefore, in the Kazakh language only positive connotations are connected with a horse, for example, qulyn-tayday tebisken (in Kazakh) ("live in friendship, consent"), kari tarlan (in Kazakh) ("many experienced in his age"; "very experienced man") etc.

In the Slavic culture, a dog notifies about the approaching of the impure force, in one word, serves as the conductor with the otherworldly world.

If someone went all the way and met a dog aside – wait for luck in a way.

To see a dog in a dream, not barking, – for profit. To see a dog in a dream, barking, – to a quarrel.

Therefore, on the one hand, a dog is a symbol of a good start, and on the other hand, a dog is the embodiment of evil: a dog's devotion; a dog's loyalty; mad like a dog, then lick, then bite etc.

According to the views of the Kazakhs, a dog is included in seven treasures of "Zheti Kazyna". According to a popular belief, "the dog has forty souls". Therefore, immediately after the birth of a child dressed in "it köylek" to protect the baby from the evil eye, damage, from all the troubles that he was hardy. However, at the same time in the Kazakh tradition, a dog is considered an impure being: a pregnant woman sees a dog in a dream – to a disease of a baby.

The nomadic way of life of Kazakhs has formed the knowledge necessary for the comprehension of nature mysteries. Economic life had a seasonal character, and it required good knowledge in determining the time of year, weather and it was associated with the observation of habits and behavior of animals: biening bas sauymynda (in Kazakh) – the first milking mares; bie sauymday uaqyt (in Kazakh) – time between regular milkings mares (about 30–40 minutes); if a horse often neighs there will be a blizzard; if a dog howls there will be an imminent danger; if a tied horse combs tail, it will be a long road.

Thus, the cognitive base of the fate-animal gestalt is the idea of animals. The whole philosophy of the collective, own for each language lies in them.

4 Conclusion

The study of language in all its diverse and various relationships with a person, with his intellect and mind, with all the mental and cognitive processes carried out by him/her is necessary, in demand at the present time, as the individual-psychological, socio-situational and national-cultural characteristics of society, person under the influence of the current globalization in general change extremely quickly. This is the relevance of the cognitive approach to language, respectively, a wide interest of linguists in this area.

The variety of aspects of the concept as a basic notion of cognitive linguistics consideration testifies to the variety of definitions of the term "concept". This leads to the following conclusion: the more definitions of a term, the greater its cognitive potential, provided that these definitions are congruent and not mutually exclusive.

The concept as a unit of culture is the fixation of collective experience, which is reflected in the language; concept as knowledge in the form of images and representations associated with words that have their own specifics in different cultures, there is an exit on the national and cultural specifics; concept as a mental education in the consciousness of the individual is an outlet to the conceptosphere of the native speaker, that is, ultimately to culture.

We define the cognitive concept as a dynamic cognitive model that reflects the structure of meaning in the individual's consciousness, and the meaning as a mental content correlated with a certain reality, linking cognitive and linguistic consciousness.

The complexity and diversity of the research of the concept phenomenon as a cultural code show that in modern linguistic science all the prerequisites for the formation of an independent scientific direction, i.e. conceptology are created.

The analysis of the Gestalt codes revealed by us as cultural codes in the conceptual model Destiny / Tagdyr allows to reveal their essential features:

1) mentality (Gestalt – something ideal, the existing in our psyche);
2) integrity (Gestalt – holistic structure, component model concept);
3) dynamic nature;
4) structure (Gestalt consists of a background and a figure);
5) universality and specificity (native speakers of a particular language see the world through the prism of their language);
6) intuitiveness (the nature of Gestalt is intuitive);
7) value (Gestalt is the unit of value picture of the world).

Literature:

1. Look into the future: the modernization of public consciousness. Kazakhstanskaya Pravda; 2017 Apr 12.
2. Krasnykh VV. Etnopsikholingvistika i lingvokulturologiya [Ethnopsycholinguistics and linguoculturology]. Moscow: Gnozis; 2010.
3. Maslow A. The Farther Reaches of Human Nature. Saint Petersburg: Yevraziya; 1997. (Original work published 1971)
4. Arutyunova ND. Tipy yazykovykh znacheniy: Otsenka. Sobytiye. Fakt [Types of meaning values: Evaluation. Event. Fact]. Moscow: Nauka; 1988.
5. Lakoff G. Cognitive semantics / Meaning and mental representations. Bloomington; 1981.
6. Sreznevsky II. Slovar drevnerusskogo yazyka (Vols. 1-3) [Old Russian Dictionary]. Saint Petersburg: Publishing House of the Imperial Academy of Sciences; 1912.
7. Vinogradov VV. Istoriya slov [History of words]. Moscow: Nauka; 1994.
8. Bolshoy entsiklopedicheskiy slovar [Great Encyclopedic Dictionary]. Moscow: Sovetskaya Entsiklopediya; 1978.
9. Likhachev DS. Poetika drevnerusskoy literatury [Poetics of Old Russian Literature]. Moscow: Nauka; 1979.
10. Gachev GD. Natsionalnye obrazy mira [National images of the world]. Moscow: Sovetskiy pisatel; 1988.
11. Maslova VA. Lingvokulturologiya [Linguocultorology]. Moscow: Academia; 2012.
12. Afanasyev, AN. Derevo zhizni [The tree of Life]. Moscow: Russskiy yazyk; 1983.
13. Konerding K.-P. Grundlagen einer linguistischen Schematheory und ihr Einsatz in der Semantik [Foundations of a linguistic schema theory and its use in semantics]. In: Pohl I, editor. Methodologische Aspekte der Semantikforschung. Sprache – System und Tatigkeit [Methodological Aspects of Semantic Research. Language - system and activity]. Frankfurt am Main: Peter Lang. Europaeischer Verlag der Wissenschaften; 1997. p. 57-84.
14. Losev AF. Ocherki antichnogo simvolizma i mifologii (Vol. 1) [Essays on ancient symbolism and mythology]. Moscow: Losev; 1930.
15. Spengler O. The Decline of the West. Moscow: Mysl; 1993. (Original work published 1918)
16. Averintsev SS. Sudba [Destiny]. In: Philosophical Encyclopedic Dictionary. Moscow: Sovetskaya entsiklopediya; 1983.
17. Sklyarevskaya GN. Slovar pravoslavnoy tserkovnoy kultury [Dictionary of Orthodox Church Culture]. Moscow: MGU; 1977.
18. Vasilenok SI. Slovar ateista [Dictionary of an atheist]. Moscow: Politizdat; 1964.
19. Preobrazhensky AG. Etimologicheskiy slovar russkogo yazyka [Etymological dictionary of the Russian language]. Moscow: Gos. izd-vo inostr. i nats. slov; 1959.
20. Kovshova ML. Kontsept sudby. Folklor i frazeologiya. Ponyatiye sudby v kontekste raznykh kultur [Concept of destiny. Folklore and phraseology. The concept of destiny in the context of different cultures]. Moscow: Nauka; 1994.
21. Suleymenova ED. Arkhetip "gadkogo utenka" i yazykovaya identichnost [Archetype of the "Ugly Duckling" and Language Identity]. International scientific theoretical Conference "Language and identity"; 2006; Almaty: Akhan's readings.
22. Suleymenova ED. Etnolingvisticheskaya situatsiya v Kazakhstane: nastoyashcheye i budushcheye [Ethnolinguistic situation in Kazakhstan: present and future]. Almaty-Astana: Mektep; 2009.
23. Shaymerdenova NZ, Karabulatova IS, Niyazova GM, Avakova RA. Etnolingvistika Yevraziyskogo kontinuuma: teoriya i praktika [Ethnolinguistics of the Eurasian continuum: theory and practice]. Moscow: RUDN; 2009.
24. Shaymerdenova NZ, Sultanova KR, Slambekova AT. Yazyk i kultura v retrospektive pamyatnikov pismennosti [Language and Culture in the Retrospect of Monuments of Written Language]. Astana: Mektep; 2010.
25. Shaymerdenova NZ, Karabulatova IS, Niyazova GM. Etnoyazykovoy kontekst: osmysleniye i voploshcheniye [Ethno-linguistic context: comprehension and embodiment]. Astana: Ak¸arman-media; 2010.
26. Karlinsky AY. Osnovy teorii vzaimodeystviya yazykov [Fundamentals of the theory of language interaction]. Alma-Ata: Ghylym; 1990.
27. Gizdatov GG. Kognitivnyye modeli v rechevoy deyatelnosti [Cognitive models in speech activity]. Almaty: Ghylym; 1997.
28. Dmitryuk NV. Kazakhsko-russkiy assotsiativnyy slovar [Kazakh-Russian Associative Dictionary]. Shymkent-Moscow: Publishing house of the Institute of Linguistics of RAN; 2000.
29. Dmitryuk NV. Formy sushchestvovaniya i funktsionirovaniya yazykovogo soznaniya v negomogennoy lingvokulturnoy srede [Forms of the existence and functioning of linguistic consciousness in an inhomogeneous linguistic culture environment] [dissertation]. [Moscow]: IYA RAN; 2000.
30. Dmitryuk NV. Assotsiativnyy eksperiment kak sredstvo issledovaniya yazykovogo soznaniya [Associative experiment as a means of investigating linguistic consciousness]. Chelyabinsk: Publishing house of YUUrGU; 2007.
31. Dzhambayeva Z. Aksiologicheskiye stereotipy yazykovogo soznaniya kazakhstantsev [Axiological stereotypes of the language consciousness of Kazakhstan people] (Unpublished doctoral dissertation). Kokshetau; 2010.

Primary Paper Section: A

Secondary Paper Section: AA, AC, AI

DIGITAL EDUCATIONAL CONTENT AS AN INNOVATIVE PEDAGOGICAL TECHNOLOGY AND ITS DIDACTIC POTENTIAL IN THE FOREIGN LANGUAGE PROFESSIONALLY ORIENTED TEACHING

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Abstract: In recent decades, the world has been rapidly moving towards a new type of economy, where digital technologies have become the main instrument of its formation. Such terms as electronic, informational and computer technologies are synonymous together with the general term "digital technology". The term "digital technologies" is used to describe the process of digitization, i.e. the scanning, conversion, processing and subsequent transmission of various multimedia data.
Experts divide most of the digital innovations into evolutionary ones (changes expected by consumers) or revolutionary ones (solving technological problems of previous developments) i.e. sustaining innovation. Some of these technologies are referred to as disruptive technologies, capable of completely changing the formed ideas about the possibilities of technology and provide new opportunities to their manufacturers and users.

Keywords: Personal learning network, Virtual learning environment, Digital educational resources, Didactic characteristic, Didactic potential.

1 Introduction

Digital literacy of students and the ability to access, manage, analyze, integrate, evaluate and create information in a variety of ways is a priority of education in general.

Thus, in the state program "Digital Kazakhstan" for 2017-2020, one of the priorities is the development of a creative society, that is, a digital society that owns digital skills, which are the basis for the growth of all sectors of the economy and are important for ensuring the possibility of integrating the digital society and gaining access to digital services, as well as for improving competitiveness and productivity. This Program provides the level of education of graduates with the requirements of employers in the ICT industry. (1)

The term "digital content" is used as a term to describe three segments of the multimedia products market:

1. production of content in a digital format;
2. the multimedia products distribution in the digital environment;
3. consumption by users of the content produced and transmitted in digital format. (2)

According to a study by J'son & Partners Consulting, digital content is an informational, entertainment or gaming product distributed over digital networks or in digital format and consumed, recorded and copied without compromising the quality of the content. (3) There is another meaning of digital content in the Internet sources is a set of entertainment and information materials that are distributed electronically through special channels for use on digital devices: computers, tablets, smartphones. (4) Either it is an electronic digital file (or a file package) intended for delivery to the user via information and telecommunication networks with or without application of intermediate transformation for the subsequent reproduction of the corresponding file on the reproducing device of the user.

Multimedia content producers associate this term with any multimedia product created using digital technologies and presented in a digital format. For Telecom operators, digital content is a special type of transmitted data, characterized by specific requirements for the quality of transmission (for example, broadcast or multicast). According to Flerov (5), a candidate of pedagogical sciences, "Multimedia content is a virtual object in fact and can be used as a learning tool. Moreover, the content can be artificially created for this (learning programs), and used as a means of language learning, without being created for this purpose».

Here's the basic model, considering the types of digital content, ways of its implementation, as well as devices for content consumption (See Figure 1).

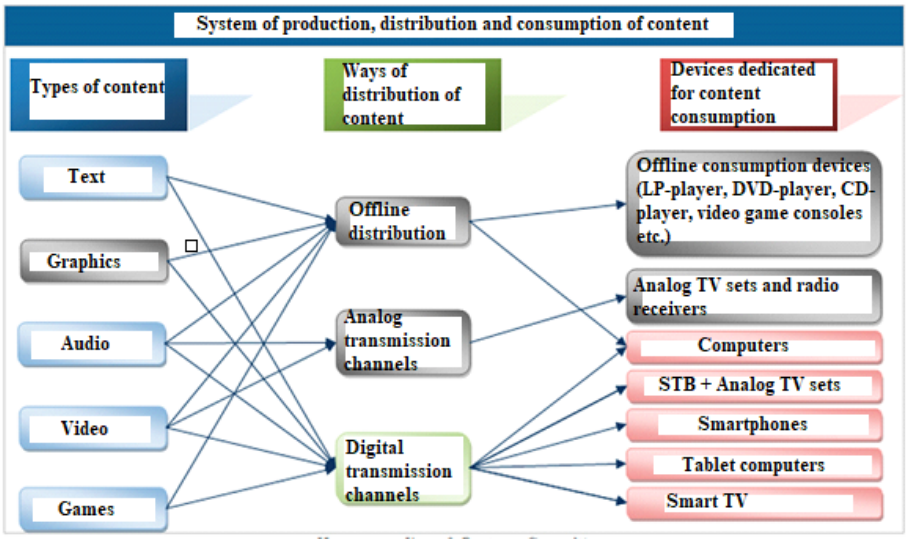

Figure 1. Digital Content

Figure 1 shows digital content that consists of:

1. Types of content: text, graphics, audio, video, and games.
2. Ways of distribution of content: offline distribution, analog data channels, digital data channels.
3. Devices for consuming content: non-network devices of consumption, analog TVs and radios, computers, smartphones, tablets, and smart TV.

J'son & Partners Consulting also includes music, mobile content, and e-books as the main types of digital content.

In the work of Korobkova and Kalinovsky (6) "Possibilities of use of digital educational resources in an educational process" is given the concept of "text", "graphics", used in a digital format in teaching foreign languages.

2 Materials and Methods

Illustrated texts in digital form are designed primarily to repeat the material of the textbook. The electronic form greatly facilitates the search for information in the text. Text objects can be incorporated into all forms and methods of teaching and used at different stages of an educational process, both teachers and students. Audio texts can be effective for repeating lesson material. They can be used as components of lectures, presentations during the explanation of the new material.

In digital educational resources, demonstration graphics are presented by diagrams, charts, drawings, photos and portraits of scientists. Graphics are not just analogs for traditional illustrations; they complement, didactically enrich the material and form a correct idea about the learning objects.

Authentic audio texts allow students to hear the speech of native speakers, which reflects the living reality and peculiarities of the national culture. Audio contributes to a significant improvement in the perception of English speech. (7) Unlike audio or printed text, which can certainly have a high informative, educational, and developmental value, video text has the advantage of combining different aspects of the act of speech interaction. In addition to the content of the communication, the video contains visual information about the place and the event, the appearance and non-verbal behavior of the participants in the communication in a particular situation, often due to the specifics of age, sex and psychological characteristics of the speaking individuals. Visual materials allow better understanding and consolidation of both factual information and purely linguistic peculiarities of speech in a particular context. (8) Thus, audiovisual communication technology (including educational) allows talented people around the world to become known due to the availability of their digitized creative product, worthy of imitation and inspiring others to similar acts.

Multimedia games and simulations in an online free encyclopedia may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator. (9) Multimedia games are a convenient, fast and effective way to present information, as well as an exciting test of learning with the help of computer programs. Thanks to the combination of computer animation, video, graphics, music and sound series, which are organized in a single environment, multimedia games for the longest time hold a person's attention.

According to the representative of Cambridge University Kirkman (10), digital learning content should include such digital technologies in the classroom, contributing to the active learning of students both in the classroom and in the remote mode of learning:

1. Bring your own device (BYOD), for example using a mobile phone to find the necessary information as a part of the research work.
2. E-portfolios, students submit their e-portfolio online, which can include scanned sketches, photos, gallery visits, written reports, authoring video and audio using multimedia files.
3. Flipped classroom, learners study the learning material at home through watching online videos and resources and apply this knowledge to build a specific diagram in the process of collective and team discussion.
4. Personal learning network (PLN), an individual selection or collection of links to resources (online face-to-face courses) and network (Twitter), corresponding to certain interests and contributing to the exchange of information.
5. Virtual Learning Environment (VLE), it could be electronic educational system LMS MOODLE, or interactive whiteboard based on the web- technologies, providing access to course content, assessment, homework, external links to additional resources.

As regarding the development of digital educational content (e-content) in the sphere of Kazakhstan education, the President of the Republic of Kazakhstan Nazarbayev (11) states the following task in the "Strategy Kazakhstan-2050": "We expect to implement modernization of teaching methods and actively develop online education system".

E-books in Kazakhstan were designed by the National Centre of Investigation under the direction of G.K. Nurgaliyeva in all school subjects from 1 to 11 grades in the Kazakh and Russian languages but the problem is that the developed electronic textbooks are not widely used in the educational process. Schools that have access to electronic textbooks, recommended by the Ministry of Education and Science, is not more than 36%.

Another type of e-content is digital educational resources (DER), which were developed within the framework of the "E-learning" project. According to the Director of LLP "Bilim Media Group" Kenzhekhanuly R., DERs in English should be developed on the basis of authentic texts, multimedia files, and audio-visual materials should be recorded by native speakers at the studios of foreign partners. (12)

Digital educational resources (DER) represent photos, video fragments, static and dynamic models, objects of virtual reality and interactive modeling, cartographic materials, sound recordings, symbolic objects and business graphics, text documents and other educational materials in digital form that are necessary for the organization of an educational process. (13)

Considering the model of classification of digital educational resources and their application in an educational process, (6) electronic resources differ from other learning tools by interactivity and multimedia and help to avoid rapid fatigue of students in the classroom (See Figure 2).

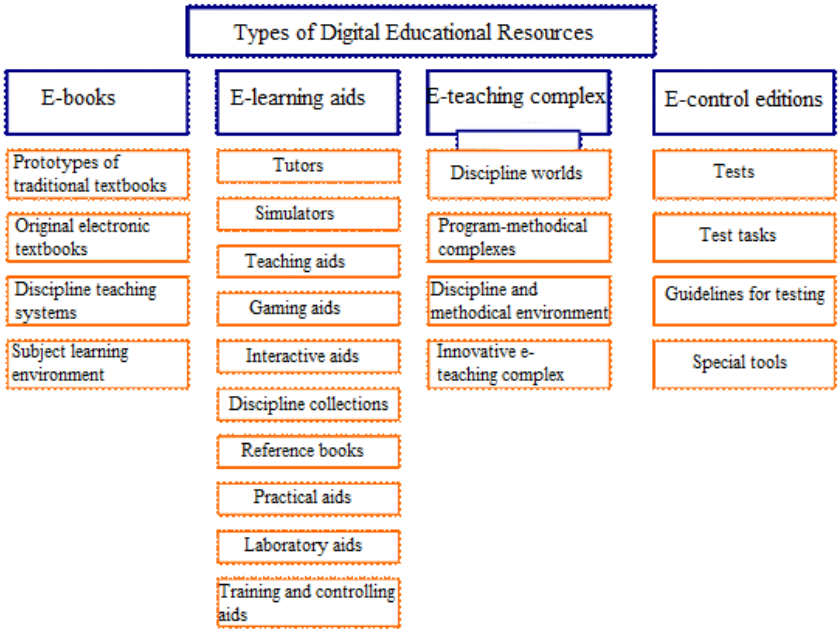

Figure 2. Digital Educational Resources

According to Figure 2, digital educational resources can be divided into e-books, e-learning aids, e-teaching complex, and e-control editions.

E-books include prototypes of traditional textbooks, original electronic textbooks, discipline teaching systems, and subject learning environment.

E-learning aids include tutors, simulators, teaching aids, gaming aids, interactive aids, discipline collections, reference books and dictionaries, practical aids, laboratory aids, and training and controlling aids.

E-teaching complex includes discipline worlds, program-methodical complexes, discipline educational and methodical environment, and innovative e-teaching complex.

E-control editions include tests, test tasks, guidelines for testing and special tools.

Electronic tutorials/learning programs are the most complete types of electronic resources to ensure the highest degree of autonomy of the student. They are very convenient and effective in a way of learning. Due to the wide choice of educational situations, the studied material can be worked out more deeply due to the repeated implementation of the given actions and necessary operations, development of practical skills and bringing them to automatism. These software tools enhance the effectiveness of an educational process in the classroom and are a means for the active cooperation between a teacher and a student. The selection of an electronic textbook depends, first of all, on the current educational material, the level of learning of students and their abilities.

Digital educational resources are divided into simple and complex types:

- Simple structured digital educational resource;
- Complex structured digital educational resource;

This model is a complex structured DER. A complex DER is a resource made up of elements that can be used separately as self-study educational resources.

Here is an example of complex DER:

1. Hypertext document with illustrations, allowing the division into separate sections (parts, chapters);
2. E-learning course on a specific subject (program), performed on a specific technology platform or requiring a specific environment (player) for use;
3. Test system;
4. Simulator;
5. Thematic catalog.

A simple DER is a resource that is capable of being used as a single unit and does not allow division into separate elements that can be used independently.

Here is an example of simple DER:

1. Article;
2. Illustration with accompanying text;
3. Book as a set of scanned pages with a table of contents;
4. Audio recording;
5. Video;
6. Presentation in MS Power Point format;
7. Separate media object of the learning course performed on a specific technology platform.

The DER is a set of interrelated educational facilities:

- symbolic objects (signs, symbols, texts, graphics);
- figurative objects (photos, pictures);
- audio information (oral texts, dialogues, music);
- video objects (animations, models, videos);
- "virtual reality" objects (simulators, interactive models, constructors). (13)

According to the type of digital educational resources can be allocated:

Electronic information products: database, presentation (demonstration), electronic magazine, electronic newspaper, multimedia recording.

Electronic submission of paper publications and information materials: a collection of scientific papers, articles, newspaper/magazine publication, practical guide, teaching guide, curriculum courses/disciplines, bibliographic reference, guidelines, a collection of tests, educational standard, lectures and much more.

Software products: application package, automated information and library system, system/application software, the automated management system of the educational institution.

Tools for creating e-learning tools: tools for creating electronic textbooks and instructional systems, tools for creating electronic exercise books, tools for creating electronic control systems of knowledge and psycho-physiological testing.

Software and information products: electronic dictionary, electronic reference book, electronic encyclopedia, information search system.

E-learning tools: tools of theoretical and technological learning, electronic book, electronic learning system, electronic control system of knowledge, tools of practical learning, electronic exercise books.

Comprehensive tools: e-learning course, e-rehabilitation course, e-laboratory workshop, educational computer game.

Specialized Internet resources: virtual library, search engine, Internet catalogue.

It is necessary to consider the requirements for the creation of a modern DER. They must:

1. Comply with the content of the textbook
2. Focus on modern forms of education
3. Provide the possibility of differentiation
4. Provide both self-study and group work
5. Contain options for academic planning
6. Be based on authentic materials
7. Exceed the volume of the relevant sections of the textbook, without expanding, at the same time, thematic sections.

Thus, in our study, digital educational content on the formation of students' foreign-language professionally - oriented competence is a multimedia content created with the help of digital technologies and includes both a virtual learning environment (VLE) and a personal learning network (PLN), corresponding to the specific requirements for teaching students of non-linguistic specialties of professional orientation and implemented in a digital format on digital devices (computers, tablets, smartphones).

Digital educational content (DEC) of the discipline "Foreign language professionally-oriented teaching" will include the following:

authentic illustrated texts (texts with sound review)

demonstration graphics (charts, graphs, drawings, photos)

authentic audio material (podcasting)

authentic video material (YouTube)

multimedia games (single player games: Sherlock Holmes: Crime & Punishment; Life is strange; Game of Thrones; the Wolf among us).

The use of digital multimedia content in foreign language education has certain specifics: it requires a pedagogical rationale, a clear planning, careful choice of electronic programs, precise selection of tools both promoting the achievement of the didactic purposes, and individual learning capabilities and needs of students.

As for the software product, we will create a complex structured digital educational resources consisting of separate elements:

- Learning-controlling DER
- Game-based DER
- Interactive DER
- DER to create a dictionary on a specific topic
- DER of tests

These digital educational resources can be used when explaining new materials, illustrating the presentation of the drawings, simple and animated diagrams, animated videos etc. Digital materials in the form of tests can be used to verify the assimilation of the individual topics of the course.

The development, improvement, and dissemination of information and communication technologies cause a significant impact on all components of an educational process, its goals, content, objectives, forms, methods, and ways of teaching. A didactic characteristic of a learning tool, including ICT, is a natural, technical, technological quality of the object, those of its aspects that can be used with didactic purposes in an educational process.

Pegov and Pyanykh (2010) distinguish three groups of didactic characteristics:

1) Didactic characteristics of the technologies of representation of educational information:
2) Didactic characteristics of the technologies of transfer of educational information:
3) Didactic characteristics of the technologies of the organization of an educational process:

These didactic characteristics allow ICT to perform didactic functions aimed at implementing certain aspects of the educational process (explanations, discussions, conducting controlling midterms, tests, creative works, etc.).

Didactic functions refer to the external features of learning tools used in an educational process to solve educational and developmental tasks. The didactic functions of ICT are largely determined by their interactivity, due to hypertext and multimedia technologies.

As mentioned above, our digital educational content (DEC) in the formation of a foreign-language professionally-oriented competence of students will include a virtual learning environment (VLE) and a personal learning network (PLN), there is a need to consider the didactic characteristics of certain learning tools that are part of the VLE and PLN [See table 1]

Table 1. Digital Content of Foreign Professionally Oriented Language Teaching

Virtual Learning Environment	Blogs, chat, e-portfolio, educational platform LMS MOODLE
Personal Learning Network (PLN)	Web resources: 1. website learning resources 2. website teaching resources 3. web 2.0 tools for language teaching

3 Results and Discussion

3.1 The Didactic Potential of the Virtual Learning Environment (VLE)

At the present stage, it is not possible to fully determine the didactic possibilities of virtual reality technologies, but some of them are already visible.

1. Virtual reality technologies allow to:

- intensify the educational process, significantly enhance the educational and cognitive activity of students and their motivation;
- effectively carry out the communicative interaction of subjects of an educational process, especially in cases when the verbal description of an object is insufficient for adequate transfer of information on it;
- simulate different situations to practice the appropriate skills and abilities;

2. An adequate application of virtual reality technologies in an educational process is able to provide:

- effective independent work of students in the framework of their interactive interaction with distributed electronic educational resources;
- implementation of a practice-oriented approach to learning through the development of learners algorithmic skills of information arrays;
- development of visual-figurative, visual-effective, intuitive, creative, theoretical thinking, as well as the effective formation of skills of analysis, synthesis, abstraction, and generalization;
- development of skills on the design of the objective world, creating abstract images and concepts, giving the learner a tool for modeling the studied objects and phenomena of reality;

Lubkov (14) states, that the use of virtual reality technologies in an educational process opens up broad opportunities for solving such didactic tasks as differentiation of learning, an organization of independent activities, and organization of joint activities of students in small groups of cooperation.

What do we consider under virtual learning tools?

Flerov (5) describes the didactic potential of virtual learning tools for teaching the English language, such as blogs and chat, which are types of software and network content. He characterizes these tools from a linguistic and methodological point of view and reveals the most effective methods and forms of work with them.

Blogs and chat as a means of teaching the language open up opportunities for teacher more unusual tasks that have methodological potential but so far infrequently used in English teaching. A blog is a web diary or an event log. Its main content is records added regularly. They can contain not only text but also images as well as multimedia. They are characterized by short entries, which are arranged in reverse chronological order (the last entry is on top). The difference between blogs and regular diaries is due to their environment: blogs are mostly public and assume other readers who may enter into a public discussion with the author of the records. Chat is an online resource that allows you to conduct written communication in real time. If the texts of the blogs represent the discourse, chat is actually a discourse in a written form. In addition, today there are also microblogging services, such as Twitter. Records in them are short; they are something between a blog and a chat.

Flerov (5) also considers the methodological value of blogs and chat for educational purposes:

1. To write comments on a blog.
2. To place the diary entries in a time sequence.
3. To write replicas of the chat on separate pieces of paper, then mix them and place in the correct order.
4. Blog yourself.
5. Blog yourself on behalf of a blogger friend and describe the same events from the outside.
6. Chat on the blackboard.

Sysoev (15), as well as Flerov (5), offers to use blog technology in teaching a foreign language. According to Sysoev (15) blog-technology has the following didactic properties:

- publicity (blogs are accessible to all project participants at a distance from each other);
- linearity (changes and additions are placed in chronological order);
- authorship and moderation (blogs have a unique authorship, moderation of the blog is carried out by its author);
- multimedia (the ability to use materials of different formats when creating blog content: text, graphics, photo, video, audio).

These didactic properties of blog-technology allow developing such types of speech activities like writing and reading. One of the first methodical works devoted to the use of blog technology in teaching a foreign language was an article by Kennedy (16), where the original blog was seen as a weblog to express students' thoughts.

Bloch (17) proposed a methodology for the development of skills in essay writing through blog technology. Students were required to publish their essays on blogs and then they need to discuss them online. The study showed that by the end of the course students developed the ability to write an essay, and also formed the skills of critical thinking.

In other work, Bloch and Crosby (18) offered a technique of the organization of network discussion and development of abilities to take part in a discussion in a foreign language on a blog of an educational group. The blog seemed to be the best way to organize a discussion of what was seen or read in a foreign language. The ability of students to express their own thoughts on various issues, as well as the opportunity to discuss their personal information for many researchers were the reason for the use of blog technology in the development of speech activities of students.

Sysoev and Evstigneev (19) carried out a range of writing and reading skills, developed through blog technology at the senior level of secondary education, and proposed a common algorithm for the development of writing skills of students through blog technology.

Pavelyeva (2010) offered the technology of skills development through participation in Internet discussions and skills of writing creative works of students of language high school on the basis of blog technology. In a number of studies, authors develop their own classifications of blogs depending on the purpose of the study. Downes (21) proposes to use three types of blogs: a) classroom web space (announcements, homework, etc.); b) a public communication area, where students publish the results of their work; c) a private space, reserved for the student's reflections, as well as for the teacher's instructions. According to Downes (21), these three blogs can be used in teaching a foreign language in the following way:

1) teachers use blogs instead of the standard classroom web page where they post the course schedule, homework, texts/articles for study and exercise;
2) teachers post Internet site addresses on a class blog that can be used by students to prepare for the study topic;
3) blogs are used to organize in-class discussions, allowing students and teachers to get to know each other better, to learn the opinions of others, to identify similarities and differences;
4) teachers use blogs to organize classroom seminars and to present their reports;

5) students are suggested to create their own blogs in which they report on the work done, i.e. perform exercises, write essays, articles on the proposed issues.

Sysoyev and Evstigneev (22) divide blogs into three types: a teacher's blog, personal blogs of students and a blog of study groups.

The next tool of VLE is an "electronic portfolio/web portfolio". Methodologists (23-25), involved in the implementation of this technology into educational process, most often define it as "a product created by a student, a collection of digital materials that reflect the experience, achievements, goals of a student and a learning process itself."

Electronic portfolios are an effective tool for developing a written form of communication (writing and reading skills), which provides the ability to repeatedly editing created text. The web portfolio provides an opportunity to significantly increase the motivation of students to learn a foreign language and culture in the process of creating educational products. It is a tool for permanent fixation of student's growth and development, their skills and knowledge. The electronic portfolio allows the teacher to clearly see how effectively the learning process of each student is. The creation and presentation of any educational product have a whole complex of processes, such as planning, synthesis, exchange, discussion, reflection, and feedback. All these processes form the basis of e-learning portfolio, which assumes that the learning process itself is no less important than the result. The student, while working on his portfolio, collects digital materials, guided by certain goals, so from the same set of materials, can be created different portfolios, depending on the target audience. A web portfolio is not only a system of organizing and storing files of various multimedia formats but also an administrative tool designed to organize and manage applications and control who can view the portfolio and provide feedback to students.

There are various platforms, systems to host web portfolios. Basically, they have the same characteristics, as they allow you to collect together different works and user files.

The most common examples of free web-based applications are Mahara and OSP (26), but Mahara site provides users with tools to create electronic portfolios, as well as social networks, to organize effective interaction between users. Mahara is a personalized learning environment as it has the following characteristics:

- teachers' tools to create electronic teaching materials of various formats (text, audio, video);
- ability to integrate social services Web 2.0 (blogs, wikis, podcasts);
- students' tools to perform tasks set by the teacher (files of various formats, the presence of a social network with the ability to create student mini-groups and forums);
- ability to structure stored files, which allows students to develop skills in organizing content web portfolio;
- demo function, with the ability to control the access of different users to the files. This feature allows you to work on all three types of the portfolio (working, presentation, and evaluation) at the same time;
- ability to organize internal and external feedback;
- ability to implement the principle of cooperation (organization and work groups on the project online);
- ability to export your portfolio and transfer it to other electronic portfolio systems. (27)

This app includes a social blogging service, CV constructor, file manager, and constructor of user's personal projects – a tool to create and structure user-created content. In addition, the system allows you to include links to other resources, which thus allows you to combine the use of different technologies Web 2.0 in one place, which simplifies the work of students. Mahara is also a social network with typical functions: 1) creation of a group of students, united by a single topic/issue or task, which allows you to create a community of students, 2) availability of communication service "forum", which gives the opportunity to organize the work of students in mini-groups on a certain project, as well as to develop skills of written communication in a foreign language.

Thus, the use of electronic portfolios in teaching a foreign language to students can effectively solve the following didactic problems:

- creation of a natural language environment, which allows increasing students ' motivation and cognitive activity;
- comprehensive systematic development of a linguistic and socio-cultural component of communicative competence through the use of structured thematically diverse resources of the Internet;
- development of the interactive component of communicative competence through the use of the electronic portfolio as a social network;
- development of students' information competence through direct active use of information and communication technologies, work on the collection, analysis, and structuring of portfolio content;
- development of skills of continuous self-education (internal and external reflection, the ability to negotiate, to prove their own point of view), contributing to the autonomy of students.

3.2 Didactic Potential of Personal Learning Network (PLN)

Personal Learning Network (PLN) is a system that helps learners take control and manage their own learning.

Didactic properties of PLN are as follows:

- display and transfer of information in text, graphics, audio, video and animation format via web resources;
- ability to search for information of interest;
- ability to consolidate knowledge and process skills;
- ability to evaluate knowledge, skills, and abilities;
- organization of communication with the teacher.
- storage and systematization of information;
- dissemination of information in various forms;
- ability to organize the discussion of the proposed topic, consultations and other forms of activities;
- ability to demonstrate educational information in a multimedia, graphic form;
- ability to organize group participation in discussion and interpretation of information;

Didactic functions of PLN:

1. Multilevel presentation of the material; convenient in the organization of independent work; allows to study and review the material from the highest level and to fall to the lower levels for detailed study of the material again.
2. The visibility of the studied material by presenting information in multimedia technologies in the form of three-dimensional graphics, diagrams, photographs, video clips, sound, animation and allows you to organize any type of the lesson, independent work, to revive the lecture; to demonstrate the virtual processes and phenomena.
3. The diversity of work - from the study of theoretical material to its consolidation and verification.
4. Modeling of processes, phenomena, objects with the help of computer constructors and simulators in practical and laboratory work that allows you to gain knowledge, skills and practice the knowledge in real situations.
5. Providing possibility of searching necessary educational information with use of the Internet and telecommunication technologies that allows:

- to organize joint research work (project method);
- to organize distance learning for different categories of students;
- to exchange information, ideas, plans with participants of joint projects;

- to develop communication skills and a culture of communication.

6. The possibility of individualization of the learning process.

In our work, the PLN of modern digital educational content includes such web resources that have proven their effectiveness in the practice of teaching a foreign professionally oriented language: website learning resources, website teaching resources, web 2.0 tools for language teaching (See table 2).

Website learning resources include links for self-study in the remote distance on a specific topic that is planned and given by a teacher. It also considers reading, language, developmental, and ability levels; include qualitative and quantitative assessment, and contain comprehensive teacher guides.

Website teaching resources help a teacher with regularly updated lesson plans and classroom materials; get tips, articles, and information about professional development, conferences, and qualifications.

Web 2.0 tools that can be used by teachers who are interested in using technology in language teaching.

Web 2.0 enables:

- Socialization - our students can use the language and skills they are learning to build networks and develop relationships with real people
- Collaboration - They can work together with others to construct and share real knowledge.
- Creativity - They can create genuine products, in a wide range and combination of media to high standards that will have a real audience.
- Authenticity - The tasks and activities they do and the people they communicate with to do them are real and motivating.
- Sharing- They can share what they create and learn from each other.

Table 2. Collection of Links to Resources, Aimed at Foreign Professionally-oriented Language Teaching for Students of Non-linguistic Directions

Collection of links to resources, aimed at foreign professionally-oriented language teaching for students of non-linguistic directions	
Virtual Learning Environment (VLE)	**Twitter-**microblogging network **Pinterest**-social networking **Edmodo**– Safe microblogging and virtual learning platform that resembles Facebook and Twitter. Create assignments, grade or give a digital badge. **Kidblog**– Free blogging for students. Set up login names and passwords, no registration needed. **Edublogs**– Free blogging and virtual classroom platform especially made for teachers. Free app. **Wix**– One of the best free tools for creating a high-quality website. Choose from templates and include many apps to make it interactive. **Mahara-** free web-based electronic portfolios
Personal Learning Network (PLN)/ Website learning resources	www.voscreen.com, learningenglish.voanews.com, BBC Learning English, TED talks, www.kazakhstan.com, www.khanacademy.org, www.purposegames.com, www.usingenglish.com, Youtube.
Personal Learning Network (PLN)/ Website teaching resources	www.onestopenglish.com, www.linquahouse.com, www.breakingnewsenglish.com, www.eslflow.com, www.allthingstopics.com, www.michellehenry.fr, learnenglish.britishcouncil.org
Personal Learning Network (PLN)/ Web 2.0 tools for language teaching	**Web 2.0 Tools for Language Teaching:** **Game-based learning and quiz:** Sherlock Holmes: Crime & Punishment Life is strange Game of Thrones The wolf among us **Quizlet–** make flash cards with vocabulary lists or choose from many flash cards users have already created. Play various games with these vocabulary lists and access on any mobile device with the free app.

	Infused Learning– create multiple choice, true/false, polls, quizzes, or games that students access on any device. **Kahoot–** create trivia quizzes accessible on any device. Students are then prompted to make their own. **VoiceThread–** interactive way to present stories, images, or host discussions. Parents and students can leave comments by text, video, or audio. They can draw on the images and choose avatars. **Podcast and audio recordings:** **Vocalremover.ru-**record audio, add music and sound effects **Vocaroo**– easily record audio then email to students who can record audio back. No registration is required. You can also send a link or download the clip. **Spreaker**– record 10 hours of audio total and add music and sound effects. www.podomatic.com www.bbc.co.uk **Video-based learning:** **Vialogues.com** is a tool for creating a video-based discussion. Language teachers can use this tool to create lessons around video. Teachers can also add polls and quizzes and comment on the video lesson. Students can post comments related with the video. **Magisto–** create a video with up to 25 clips or 30 photos, choose a theme and soundtrack, and add text, images, and video clips. **ZimmerTwins**– choose from various characters, type in the dialogue, choose your background scene, and create a fun movie. **Multimedia posters, presentations, e-magazines, e-books:** **Buncee–** create multimedia posters, scrapbooks, or slides with audio, video, stickers, templates, text and more. **Canva-** create e-magazine, business card, uploading images, pictures and text, record own voice. **Flipboard–** create a personalized digital magazine with your bookmarks and feeds from social media (Twitter, RSS, blogs, Flickr, Facebook, and Instagram) **Popplet–** students can collaborate on a mindmap that includes Flickr images, Youtube videos, links, text, and their own images and drawings.

Strokan (28) justifies the relevance of the use of these Internet resources/web resources in teaching foreign languages, examines their types and characteristics, as well as proves the productivity of their use for better assimilation of basic knowledge.

4 Conclusion

The latest multimedia technologies help to quickly and effectively master oral forms of communication, correct pronunciation, learn the grammatical rules, master fluent reading and deep understanding of authentic texts, create real situations of communication, remove psychological barriers and increase interest in the language. In the context of foreign language education, Internet technologies allow creating a technological learning language environment for the formation of foreign language competence of students. (29)

Web resources provide teachers and students a special program of teaching foreign languages, cross-cultural material, news about economy and politics, culture, authentic literature, the selection of which teacher can conduct independently and adapt to specific learning goals. Students, in turn, with the right choice of material, programs, resources have the opportunity to participate in Internet conferences, webinars, competitions, create multimedia presentations in the process of working on projects.

Famous American scientist Krystal (30) in his publication "Language and the Internet" defines several reasons why it is necessary to use the Internet in the teaching of foreign languages. He argues that one reason is that the linguistic nature of online communication is necessary to improve language learning. Another reason for the effectiveness of the use of the Internet in teaching foreign languages, according to the scientist, is that web resources create favorable conditions for learning writing, as online resources provide the audience for written communication. The next reason is that communication online several times increases the motivation of students to learn a

living language, and also gives a positive effect on a large amount of time spent by students on the Internet.

Strokan (28) believes that the use of Internet resources in a foreign language lesson allow:

- to provide a stable motivation for foreign language learning;
- to create a comfortable atmosphere for a lesson;
- to ensure a high degree of personalized learning;
- to increase the amount of work and increase the amount of knowledge, skills acquired in the classroom;
- to improve the quality of control of students' knowledge;
- to efficiently plan and organize the learning process, thereby increasing the effectiveness of the lesson;
- to form communicative competence of students through authentic materials;

Sysoev et al. (31) found that educational Internet resources are created exclusively for educational purposes and can be aimed at the development of foreign language communicative competences (by types of speech activity: productive (speaking and writing) and receptive (listening and reading).

Internet applications, computer-based teaching programs and resources of educational platforms play a huge role in foreign-language professionally-oriented teaching. Burenkova (32) in scientific publication considers the didactic potential of such multimedia programs and platforms as Quizlet, Moodle, Wiki, VoiceThread, XMind, which form linguistic competence of students.

In the modern methodology of teaching foreign languages, there are the most common Internet technologies, such as hotlist (thematic list of links), multimedia scrapbook (multimedia album), treasure/scavenger hunt (treasure hunt), subject sampler (collection of examples), web quest. (33) A more detailed description of the online technologies is given by Chistobaeva and Shadje (34) in their publication "Innovative pedagogical technologies of teaching foreign language in non-linguistic universities". Poklad (35) describes the didactic function of teaching web quest in the classroom.

The next innovative digital Web 2.0 tool for language learning is the podcast. The podcast is an audio or video recording made by any person and available for listening or viewing on the World Wide Web. The podcast is a type of Web 2.0 social service that lets you listen to, view, create, and distribute audio and video recordings. On the Internet, you can find both authentic podcasts created for native speakers (for example, BBC news) and educational (for educational purposes). For English language learners, the podcast directory is available at www.podomatic.com www.bbc.co.uk. This service of podcasts allows students to listen to and view online podcasts, record and place on one of the podcast servers own podcasts on any topic. Most prominent podcast server is YouTube. On YouTube, every registered user can post his/her video podcast, view others, as well as participate in discussion/commenting podcasts in microblogs (15).

Sysoev (15) identifies the following didactic properties of a podcast:

1. the ability to place personal podcasts of users on the Internet;
2. the ability to create a personal area of the user on the service of podcasts (personal user area necessary for organizing a network discussion of a podcast);
3. the ability to organize online discussion of the podcast in the personal area of the user in the microblog;
4. the creation of the user's personal zone and its moderation are carried out by the podcast author;
5. posting comments in network discussion of a podcast is made chronologically;
6. accessibility of podcast to view all registered users of the service.

Since podcasts develop listening skills, it should be based on the type of texts, which students will meet in real life. A number of studies show that the use of podcasts in the development of speaking skills significantly increases the motivation of students and brings diversity in the process of language learning at school and university. (36) In addition, Solomatina (2011) in her research work defines the range of linguistic skills developed through podcasts (listening and speaking skills). The highlighted language skills (speaking and listening) match the skills identified in the requirements to the level of teaching students at all three stages of education (primary, secondary and senior) in secondary school and university. This means that the use of podcasts in teaching a foreign language can occur on a daily basis.

In our research work, we define the following skills of students of non-linguistic specialties in foreign language professionally oriented teaching with the use of digital technologies (See Figure 3 and 4).

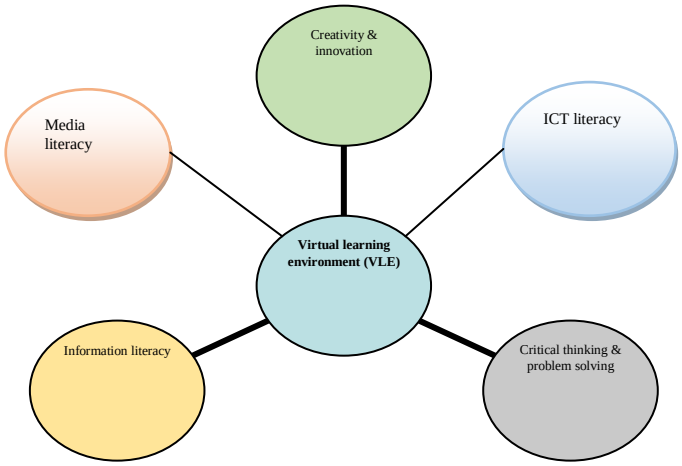

Figure 3. Descriptors of students' skills with the use of virtual learning environment (VLE).

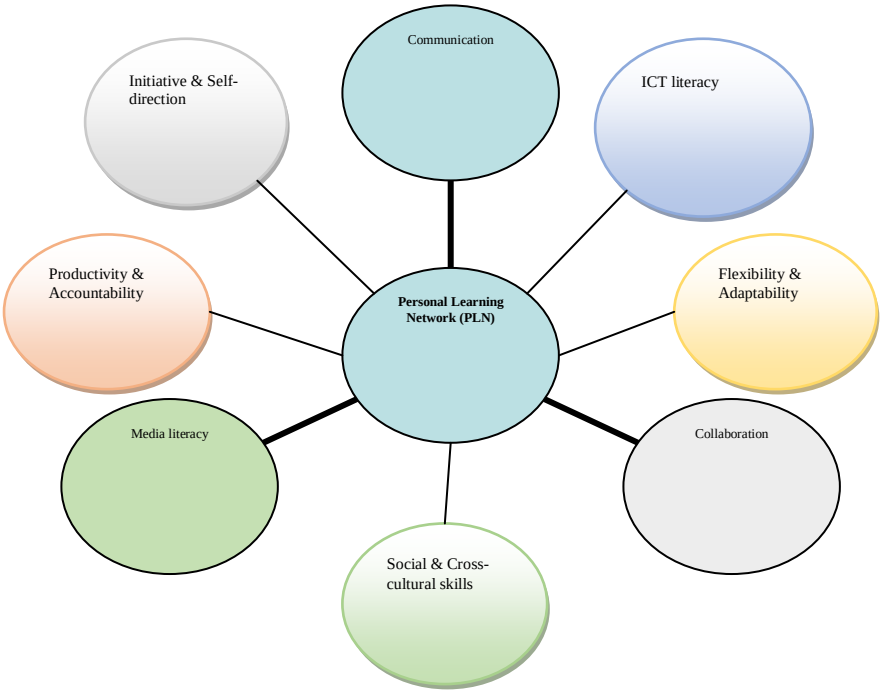

Figure 1. Descriptors of students' skills with the use of personal learning network (PLN)

Literature:

1. Nazarbayev N. On the strategic development plan of the Republic of Kazakhstan until 2020. The state program "Digital Kazakhstan" for 2017-2020. (Publication No. 922 of February 1, 2010). Astana: President of the Republic of Kazakhstan; 2010.
2. Kashtanov P. [Internet] ; 2012. Available from: http://www.tadviser.ru/index.php/Статья:Цифровой_контент
3. J'son & Partners Consulting. The market of digital content in Russia and the world, 2009-2013 [Internet]; 2012. Available from: http://www.json.ru/poleznye_materialy/free_market_watches/analytics/rynok_cifrovogo_kontenta_v_rossii_i_mire_2009-2013/
4. Semantica [Internet]; 2017. Available from: https://semantica.in/blog/czifrovoj-kontent.html
5. Flerov O. Virtual techniques of teaching English language. Journal of Educational Resources and Technologies. 2015; 1(9):28-33.
6. Korobkova K, Kalinovsky Y. Possibilities of using digital educational resources in an educational process. IV International student electronic scientific conference. Student Science Forum; 2012.
7. Kareva, N. Use of authentic audio and video materials to increase the motivation for learning a foreign language. Naukovedenie. 2014; 3(1-8).
8. Barmenkova O. Video lessons in the system of teaching foreign speech. Foreign languages at school. 2010; 3:20.
9. Sullivan I. Multimedia [Internet]; 1979. Available from: https://en.wikipedia.org/wiki/Multimedia
10. Kirkman, Ph. Digital technologies in the classroom. Cambridge International Examinations, November; 2015.
11. Nazarbayev N. Strategy "Kazakhstan-2050." [Internet]; 2012. Available from: http://www.akorda.kz/ru/addresses/addresses_of_president/poslanie-prezidenta-respubliki-kazahstan-nnazarbaeva-narodu-kazahstana-14-dekabrya-2012-g
12. Bapakova S, Baitlesov Zh. Development of digital educational content (e-content) in the sphere of Kazakhstan education [Internet]; 2018. Available from: http://nomad.su/?a=3-201311200034
13. Gorokhova L. The application of digital educational resources in the lessons of mathematics [Internet]. In Festival of pedagogical ideas "Demolesson"; 2017. Available from: открытыйурок.рф/статьи/411543/
14. Lubkov R. Didactic potential of the virtual educational environment [dissertation]. [Samara]; 2007. p. 102-142.
15. Sysoev P. Blog-technology in learning a foreign language. Journal of Language and Culture. Russia; 2012.
16. Kennedy K.. Intellectual property in the digital age. Technology & Learning. 2001; 2.
17. Bloch J. Abdullah's Blogging: A Generation 1.5 student enters the blogosphere. Language Learning and Technology. 2007; 2: 25–37.
18. Bloch J, Crosby C. Blogging in academic writing development. Handbook of Research on Computer-Enhanced Language Acquisition and Learning. N.Y.: Information Science Reference; 2007.
19. Sysoev P, Evstigneev M. Methodology of teaching a foreign language using new information and communication Internet technologies. Rostov-on-Don: Phoenix; 2010.
20. Pavelyeva T. Technique of development of skills of written speech of students by means of educational Internet-blog (English language, language high school) [dissertation]. [Tambov]; 2010.
21. Downes S. E-Learning 2.0. In eLearn Magazine [Internet]; 2007. Available from: http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1
22. Sysoev P, Evstigneev M. Technologies Web 2.0: Social blogging service in learning a foreign language. Foreign languages at school. 2009; 4:12–18.
23. Barrett H. Researching Electronic Portfolios and Learner Engagement: The REFLECT Initiative. Electronic Portfolio issue of the Journal of Adolescent and Adult Literacy (JAAL-International Reading Association). 2007 Mar 8; 436-449.
24. Campbell J. Electronic Portfolios: A Five-Year History. Computers and Composition. 2007; 2003:94-185.
25. Stefani L, Mason R, Pegler C. The educational potential of e-portfolios. London: Routledge; 2007.
26. Safonova O. Integration of e-portfolios into the process of developing professional competence of Applied Linguistics students. Technologies and techniques in education. 2010; 6.
27. Gerbic, Ph. Collaborative self-study supporting new technology: The Mahara e-portfolio project. The ASCILITE Conference; 2008; Melbourne.
28. Strokan V. The actuality of using Internet resources in teaching a foreign language. Scientific and methodical electronic

journal "Concept" [Internet]. 2017; 8:61-66. Available from: https://e-koncept.ru/2017/470109.htm
29. Bogomolov A. Virtual language environment for teaching Russian as a foreign language (linguocultural aspect). Bulletin of the Russian University of Peoples' Friendship. Series: Education Issues: Languages and Specialty [Internet]. 2008; 4:14–17. Available from: https://cyberleninka.ru/article/n/virtualnaya-yazykovaya-sreda-obucheniya-russkiy-yazyk-distantsionno-po-materialam-smi-struktura-i-soderzhanie-uchebnogo-kontenta
30. Krystal D. Language and Internet. Cambridge; 2006.
31. Sysoev P, Evstigneev M. Use of modern educational Internet resources in teaching foreign language and culture. Journal of Language and Culture. 2008; 100-110.
32. Burenkova S. Multimedia bases of formation of the linguistic competence. Bulletin of the Siberian Institute of Business and Information Technology. 2014; 3(11):93-101.
33. Walkers Yu. History and advantage of a method of projects in the educational process of a modern higher education institution. In: Method of projects: the scientific methodical collection; 2003.
34. Chistobayeva L, Shadje Z. Innovative pedagogical technologies for teaching a foreign language in a non-linguistic institution. Journal of the Maykop State Technological University. 2015.
35. Poklad N. Using the web-quest for the development of information and communication competence in English classes [Internet]. Employee social network of education nsportal.ru; 2013. Available from: https://nsportal.ru/shkola/inostrannye-yazyki/library/2013/01/28/ispolzovanie-veb-kvesta-dlya-razvitiya-informatsionno
36. Solomatina A. Development of speaking and listening skills through podcasts. Language and Culture. 2011; 2(14):130–134.

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THE ROLE OF MODERN EDUCATIONAL TECHNOLOGIES IN HUMANIZING CHEMISTRY EDUCATION OF FUTURE TEACHERS BASED ON NATIONAL TRADITIONS

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Abstract: The key idea of humanizing chemistry education is the integration of the values of humanity and society with the fundamental content of chemical science and its practical application. The humanizing of chemistry and pedagogy education in institutions of higher education is viewed through the humanizing of the content of chemistry education and the use of modern humanities-based teaching technologies. In the research, the humanizing of the content of chemistry education was provided by the introduction of historical and national elements, namely, information about the Kazakh chemists and their contribution to world science. For the formation, via chemistry education, of the basic educational values stipulated by the State Compulsory Standard of Higher Education of the Republic of Kazakhstan (Kazakh patriotism and civic responsibilities, respect, cooperation, openness), modern educational technologies such as project-based learning, game-based learning, interactive learning and flipped classroom (a model of blended learning) were used. Students of three universities attended the experiment. The control and experimental groups consisting of these students were established. To analyze the formation of basic values via chemistry education a questionnaire method and specially developed assessment criteria were used.
The pedagogical experiment showed the effectiveness of the educational technologies used for the formation of Kazakh patriotism, respect, cooperation, and openness. The specifics of the application of modern humanities-based teaching technologies to chemistry education of students obtaining a bachelor's degree in pedagogy were revealed. These specifics conflict with the traditional approach to education.

Keywords: Humanization of education, Higher education, Basic values, Educational technologies, Chemistry education.

1 Introduction

Humanization of education, understood as orienting the learning process "to the development and self-development of an individual, to the priorities of human values, to optimize the interaction between an individual and society" (1), has been a global trend since the end of the 20th century, extending to all levels of education. Provisions on the humanization of education are enshrined in the legislative acts of many countries including Kazakhstan and Russia. The tasks are assigned for forming personalities with an active life position, who responsibly use the knowledge, skills, and competencies acquired with focusing on the learned moral values. In addition, the importance is attached to the development of patriotism, tolerance, and culture of interpersonal relations. Since the harmonious development of any individual is largely determined by the extent to which an education system is able to transfer not only knowledge and skills but also to develop cognitive interests, value relationships, and striving for self-development with respecting individuality, humanization of pedagogical education is particularly important. (2, 3)

At the present stage of the development of society, the social need for non-standard-minded creative personalities has increased more than ever. The need for the creative activity of a specialist with a developed technical thinking, ability to design, evaluate, and rationalize technologies is growing rapidly. In many ways, the solution of these problems depends on the content and teaching technologies of future specialists.

The trends in the development of educational technologies are directly related to the humanization of education, which promotes self-actualization and self-realization of an individual. New educational technologies contribute to the results of significant researches. Thus, the development of cybernetics and computing led to the development of programmed instruction. The results of research on the patterns of development of human thinking led to the development of problem-based learning. The activity approach arose from the research of psychologists and philosophers in the field of human activity.

In UNESCO documents, learning technology is considered as a systematic method of creating, applying and determining the entire process of teaching and learning, taking into account technical and human resources as well as their interaction. The individual forms and methods of active learning, which make the learning process torn apart, are replaced by holistic educational technologies in general and teaching technologies in particular. The technological effectiveness of the learning process is to make the learning process completely manageable.

An educational technology negates the pedagogical impromptu in practical activities and converts it into the path of the preliminary design of the educational process with the subsequent implementation of a project in a group. In contrast to the developments previously used by teachers in classes, an educational technology proposes a project of the educational process that determines the structure and content of a student's activities, that is, the design of educational and cognitive activities leads to a high stability of the success of almost any number of students. An essential feature of educational technologies is the process of goal formation. This is the central problem of educational technologies, in contrast to traditional education. Thanks to the idea that the subject of an educational technology is a project of a certain educational system, it is possible to formulate an important principle for the development of educational technologies and their implementation in practice as the principle of integrity (structural and substantive) of the whole educational process. The principle of integrity is the harmony of all elements of the educational system.

New requirements of society to the level of education and personal development lead to the need to change teaching technologies. Today, technologies are productive if they allow organizing the educational process taking into account the professional orientation of education, as well as a focus on the personality of a student, his or her interests, inclinations and abilities.

The problem of teaching methods is one of the most important problems of didactics. It remains relevant both in theoretical and in practical terms. The educational process itself, the activity of the teacher and students, and, consequently, the result of the education, depend on this problem's solution. The orientation and nature of students' activities, the degree of their autonomy, and the manifestation of their creative abilities largely influence the success of the education. These factors should serve as important criteria for choosing a method.

The main problem is that the education system does not keep pace with the dynamically changing world, since it remains an appendage to other areas of society, adapts to their interests and serves their private, momentary requests. In this situation, there is an urgent need to revise the basic imperatives of educational activities, to determine its most important priorities. This is a requirement of the modern era of global instability, in which the actions of one person can lead to planetary consequences. When ignoring the problems of education, we are thus "promoting" the generation of people who are not capable of critical, creative thinking, and active participation in various forms of social communications. Therefore, we need an education system that provides the opportunity and the right to be far ahead of all situational demands of society and to set the tone, create an atmosphere of the search for all existing and other areas of society that are possible in the future, helping to develop a creative type of personality.

The issue of education is not only and not so much a problem of a teacher and a student but an issue of a sociocultural nature. The essence of this issue is determined by the search for the harmonious cooperation of both teacher and students supported by the relevant value imperatives of the socio-economic, spiritual, and cultural development of society. Therefore, the idea of humanizing education is so important when discussing

the problems of education in modern social and humanities knowledge. Humanization of education is understood as the ability of education, as a social institution, to ensure that a person acquires a conscious independence in the development of space and time of his or her life. It is possible to judge about the predominance of a positive or negative trend in the process of humanizing the education system on the basis of whether the degree of independence of a subject of educational activity increases or decreases. Humanizing the education system is the main condition for the reproduction of social life in all its diversity. At the same time, the general theoretical ideas about the form and content of the educational process are extremely mobile, and the specific historical types of educational programs of a given society were and remain in a state of constant transformation. Therefore, for modern Kazakhstan, the problem of humanization of education is connected with the fact that, taking into account the overall vector of development of world education in the context of globalization of the organization and structure of educational systems, it is necessary to preserve and use its own positive experience in these activities. (4, 5)

The authors share the fears of those representatives of the domestic social and humanities knowledge who claim that the existing education system, and especially higher education, continues, first of all, to train narrow specialists, qualified doers, and functionaries who are in demand by the technologized system of a labor organization. This leads not only to the prevalence of a utilitarian and pragmatic approach to learning, in which knowledge becomes an informational commodity, a product for sale and consumption but also to the students lose their own totality, to the formation of a "one-dimensional man," (6) and to the fragmentation of human existence since, in the modern technocratic world, "already man rarely meets with himself." (7)

While recognizing the objective nature of the widespread use of information and communication technologies nowadays, one should not stop thinking about their ambiguous influence on the culture of thinking. The adaptation of a person to the world of information technologies creates a "mosaic" style of thinking, the weakening of reflective ability occurs, which leads to the fragmentation of consciousness and has a negative impact on the development of an integral personality, and complicates self-identification. This results in weakening the ability of judgment, profaning objective and evidentiary knowledge, promoting the cult of sensual life, increasing social apathy and infantilism, spreading irrational views and superstitions. All this leads to a decrease in the degree of autonomy of a person in choosing their relationship with the outside world, to the gradual loss of their ability to be independent and responsible in understanding and solving the problems of social and personal being.

A genuine personality, according to Ilyenkov (8), is manifested precisely in the ability to do what everyone else can do but best of all, therefore, establishing a new benchmark of work. The formation of a person is impossible when a person does not gain the freedom to reveal his or her creative potential. Here freedom is understood not in a narrow-minded sense (in the sense of striving to do anything) but in the sense of a developed ability to independently find solutions to issues that arise in real life practice, and, therefore, the ability to act every time not only according to already known standards, stereotypes, and algorithms but also to vary the general methods of action as applied to individual and unique situations. (9)

Among the tendencies in humanizing teacher training in the CIS countries and Europe, there is the humanization of content, individualization, differentiation, the professional orientation of the learning process, and the development of students' subjectivity. (2) The orientation of education to the ideas of humanistic pedagogy and psychology, which have many common international features, at the same time, in different countries, takes into account national traditions and features. The State Compulsory Standard of Higher Education of the Republic of Kazakhstan determines Kazakh patriotism and civic responsibilities, respect, cooperation, and openness as the basic values of the content of education. Requirements for the results of training and the levels of training of graduates are determined on the basis of the Dublin descriptors of the first level (bachelor's degree) and are expressed by competencies.

The strategy of humanizing pedagogical education is implemented via the humanization of each academic discipline, including chemistry. (10) The integration of universal human values and fundamental natural science content is essential for humanizing chemistry education both at university and at school. (11) Humanizing the content of chemistry education is connected with the introduction of historical, environmental, literary, art history and other material into the facts, theories, and laws of chemistry. At the same time, the ideas of humanism extend not only to the content but also to the teaching methods, forms, and technologies that future teachers will transfer to their professional activities, thereby ensuring the continuity of values. The modern concept of humanizing chemistry and pedagogical education based on competencies and personal development requires scientific substantiation and confirmation of the effectiveness of teaching technologies that provide the expected results of chemistry education and the basic values of educational content.

Chemistry education of students obtaining bachelor's degree in pedagogy will contribute to the formation of basic educational values (patriotism, civic responsibilities, respect, cooperation, and openness) if the teaching technologies and humanities-based components of the content are adequate for the goals, justified and used.

2 Materials and Methods

The methodological basis of the research is the modern concepts of development and application of new teaching technologies, the modern pedagogical theories of educational modernization, the fundamental principles of professional pedagogy, the theory of competence-based approach in training specialists of the new formation, scientific foundations of innovative technologies in education, and the researches of chemistry teaching methods for higher education. (12-19)

2.1 Justification of the Choice of Teaching Technologies

The concepts of "pedagogical technology", "technology of education", "teaching technology" are widely used in modern pedagogical literature, but there are certain different interpretations and definitions by various scientists. (20-23) The emergence of teaching technologies in the middle of the last century is associated with the transition from the spontaneous realization of the learning process to the scientific substantiation of each stage of functioning and of each element of the pedagogical system in order to obtain a guaranteed and diagnosable result. (16) There are several components in the concept of pedagogical technology: scientific substantiation and development of goals, content, process, and result; description of the algorithm of actions of students and teacher; practical implementation of the learning process by using an arsenal of instrumental and methodical means. (24) The main function of a teaching technology is the formation of a personality in accordance with the needs of society. From this point of view, all teaching technologies correspond to the ideas of humanization. A teaching technology is always based on a didactic process. 16 Teaching technologies used in domain-dependent learning are called educational technologies, with an emphasis on the triune function of education (training, mentoring and development), which seems more logical in the context of humanization.

Today, traditional and innovative educational technologies are used in chemistry and pedagogical education:

- explanatory-illustrative technologies;
- problem-based learning technologies;
- research technologies;
- conversational technologies;

- collective learning technologies;
- information and communication technologies;
- modular technologies;
- full learning technologies;
- technologies developing critical thinking;
- technologies consolidating didactic units;
- integrative technologies;
- adaptive technologies;
- creative technologies.

The combination and integration of technologies also occur. In modern higher education, the most promising, according to modern researchers (25), are educational technologies based on various forms of interactive learning, project activities, and non-standard forms of conducting classes. A teacher chooses an educational technology based on the goals of applying knowledge in real professional situations, the available means (material, organizational, and didactic ones), and the level of proficiency in the experience of technologization of education. (26) Teachers conducting innovative work are guided by the development of autonomy, active mental activity, creative and communication skills of students. The role of a teacher also changes. A teacher ceases to be a person who just transfers knowledge but becomes a consultant, moderator, and tutor.

2.2 Teaching Technologies in Use

The following teaching technologies were used in the research for the formation of basic educational values of the Republic of Kazakhstan via chemistry education:

- project-based learning for the formation of Kazakh patriotism and civic responsibilities;
- game technologies to build respect;
- interactive learning to form collaboration skills;
- flipped classroom (a model of blended learning) to form openness.

Project-based learning, developed by J. Dewey, has always been associated with the ideas of humanistic education. In chemistry education at university, projects traditionally occupy a significant place. (27, 28) In addition, almost all courseworks and final qualification works are carried out in the form of projects. In addition, the role of projects in the extracurricular independent work of students (29), is high, both in supplementing the content of chemistry education and in forming universal and professional competencies. (17) In this research, the goal of the project was to create a brochure (and eventually a website) about Kazakh chemistry researchers, educators and science organizers. The project was collective in nature. Students were united in groups of 3-4 people and during the semester they prepared material about Kazakh chemists, the presentation of materials was carried out in accordance with the themes of the academic discipline. The teacher determined the methods of presenting the result and established the evaluation criteria. A technical group consisting of three people carried out the integration of materials of each student into a common information product.

Game teaching technologies include a wide group of methods and techniques. Games differ by type of activity and nature of the game technique. They improve emotional state, relieve intellectual tension, and create a space for self-realization of students. (30) Business games in which a student played the role of a teacher or the role of a researcher in accordance with a studied theme were used. The method of the first game was that each of two “teachers” had a group of students consisting of 5-10 people and had to explain them a material, for example, “chemical reaction rate”; then “teachers” swapped to control the knowledge of students of the other group. Then the answers of the two groups were compared, the strengths and weaknesses of the teacher’s explanations were found out, and a reflection was carried out. The second game was used in the study of scientific theories when a student was in the position of "researcher" and had to protect a theory from the questions of "opponents."

The interactive learning technology in chemistry education was used to form cooperation skills. (17) Interactive learning assumes the involvement of a student in the educational process as an active subject. This develops interactions between a student and a teacher, between students themselves, and between a student and learning tools. The joint work of students in small groups in the classroom was used. For example, they performed laboratory work in pairs, issued a report together, and defended the results. In addition, the methods of mutual learning were used, for example, one student teaches another how to work correctly with a device for measuring pH. Mutual control techniques and discussions in practical classes were also used.

Flipped classroom technology (a model of blended learning) was used to form openness. This technology is relatively new for higher chemistry education. (31) It provides students with a preliminary acquaintance with the theoretical material at home, which is actively discussed in the classroom. (32, 33) In the classic version, students should watch a video at home; a presentation is brought to their attention, which is then discussed in the classroom. We conducted five lessons based on the flipped classroom model when studying the "Solutions" theme. It should be noted that in the first lesson, only 10% of students watched a presentation at home and prepared questions. Then activity increased but did not reach 100%.

2.3 Experimental Basis

The pedagogical experiment was conducted in the 2017-2018 school year when teaching inorganic chemistry to first-year students of pedagogical specialty “5B011200-Chemistry” of the Abai Kazakh National Pedagogical University (39 students), Korkyt Ata State University of Kyzylorda (28 students), Zhubanov Regional State University of Aktobe (68 students). In total, 135 students and three teachers took part in the experiment. The students of the Abai Kazakh National Pedagogical University and Korkyt Ata State University of Kyzylorda represented an experimental group (67 people in total), and the students of the Zhubanov Regional State University of Aktobe represented a control group.

3 Results and Discussion

When teaching chemistry to the students of pedagogical specialties, for the formation of basic educational values, four educational technologies were used: project-based learning, game-based learning, interactive learning and flipped classroom (a model of blended learning). Based on the experience of using these technologies, we can say that they in many ways complement and improve each other: they help in the development of a student's subjectivity, increase the level of social activity, teach a student new ways to gain knowledge, stimulate creative abilities. A student becomes an active participant in the educational process when learning, or rather, gaining disciplinary (chemistry) knowledge and skills during their own activities.

At the preparatory stage of the experiment, the working programs of the disciplines were agreed upon and methodological support was prepared:

- a project plan for studying the activities of Kazakh chemists;
- materials for business games;
- presentations and questions to discuss for the flipped classroom model;
- the fund of evaluation tools has been updated;
- materials and methods have been developed to determine the success of the formation of basic educational values in teaching chemistry.

The questionnaire for determining the formation of basic education values when following the course of chemistry included four basic questions several answers, the first question assumes an open answer.

1. Name the Kazakh chemists (scientists, organizers of science and chemical industry, teachers who have contributed to the

chemistry education). The evaluation was made according to a scale: “less than three Kazakh chemists”; “between three and five Kazakh chemists”; or “more than five Kazakh chemists” are named.
2. Do you consider the profession of a chemistry teacher respected? Answer options: “Yes, a chemistry teacher is a respected profession”; "Not sure", "no, a chemistry teacher is not a respected profession."
3. Is the student-teacher collaboration useful in achieving learning goals? Answer options: “No, it's better to do everything individually”; “It is useful to collaborate with other students, but not with the teacher”; “It is useful to cooperate with the teacher, but not with the students”; “Cooperation with other students and the teacher is helpful.”
4. Can you openly express your opinion or attitude if it does not coincide with others? Answer options: “Yes, always”; "Sometimes, depending on the situation"; "I can never."

Answer options were used for interview and monitoring topics.

Table 1. Criteria Adopted for a Generalized Analysis

Parameters	Criteria
Knowledge about Kazakh chemists	The student named more than five Kazakh chemists.
Respect for the teacher	The answer chosen is “yes, chemistry teacher is a respected profession.”
Willingness to cooperate	The answers chosen are “It is useful to collaborate with other students, but not with the teacher”; “It is useful to cooperate with the teacher, but not with the students”; “Cooperation with other students and the teacher is helpful.”
Openness	The answers chosen are “Yes, always”; "Sometimes, depending on the situation."

In the practical implementation of a pedagogical experiment, an ascertaining experiment was conducted, which, according to the results of the survey (Figure 1), showed the similarity of the studied groups of students of pedagogical specialties from three universities of Kazakhstan.

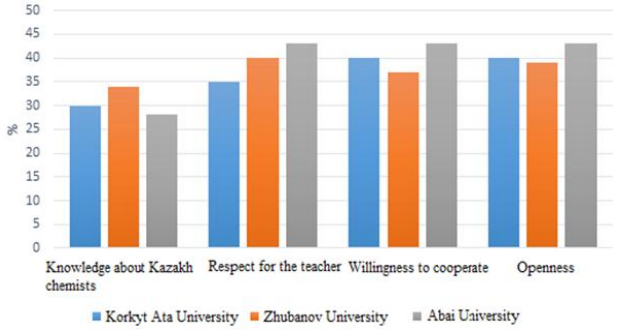

Figure 1. Results of the Survey of the Students at the Ascertaining Stage of the Pedagogical Experiment

The Wilcoxon-Mann-Whitney criterion was chosen as the statistical criterion. The critical value for the studied samples is 1.96. Statistical processing confirmed the “no difference” hypothesis (null hypothesis). The characteristics of the experimental and control groups coincide with a significance level of 0.05. Processing was carried out for all questions of the questionnaire.

The ascertaining experiment showed that students do not know domestic chemists well, and in person, they find it difficult to describe their contribution to the development of science. It is therefore difficult to speak of patriotism. It was surprising to obtain a low percentage of students who believe that the profession of a chemistry teacher is not very respected in society since they themselves chose a pedagogical specialty. Less than half of the respondents showed a willingness to cooperate and openness.

At the formative stage of the experiment, chemistry classes of the first year students of the experimental group were conducted with the use of such technologies as project-based learning, game-based learning, interactive learning and flipped classroom model of blended learning. The classes of the students of the control group were conducted with the use of traditional teaching technologies. Students were observed, interviews with students and teachers were conducted.

At the monitoring stage, a survey was conducted again and the processing of its results (Figures 2 and 3) showed that the students of the experimental group know much more Kazakh chemists and can describe their contribution to the development of science. The respect for the profession of a chemistry teacher was improved. The students appreciate the cooperation with other students and teachers. They have become more open. In the control group, the indicators before and after the start of the experiment changed slightly.

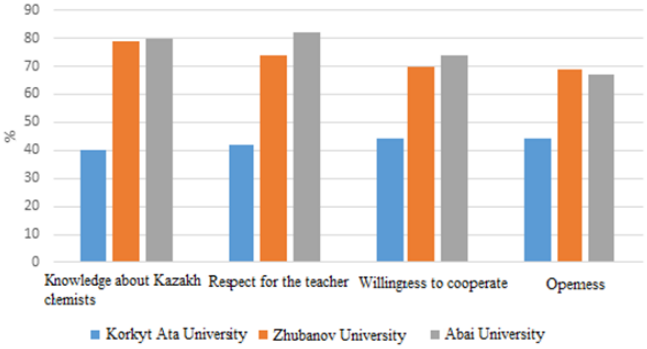

Figure 2. Results of the Survey of the Students at the Monitoring Stage of the Pedagogical Experiment

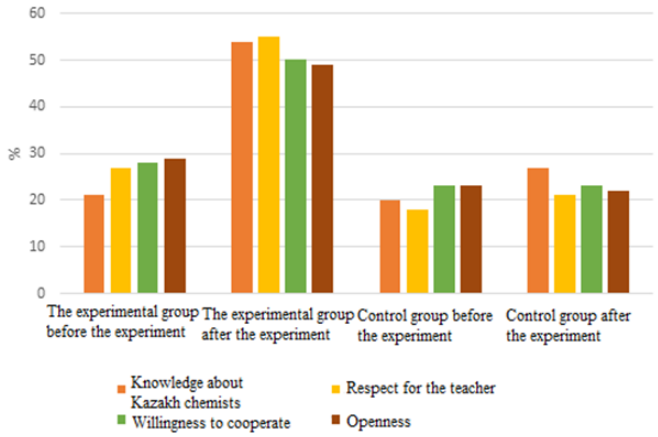

Figure 3. Generalized Results of the Survey of the Students Before and After the Pedagogical Experiment.

The statistical processing showed that the reliability of differences in the characteristics of the experimental and control groups according to the Wilcoxon-Mann-Whitney statistical criterion is 95%. The reliability of the similarity of the results of the control group before and after the experiment coincides with a significance level of 0.05.

Undoubtedly, the most important principle of didactics is the principle of independent creation of knowledge as a result of organized educational activities. Consequently, various types of teaching technologies promote the development of students' cognitive and creative interests. (34)

Thus, various types of humanities-based teaching technologies contribute to the formation of basic educational values in chemistry education. However, the introduction of modern educational technologies does not mean that they will completely replace all the pedagogical experience proven over the years. Any educational technology is a combination of individual techniques, methods, forms and means of training and mentoring, which provides guaranteed planned results. It is very difficult for a teacher to overcome the stereotypes related to conducting classes that have taken shape over the years. Not every teacher is ready to participate in innovation processes, even to the rejection of any innovations, especially since it requires great effort. At the same time, this is a problem for students as they are used to seeing a teacher "on the other side of the desk"; it is difficult for them to accept a teacher as an ally, assistant and mentor interested in their personal success. It is necessary for both of them to understand their own position in a new way, to understand why changes are necessary, and, above all, to change themselves.

This research was conducted at the Department of Chemistry of the Abai Kazakh National Pedagogical University in Almaty. The results of the research were discussed at the meetings of the department, at the international scientific and practical conferences such as "Modernization of natural science education in terms of updated content" (held in Almaty in 2017) and "Modern achievements of the natural sciences, current learning problems: status, new technologies, and prospects" (held in Almaty in 2017) etc. The summarized results of the research are published for the first time.

4 Conclusion

As part of the study, it is shown that it is possible in principle to use modern humanities-based teaching technologies in chemistry education to form the basic educational values in accordance with the requirements of the State Compulsory Standard of Higher Education of the Republic of Kazakhstan. The following four teaching technologies introduced into the educational process (project-based learning, game-based learning, interactive learning and the flipped classroom model of blended learning) influenced the first-year students of pedagogical specialty:

- Kazakh patriotism expressed in the knowledge about domestic chemists and their contribution to world science;
- respect for the profession of a teacher;
- willingness to cooperate with other students and teachers, openness.

Since these technologies were used all together, the authors have not yet managed to figure out the influence of each of them on a certain personality quality. At the same time, there is a definite correlation between the formation of the basic educational values and disciplinary results in chemistry learning. This issue is also to be studied.

In order to increase the effectiveness of professional education, whatever teaching methods are used, it is important to create such psychological and pedagogical conditions in which a student can take an active personal position and fully express himself (herself) as a subject of educational activity. The didactic principle of personal activity in education and professional self-identification determines the system of requirements for a student's learning activities and a teacher's professional activities in a single learning process. This system includes external and internal factors, needs and motives. The ratio of these characteristics determines the choice of the content of education, specific teaching methods, and the conditions for the organization of the whole process of the formation of an active creative personality.

The quality of education consists of the quality of learning and the quality of mentoring. The quality of learning can be achieved only as a result of ensuring the effectiveness of each stage of learning. That is, the whole process of learning is based on the following scheme: to perceive - to comprehend – to remember - to apply – to check. To achieve a high quality of learning, it is necessary to go consistently through all these steps of the cognitive activity. The use of various forms and methods in the learning process contributes to the quality of learning.

The student's emotional state largely determines his or her mental and physical performance. A high emotional tone of the audience and its involvement in the educational process disclose the reserves of a student's personality. If there is no psychological comfort in class, then other stimuli to educational and cognitive activity are paralyzed. The main value of the relationship between a teacher and students is their cooperation, which involves a joint search, joint analysis of success and miscalculations. In this case, a student becomes an initiative partner.

The main teaching methods that improve the quality of learning are role-playing games, business games, seminars, repeating and summarizing lessons, conferences, debates, dialogues, problem-based learning, independent work, making up abstracts, individual work, creative writings, reports, messages, testing, research work etc. All the listed teaching technologies contribute to solving the problem of learning quality.

Humanizing chemistry pedagogical education in practice relies on the creative use of general pedagogical regularities of the learning process based on national peculiarities and traditions. The active participation of students on par with a teacher in the learning process based on individual interests and peculiarities, permeated with respect to all participants of the educational process, creativity, diligence, and interest not only contributes to the development of professional competence of future education system specialists but also helps them to take responsibility for their own future, personal and professional progress. Acquired qualities actively contribute to the socialization of an individual and meet the modern needs of society.

Literature:

1. Vishnyakova S. Professional education. Dictionary. Key concepts, terms, relevant vocabulary. Moscow: NMC software; 1999.
2. Nilova E.A. Humanization of pedagogical education in Western Europe. Siberian pedagogical journal. 2006; (2):207-215.
3. Li Y. Humanization of higher pedagogical education: theoretical foundations. Bulletin of Irkutsk pedagogical University. 2009; 10:94-103.
4. Izotov MZ. Proceedings from the National Academy of Sciences of Kazakhstan. Series of social sciences and humanities: Social and philosophical problems of education in independent Kazakhstan; 2011.
5. Izotov MZ. Proceedings from the National Academy of Sciences of Kazakhstan. Series of social sciences and humanities: Philosophical and methodological problems of improving the quality of education in the context of human capital; 2012.
6. Marcuse H. One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society. Boston: Beacon Press; 1964.
7. Heidegger M. Bauen Wohnen Denken: Vorträge und Aufsätze. Klett-Cotta; 2018.
8. Ilyenkov YV. Philosophy and culture. Moscow: Politizdat; 1991.
9. Ilyenkov YV. What is personality? In: Kosolapov RI, editor. How to start a personality. Moscow: Politizdat; 1979. p. 238.
10. Osmanov AH, Murtazalieva MK, Bakargiev PR. Humanization as a priority the reform of chemical education. Izvestiya Dagestanskogo gosudarstvennogo pedagogicheskogo universiteta. Psychological and pedagogical Sciences. 2013; 3 (24):86-90.
11. Lyamin AN, Pak M. Humanitarian updating of teaching chemistry in modern school. Scientific and methodical electronic journal "Concept" [Internet]. 2012; 7:1-5. Available from: http://e-koncept.ru/2012/12081.htm
12. Abdulina O. Actual problems of pedagogical education. Journal of Higher School of Kazakhstan. 1995; 5:58-63.
13. Adolf V. Theoretical bases of the formation of professional competence of teachers. Moscow: Nauka; 1998.
14. Babansky, Y. (1992). Competence model: from the idea to the educational program. Moscow: Nauka, p. 366.
15. Bashirova Z. Pedagogical competence of teachers in higher education. Higher education today. 2003; 11:21-27.
16. Bespalko VP. The components of pedagogical technologies. Moscow: Nauka; 1989.
17. Gavronskaya YY. Formation of General cultural and professional competences of students of the pedagogical high school in teaching chemical disciplines. Fundamental study. 2013; 10-12:2773-2777.
18. Gershunskiy B. Philosophy of Education for the XXI Century. Moscow: Nauka; 1997.
19. Kuzmina N. The professionalism of a teacher's personality. Moscow: Nauka; 1990.
20. Likhachev BT. Pedagogics: series of lectures. Training manual of students-teachers, educational institutions, and listeners of IPK and FPK. Moscow: Urait-M; 2001.
21. Ilyasova K. Introduction to teaching activities. Almaty: Kazakhstan; 2006.
22. Volkov IP. Modern educational technologies. Moscow: Pedagogics; 1998.
23. Monakhov VM. Fundamentals of pedagogical technology. Moscow: Nauka; 1997.
24. Selevko GK. Modern educational technologies. Moscow: Public Education; 1998.
25. Klarin MV. Technologies of teaching: the ideal and reality. Riga: Vesta; 1999.
26. Skatkin MI. Modern didactics: theory and practice. Moscow: Prosveshcheniye; 1995.
27. Burykina OV, Maltseva VS, Fatyanova EA. The use of the method of projects in the organization of independent research of students in the study of disciplines of the chemical profile. Izvestiya Yugo-Zapadnogo gosudarstvennogo universiteta. 2012; 4-3(43):257-261.
28. Volkov AA, Gastev SA. Information and axiological technologies of project-based approach to the study of chemistry. Distance and virtual learning. 2015; 3(93):107-114.
29. Rybakova GV, Shilova TV. Project activity of students in higher education institution at the training of chemistry. Bulletin of Chuvash State Pedagogical University. 2018; 2(98):275-28.
30. Prokhorenko LA, Nezamentimova LE. The Need to use technology entertainment learning when conducting classroom-practical work in chemistry. Problems of higher education. 2011; 1:207-208.
31. Glynn J. The Effects of a Flipped Classroom on Achievement and Student Attitudes in Secondary Chemistry [Internet]; 2013. Available from: https://scholarworks.montana.edu/xmlui/bitstream/handle/1/2882/GlynnJ0813.pdf?sequence=1&isAllowed=y
32. Alvarez B. Flipping the classroom: Homework in class, lessons at home. Education Digest: Essential Readings Condensed For Quick Review. 2011; 77(8):18–21.
33. Akramova LY. Distinctive features of the model "Flipped classroom." [Internet]. Modern pedagogy. 2017; 4. Available from: http://pedagogika.snauka.ru/2017/04/7078
34. Murzina SA, Stukalenko NM, Naviy L, Zhussupbekova GG. Study of peculiarities of communicative type of teaching. Man in India. 2017; 97(23), Part 3: 409-420.

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ARREST AS A FORM OF PUNISHMENT: CRIMINAL LAW AND CRIMINAL ENFORCEMENT ASPECTS

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Abstract: The relevance of the topic of the article is determined by the imperfection of the legal regulation of assignment and enforcement of punishments in the form of arrest in the criminal and criminal enforcement legislation of the Republic of Kazakhstan and the novelty of the said legislation. In this connection, there is a need for a comprehensive assessment of social relations arising in the process of assigning and enforcing a punishment in the form of arrest and determining the legal nature of this punishment, which is the basis for the legal relations emerging due to the fact of a criminal offense committed by the guilty.
The authors of this article came to the conclusion that arrest, as a new type of punishment, which is hardly applicable in practice due to a number of circumstances, requires more detailed regulation in the criminal and criminal enforcement legislation of the Republic of Kazakhstan. Further improvement of the relevant types of legislation will allow the use of this type of punishment for preventing criminal offenses and improving the effectiveness of the reformation of the convict.

Keywords: Arrest, Imprisonment, Convict, Prison term, Punishment, Criminal misdemeanor, Humanization of punishment, Lockdown.

1 Introduction

In Kazakhstan, the emergence of the institution of punishment in the form of arrest was the result of economic and political transformations carried out in the early 90s of the last century, requiring an appropriate legal infrastructure. In particular, the Decree of the President of the Republic of Kazakhstan of February 12, 1994 No. 1569 "On the State Program of Legal Reform in the Republic of Kazakhstan" (1) indicated that it would be necessary to make changes to the punishment system: to expand the size and scope of application of property sanctions as more appropriate to market relations; to establish new types of punishments such as deprivation of liberty and arrest (for up to three months), excluding such types as public reprimand, dismissal from office, suspended sentence, and correctional labor; limit the number of crimes for which the death penalty is provided for.

Later, in the Decree of the President of the Republic of Kazakhstan of September 20, 2002 No. 949 "On the Concept of the Legal Policy of the Republic of Kazakhstan" (2), one of the areas of the implementation of the criminal policy of the Republic of Kazakhstan was to create the necessary conditions for the introduction of criminal law norms providing for such new types of punishment as deprivation of liberty, arrest, and life imprisonment.

In order to implement the assigned tasks, the Criminal Code of the Republic of Kazakhstan of 1997 (hereinafter the Kazakh CC of 1997) (3) was first adopted together with the Penal Enforcement Code of the Republic of Kazakhstan 1997 (hereinafter the Kazakh PEC of 1997). (4).

For the first time in the criminal legislation of the Republic of Kazakhstan, the Kazakh CC of 1997 provided for the punishment in the form of arrest. Although for the criminal legislation of several countries, this type of punishment is not new. According to L.V. Ryabova, this type of punishment was enshrined in the Criminal Code of Italy in 1930, in the PRC in 1979, in Switzerland in 1937, in Japan in 1907 and in several other countries. (5)

This type of punishment was enshrined in Article 46 of the Kazakh CC of 1997. In accordance with Part 1 of Article 46 of the Criminal Code of the Republic of Kazakhstan, arrest involves the lockdown of a convicted person for the entire sentence term. Part 2 of this article has enshrined that the arrest is established for a period of from one month to six months. In the case of substitution of correctional labor or a fine with an arrest for a term less than one month. Part 3 established that the arrest does not apply to persons who are under the age of sixteen years, as well as pregnant women and women with minor children. Part 4 of this article determined that the members of armed forces were arrested in military prisons.

Until 2011, the enforcement of punishment in the form of arrest was postponed several times. When instituting the Kazakh CC of 1997, it was initially determined that the provisions of this Code concerning punishments such as correctional labor, deprivation of liberty, arrest, and life imprisonment come into effect after the Kazakh PEC enters into legal force, as the necessary conditions for the enforcement of these types of punishments are created, no later than 2003. This provision was enshrined in Article 4 of the Kazakh Enactment of the Criminal Code Act of July 16, 1997 No. 168-1. (6) On May 5, 2000, the aforementioned article of the above Act was modified by the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Fight against Crime No. 47-II (paragraph 4 of the Amendments), according to which correctional labor was removed from the list of previously mentioned punishments and it was enshrined that the provisions of this Code concerning correctional labor come into force on January 1, 2000. (7)

Later, in accordance with Paragraph 1 of the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning punishment in the form of arrest, as well as the introduction of life imprisonment of December 31, 2003 No. 514-II (8), the provisions of the Criminal Code of the Republic of Kazakhstan on arrest were again changed, i.e. 2008 was chosen instead of 2003.

Paragraph 4 of the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Further Improvement of the System of Enforcement of Criminal Sentences and the Penitentiary System of December 10, 2009 No. 228-IV (9) established that the provisions of the Kazakh CC of 1997 concerning punishment in the form of arrest comes into effect on January 1, 2010.

Nevertheless, these provisions did not come into effect since, on the basis of subparagraph 8 of paragraph 1 of Article 1 of the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Further Humanization of the Criminal Legislation and Strengthening the Rule of Law in the Criminal Procedure of January 18, 2011 No. 393 – IV [10] (2011), Article 46 of the Kazakh CC of 1997 was edited and was already devoted to another type of punishment, i.e. the detention in a military prison.

At the same time, the same amendments regarding the date of entry into force of Articles 64-67 of the Kazakh PEC of 1997 dedicated to the enforcement of such punishment as arrest, were introduced into the Enforcement of the Penal Code of the Republic of Kazakhstan Act of December 13, 1997 No. 209. (11)

Thus, for more than ten years in the legislation of the Republic of Kazakhstan, there was a situation in which certain provisions of the existing Criminal and Penal Enforcement Codes of the Republic of Kazakhstan did not have the opportunity for the practical implementation.

This situation was repeated in the framework of the Criminal Code of the Republic of Kazakhstan of 2014 (hereinafter the Kazakh Criminal Code of 2014) (12) and in the Penal

Enforcement Code of the Republic of Kazakhstan of 2014 (hereinafter the Kazakh PEC of 2014) (13), although for a shorter period.

The Kazakh CC of 2014 adopted in July 3, 2014 has Article 45, which defines arrest as a lockdown for the entire duration of the sentence imposed (Part 1). In part 2 of this article, the period of arrest was established for a period of from thirty to ninety days. The period of detention is included in the period of arrest. In Part 3 of the article under review, persons who are not subject to an arrest are listed: minors, pregnant women, women with young children, men raising young children alone, women aged fifty-eight and over years, men aged sixty-three and over, disabled people of the first and second disability groups. In accordance with part 4 of this article, service members are arrested in military prisons.

Article 45 of the Kazakh CC of 2014, in accordance with Article 467 of the Kazakh CC of 2014 "On the introduction of this Code into force and the recognition of certain legislative acts of the Republic of Kazakhstan as invalid" comes into force on January 1, 2017. At present, the application of Article 45 of the Kazakh CC of 2014 is suspended until January 1, 2020, with the exception of the provisions applicable to military personnel and in cases provided for by Part 3 of Article 41, Part 3 of Article 42 and Part 2 of Article 43 of this Code (that is, situations when a fine and correctional labor assigned to convicts are replaced by an arrest due to a number of circumstances), which are applied from January 1, 2017. These dates were established by the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of the Criminal Enforcement Legislation of April 18, 2017 No. 58-VI (14), which included part 1-1 in Article 467 of the Kazakh CC of 2014. Part 1-1 includes the above clarifications concerning the application of Article 45 of the Kazakh CC of 2014.

Thus, the formal date of commencement of such punishment as arrest in the Republic of Kazakhstan is January 1, 2017, that is, Article 45 of the Kazakh CC of 2014 comes into force two years after the Kazakh CC of 2014 comes into force. In fact, until January 1, 2020, the provisions of Article 45 of the Criminal Code of the Republic of Kazakhstan will not be applied in full but only in cases provided for by Part 1-1 of Article 467 of the Kazakh CC of 2014.

January 1, 2017 is the date of entry into force of Chapter 15 of the Kazakh PEC of 2014 devoted to the enforcement of punishment in the form of arrest. This date is included in Part 1 of Article 177 of the Kazakh PEC of 2014.

The purpose of the article is to analyze the legal nature of legal relations arising in the process of assignment and enforcement of arrest.

2 Materials and Methods

The implementation of the purpose of the article is carried out with the help of an analysis of the norms of Kazakh legislation regulating the assignment and enforcement of a punishment in the form of arrest, with the aim of legal qualification of this type of punishment and determining its place in the legal system of Kazakhstan.

The methodological potential includes general scientific methods (dialectical method, analysis, synthesis, analogy, induction, and deduction) and such methods as systemic, formal legal and comparative legal ones, which allow to compare different views on the legal nature of relations arising in the process of applying the Kazakh CC of 1997 and that of 2014 as well as the Kazakh PEC of 1997 and that of 2014 when assigning and enforcing an arrest.

3 Results and Discussion

In recent years, the criminal and criminal enforcement legislation of the Republic of Kazakhstan has undergone significant changes in terms of the assignment and enforcement of sentence in general, as well as in the terms of the assignment and procedure for the enforcement of certain types of punishment, in particular. These changes can be clearly examined by the example of the assignment and enforcement of an arrest.

In accordance with Part 1 of Article 46 of the Kazakh CC of 1997 and Part 1 of Article 45 of the Kazakh CC of 2014, arrest consists in a lockdown for the entire term of the sentence imposed.

G.F. Polenov (15, p99) noted that despite the fact that arrest is a short-term form of punishment, it is, because of the significance of repressiveness (lockdown), can have a great preventive effect on those who commit crimes.

The term of arrest in accordance with Part 2 of Article 45 of the Kazakh CC of 2014 is currently within ten and within fifty days. Until July 12, 2018, this period was different, i.e. from thirty to ninety days. These changes were made to the Kazakh CC of 2014 by the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of Criminal, Criminal Procedure Legislation, Law Enforcement and Special State Bodies of July 12, 2018 No. 180-VI. (16)

In the former Criminal Code of 1997, the period of arrest was much longer: from one month to six months (Part 2 of Article 46 of the Kazakh CC).

In accordance with Part 5 of Article 45 of the Kazakh CC of 2014, when a sentence is replaced, the minimum period of arrest may be less than ten days.

This situation may arise in the following cases provided by law:

1. When enforcing a fine imposed on a convict for a criminal misdemeanor, the unpaid part of the fine is replaced by an arrest at the rate of one day of arrest for four unpaid monthly calculation indicators (Paragraph 1) of Part 6 of Article 41 of the Kazakh Criminal Code of 2014);
2. In the event of circumstances impeding the carrying out of correctional labor by a convict (except for disability), it is replaced by an arrest at the rate of one day of arrest for four unpaid monthly calculation indicators (Paragraph 1) of Part 5 of Article 42 of the Kazakh CC of 2014);
3. In case of evasion of a convicted person from community service, it is replaced by an arrest at the rate of one day of arrest for four unworked hours of community service (Paragraph 1) of Part 2-1 of Article 43 of the Kazakh CC of 2014).

An arrest, in accordance with Part 3 of Article 45 of the Kazakh CC of 2014, is not assigned to a certain group of persons, which includes

1. minors;
2. pregnant women;
3. women with young children;
4. men raising young children by themselves;
5. women aged fifty eight and over;
6. men aged sixty-three and over;
7. disabled people of the first and second disability groups.

This list has undergone significant changes compared to the Kazakh CC of 1997, which included only three categories of persons:

1. Persons who are under the age of sixteen by the time they are sentenced, and later those who have not reached the age of eighteen by the time they are sentenced, in accordance with the Amendments to the Criminal, Criminal Procedure, and Penal Enforcement Codes of the Republic of Kazakhstan concerning the Simplification of Procedures for the Investigation of Criminal Cases, the Decriminalization of Certain Offenses and the Improvement of Legislation for Administrative Offenses of December 9, 2004 No. 10-III (17);
2. pregnant women;
3. women with young children.

The inclusion of minors (initially - persons under sixteen years old) in the number of persons subject to the punishment in question is justified by the fact that thus the negative consequences of this punishment in relation to children are prevented. Lockdown (keeping locked up in chambers, lack of meetings with parents or other close people), lack of general education, vocational training, and movement under escort lead to a breakdown of positive social and emotional ties with parents, relatives and other people, loss of time and opportunity in obtaining education and mental and physical development, which later, after serving the sentence, is either difficult or impossible to recover.

Changes in the criminal law in respect of the persons, to whom arrest is not applied, were carried out in two directions:

1. extension: the list includes 1) men who bring up young children alone, 2) women aged fifty eight and over, 3) men aged sixty-three and over, 4) people of the first and second disability groups.
2. reduction: instead of women with minors, now it involves women with young children.

In Part 4 of Article 45 of the Kazakh CC of 2014 a provision stating that service members are arrested in military prisons was remained.

The fifteenth chapter of the Kazakh PEC of 2014 currently regulates the process of enforcement of punishment in the form of arrest. This chapter, in accordance with Part 1 of Article 177 of the Kazakh PEC entered into force on January 1, 2017.

Places where persons serve punishment in the form of arrest are detention centers and isolated areas of remand centers assigned according to the place of conviction (Paragraph 1 of Article 83 of the Kazakh PEC of 2014) and military prisons for military personnel (Paragraph 2 of Article 83 of the Kazakh PEC of 2014).

It should be noted that the Article 83 of the Kazakh PEC of 2014 included isolated areas of the remand centers in the list of places where persons serve punishment in the form of arrest according to the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of the Criminal Enforcement Legislation of April 18, 2017 No. 58-VI. (18) Prior to this amendment, only detention centers were places where persons served punishment in the form of arrest.

At the same time, it should be noted that the former Kazakh PEC of 1997 initially defined arrest facilities as places where persons served punishment in the form of arrest. Later, in accordance with the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning Further Improvement of the System of Enforcement of Criminal Sentences of December 10, 2009 No. 228-IV, were replaced with remand centers. (9)

For the first time, the Kazakh PEC of 2014 defined time periods for sending convicts to serve an arrest, i.e. starting from the day the sentence enters into legal force (Part 1 of Article 84), and, in relation to convicted military personnel, within three days after receiving a court order on the enforcement of sentence entered into force (Part 2 of Article 84).

The peculiarities of enforcement of arrest are reflected in Article 85 of the Kazakh PEC. A smaller part of these peculiarities was already present in the former criminal enforcement legislation of the Republic of Kazakhstan: for example, the fact that persons convicted for arrest are kept lockdown in cells (Part 1). Nevertheless, here it is necessary to clarify that in the edition of Part 1 of Article 64 of the Kazakh PEC of 1997 with amendments of December 10, 2009, the cell type was specified (shared lockable cells). (9) Prior to this, there was no such specification, although the the detention of prisoners in shared lockable cells was implied. This was due to the fact that the original edition of Part 2 of Article 64 of the Kazakh PEC of 1997 enshrined that persons convicted to arrest are subject to the conditions of detention established by this Code for persons serving a sentence of imprisonment according to the general regime in prison. Article 127 of the Kazakh PEC of 1997 in the edition in question determined that those sentenced to deprivation of liberty are kept in prisons in shared lockable cells (Part 1).

Also, as before, in places where persons serve the sentence of arrest, men, women and persons who have previously served their sentences and have a criminal record are kept separately. In the original edition of Part 1 of Article 64 of the Kazakh PEC of 1997, the list of these persons also included minors, who were subsequently excluded.

However, most of the peculiarities of serving the sentence of arrest are new for the current criminal enforcement legislation of the Republic of Kazakhstan:

1. Prisoners with various infectious diseases are kept separately from healthy people (Part 1 of Article 85 of the Kazakh PEC of 2014);
2. Such convicts as former employees of courts, law enforcement and special state bodies, persons authorized to exercise control and supervision over the behavior of convicted persons are kept in isolation from other convicts (Part 1 of Article 85 of the Kazakh PEC of 2014);
3. When a convicted person is hospitalized in a medical institution, an escort is organized to ensure his or her protection (Part 1 of Article 85 of the Kazakh PEC of 2014);
4. Convicted military personnel are kept separately depending on their ranks (commissioned officers and enlisted grades) and separately from military personnel held in the military prison for other reasons (Part 3 of Article 85 of the Kazakh PEC of 2014).
5. Persons sentenced to arrest are provided with food according to the standards applied to persons sentenced to deprivation of liberty.

Military personnel sentenced to arrest are provided with food according to the standards established by authorized bodies dealing with criminal enforcement, national security, and defense of the Republic of Kazakhstan in coordination with the central authorized body charged with budget planning (Part 2 of Article 85 of the Kazakh PEC of 2014).

In accordance with Article 86 of the Kazakh PEC of 2014, a person sentenced to arrest, in addition to general rights and obligations (Articles 10 and 11 of the Kazakh PEC of 2014), the following rights are granted:

1. to receive and send letters and telegrams at his or her own expense once a month;
2. to receive money transfers;
3. to spend monthly, for the purchase of food and essential items, the funds available in control accounts dedicated for temporary placement of money amounting to one monthly calculation indicator;
4. to receive monthly parcels, transfers, and packages with essential items and clothing according to the season. Also, sick and disabled convicts are entitled to receive packages and transfers with medicines and medical products in the quantity and assortment determined by a medical certificate;
5. to have meetings with a lawyer without limitation of their number and duration, under conditions that ensure their confidentiality;
6. to have a daily walk of at least one and a half hours;
7. to have a telephone conversation with the spouse and close relatives at own expense in cases of death or terminal illness of the spouse or a close relative, a natural disaster that caused significant material damage to his or her family and other exceptional circumstances of a personal nature;
8. to have short-term visits for a period of not more than seven days, not counting the time required for travel (not more than five days), in connection with the death or terminal illness of the spouse or a close relative, or a natural disaster that caused significant material damage to his or her family.

In the above article, along with the rights and obligations common to all convicts provided by Articles 10 and 11 of the Kazakh PEC, special rights are provided for persons sentenced to arrest. It should be noted that the conditions of serving the sentence of arrest, as defined in Article 86 of the Kazakh PEC of 2014, significantly differ from the previous criminal enforcement legislation. B.K. Shnarbayev and A.E. Mizanbayev (19) note that the legislation has refused a repressive approach to the enforcement of punishments in the form of arrest, which occurred earlier in legal theory and practice. The humane approach to serving the sentence of lockdown is reflected in special rights for persons sentenced to arrest. (26-30)

In particular, receiving parcels, transfers, and packages with essential items and clothing according to the season is now possible once a month (Subparagraph 4 of Part 2 of Article 86 of the Kazakh PEC of 2014), while earlier, although such a receiving was provided for, its frequency was not specified.

In the new PEC of the Republic of Kazakhstan, the legislators readopted the size of one monthly calculation indicator for the monthly expenses of the convict for the purchase of food and essential items deducted from the funds available in control accounts dedicated for temporary placement of money (Subparagraph of Part 2 of Article 86 of the Kazakh PEC of 2014). This size was also provided in the first edition of the Kazakh PEC of 1997. It should be borne in mind that the specified size, in accordance with the previously mentioned Kazakh Act of December 10, 2009 has been increased to three monthly calculation indicators. (9) Accordingly, the current size of the monthly expenses for the purchase of food and essential items is a manifestation of tougher conditions for serving the punishment in question. Moreover, there is a need to consider the possibility of increasing this indicator to three monthly calculation indicators.

The fact that the Kazakh PEC of 2014 increased the minimum duration of walks of persons sentenced to arrest from one hour to one and a half hours deserves a positive assessment (Subparagraph 6 of Part 2 of Article 86 of the Kazakh PEC of 2014). the Kazakh PEC of 1997 also provided for the duration of walks of at least one and a half hours but only for minors.

In addition, the current legislation specifies exceptional circumstances of a personal nature with which a telephone conversation of a convict with his or her spouse or close relatives can be allowed (Paragraph 7 of Part 2 of Article 86 of the Kazakh PEC of 2014). This will allow to apply the law in a uniform manner, as well as to avoid the facts of abuse of official powers by the relevant staff in the places where persons serve the sentence of arrest.

The evidence of further humanization of the criminal enforcement legislation of the Republic of Kazakhstan is that in the Kazakh PEC of 2014 for the first time granted the following rights to persons sentenced to arrest:

1. to receive and send letters and telegrams once a month at own expense (Paragraph 1 of part 2 of Article 86 of the Kazakh PEC of 2014);
2. to receive money transfers (Paragraph 2 of Part 2 of Article 86 of the Kazakh PEC of 2014);
3. to have short-term visits for a period of not more than seven days, not counting the time required for travel (not more than five days), in connection with the death or terminal illness of the spouse or a close relative, or a natural disaster that caused significant material damage to his or her family (Subparagraph 8 of Part 2 of Article 86 of the Kazakh PEC of 2014).

The novels of the Kazakh PEC are the provisions of Article 87, which for the first time determined the peculiarities of the legal status of convicted military personnel serving a sentence of arrest:

1. the time of serving a sentence of arrest shall not be counted in the total term of military service and the length of service when bestowing a military rank (Part 1);
2. during this period, a service member cannot be bestowed with a military rank, appointed to a higher position, transferred to a new duty station or dismissed from military service, except for cases of recognition as unfit for service due to health reasons (Part 2);
3. also, a convicted service member, during the specified period, is not paid a monetary allowance (Part 3).

The theoretical legal analysis of the previous and current Kazakh criminal and criminal enforcement legislation and the existing scientific interpretation of legal categories in the field of the application of punishment in the form of arrest allows to identify the following main conclusions.

Despite significant positive changes in the definition, procedure and conditions for the enforcement of punishment in the form of arrest in the criminal and criminal enforcement legislation of the Republic of Kazakhstan, there are certain gaps and contradictions in them that need to be eliminated as soon as possible in order to implement the principles of justice and legality.

First, it is necessary to draw attention to the minimum presence of labor in the enforcement of the sentence of arrest. Paragraph 71 of the General Order and the System for the Keeping of Convicts in Military Prisons of Military Police Bodies of the National Security Committee of the Republic of Kazakhstan approved by the order of the Chairman of the National Security Committee of the Republic of Kazakhstan No. 319 of September 25, 2014 (20), indicates that convicted military personnel are involved in the work for economic maintenance of military prisons with a duration of not more than two hours per week. Chapter 7 of the General Order and the System for the Keeping of Convicts in Military Prisons of Military Police Bodies of the Armed Forces of the Republic of Kazakhstan Approved by Order No. 367 of the Minister of Defense of the Republic of Kazakhstan of July 20, 2017 (21) stipulates the possibility of engaging military personnel in the maintenance work in military prisons, cleaning the cells and other premises of military prisons in order of priority according to the duty schedule, as well as the site improvement of military prisons. Paragraph 34 of the Rules of Organization of Activities and General Order of Special Institutions Enforcing Punishments in the Form of Arrest approved by the Order No. 504 of the Minister of Internal Affairs of the Republic of Kazakhstan of July 26, 2017 (22), indicates that prisoners are charged with sweeping and washing cells, cleaning the cell's lavatory and the exercise yard at the end of the walk. However, in the last two documents the maximum limit of the duration of such work per week is not specified. Chapter 15 of the Kazakh PEC of 2014 has no provision at all for engaging persons sentenced to arrest in work. Although, Article 65 of the Kazakh PEC of 1997 indicated that the administration of places of arrest has the right to involve convicts in the maintenance of the premises of places intended for serving a sentence of arrest, without payment lasting no more than four hours a week. The possibility of engaging persons sentenced to arrest in paid work is also not provided for in the specified chapter of the Kazakh PEC of 2014.

The need for labor (both in the form of paid labor, and in the form of improvement of living conditions) when enforcing an arrest is due to the fact that labor is an integral part of the reformation of a convict. (23-25) First, it is based on the very concept of reforming a convict, that is, the formation of his or her law-abiding behavior, a positive attitude towards individuals, societies, work, norms, rules and ethics of behavior in society (Subparagraph 10 of Article 3 of the Kazakh PEC). Secondly, socially useful work is one of the main means of reforming a convict (Subparagraph 4 of Part 1 of Article 7 of the Kazakh PEC). The importance of the raformation of a convict is due to the fact that this is one of the purposes of punishment (Part 2 of Article 39 of the Kazakh PEC of 2014). Thirdly, the main duty of convicts is the conscientious attitude to work (Subparagraph 7

of Part 1 of Article 11 of the Kazakh PEC). The lack of labor in the reformation of a person sentenced to arrest is also perplexing due to the fact that even those sentenced to deprivation of liberty who are serving a sentence in cells work in specially equipped working cells or on the territory of isolated local areas of a manufacturing zone (Parts 1 and 4 of Article 149 of the Kazakh PEC).

It would be advisable to provide in Chapter 15 of the Kazakh PEC of 2014 the possibility of engaging persons sentenced to arrest in maintenance of the premises of places intended for serving a sentence of arrest without payment of no more than two hours per week.

Secondly, the new Kazakh PEC of 2014 did not reflect the measures of encouragement and punishment applied to those sentenced to arrest, and, accordingly, the procedure for their application. Although, the Kazakh PEC of 1997 had such a rule, i.e. Article 66. It is advisable to adopt the experience of the previous Kazakh legislation concerning this issue, making certain changes in it, taking into account the current conditions of serving the sentence of arrest. In particular, the list of incentive measures previously provided for in the Kazakh PEC of 1997 including acknowledgment, early removal of the previously imposed penalty, and permission for a telephone conversation, should be expanded to include additional spending of money amounting to monthly calculation indicator for the purchase of food and essential items during holidays. Such a list of incentive measures is practiced in the previously mentioned General Order and System for the Keeping of Convicts in Military Prisons of Military Police Bodies of the National Security Committee of the Republic of Kazakhstan (Paragraph 111). (20)

It is suggested to keep the list of penalties the same: reprimand and placement in a punishment cell. Nevertheless, the maximum term for the latter penalty is necessary to be reduced from ten to five days, taking into account the fact that at present the maximum term of arrest is reduced from ninety days to fifty days.

In connection with consideration of the issue of incentives and penalties applied to persons sentenced to arrest, it is inadmissible to invoke Articles 128 and 131 of the Kazakh PEC of 2014 in the previously mentioned Rules of Organization of Activities and General Order of Special Institutions Enforcing Punishments in the Form of Arrest due to the fact that these articles regulate incentives and penalties, as well as the procedure for applying them to persons sentenced to another type of punishment, i.e. deprivation of liberty.

Thirdly, the Kazakh PEC of 2014 does not regulate the procedure for the movement of convicts in the territory of the places arrest. Only in Part 1 of Article 85 of this Code, there is a provision stating that in case of a convict being sent for hospitalization to medical institutions, an escort is sent to ensure his or her protection. In addition, in paragraph 31 of the previously mentioned Rules there are provisions for an escort for convicts, according to which the movement of convicts through the territory of a detention center or a remand center is carried out only under escort. It is necessary in the Kazakh PEC of 2014 to introduce a norm providing for the obligation of persons sentenced to arrest to move through the territory of the places of arrest only under escort and not to be limited to the presence of a corresponding provision in the by-law. Fourth, Article 84 of the Kazakh PEC of 2014 states that only a court verdict that has entered into legal force as the basis for the enforcement of a sentence of arrest, which is not enough. The grounds for the enforcement of arrest include a court decision that has entered into legal force in the event of the replacement of such types of punishment as a fine, correctional labor and community service by an arrest in accordance with Paragraph 1 of Part 6 of Article 41, Paragraph 1 of Part 5 of Article 42 and Paragraph 1 of Part 2-1 of Article 43 of the Kazakh CC.

Fifth, in accordance with Subparagraph 5 of Part 2 of Article 86 of the Kazakh PEC of 2014, sentenced to arrest have the right to meet only with a lawyer without limiting the number of such meetings and their duration, under conditions that ensure their confidentiality. As violation of this provision, Subparagraph 95-104 of the general order and the system for the keeping of convicts in military prisons of military police bodies of the National Security Committee of the Republic of Kazakhstan has provisions concerning holding meetings of convicted military personnel with lawyers, relatives and other persons. (20) In particular, it is indicated that convicted service members are provided with short two-hour meetings (Paragraph 95), for example, with persons who are not relatives of a convicted service member (Paragraph 96), as well as with the spouse and relatives (Paragraph 97) on a rotational basis (Paragraph 98). It seems to be logical to bring the above-mentioned bylaw into line with the Kzakh PEC of 2014 by excluding most of the provisions of Paragraphs 95-104 of above-mentioned General Order, with the exception of the provisions on granting a service member meetings with a lawyer, as well as security measures during meetings.

Sixth, Part 1 of Article 467 of the Kazakh CC of 2014 currently invokes Part 3 of Article 41, Part 3 of Article 42 and Part 2 of Article 43 of this Code. Before the amendments to the Kazakh CC of 2014, in July 2018, these norms provided for provisions on the replacement of fines, correctional labor and community service with punishment but according to the Amendments of July 12, 2018 № 180-VI, (16) Articles 41 and 42 of the Kazakh CC of 2014 were edited and Part 2 of Article 43 of the Kazakh CC of 2014 was edited and supplemented with new Parts: 2-1 and 2-2.

4 Conclusion

The stated provisions can be used in the process of improving the criminal enforcement legislation of the Republic of Kazakhstan concerning the legal regulation of the assignment and enforcement of such type of punishment as the arrest in order to prevent criminal misconduct, improve the efficiency of correction of the convict, etc.

In particular, the proposal to increase the monthly expenditure on the purchase of food and essential items from one to three monthly calculation indicators is an additional opportunity to humanize the penal legislation of the Republic of Kazakhstan.

The desire to improve the correction of persons sentenced to arrest explains our proposal to include in Chapter 15 of the Kazakh PEC of 2014 the provisions on the possibility of engaging convicts in work, as well as to make up a separate article providing for incentives and penalties applied to convicts and the procedure for their application.

For the prevention of possible offenses by convicts, it is proposed to introduce in the Kazakh PEC of 2014 the obligation of convicts to move around the territory of places of arrest only under escort.

In order to fully reflect the current criminal and criminal procedure legislation, it was suggested that, in addition to the court's verdict, the court's rulings entered in force in case of replacement of fine, correctional labor and community service for arrest are also included in grounds of arrest.

To eliminate the contradictions in the Kazakhstan legislation, it is proposed to make the appropriate changes in part 1-1 of Article 467 of the Criminal Code of the Republic of Kazakhstan, as well as in separate by-laws of the Republic of Kazakhstan.

The stated conclusions and suggestions of the authors to improve the criminal and criminal enforcement legislation in terms of defining, assigning and enforcing such punishment as arrest can be used by other authors of scientific papers on the specified topics, both within Kazakhstan's science and beyond.

Literature:

1. Decree of the President of the Republic of Kazakhstan of February 12, 1994 No. 1569 "On the State Program of Legal Reform in the Republic of Kazakhstan" (1994). Available from: http://adilet.zan.kz/rus/docs/K940001569
2. Decree of the President of the Republic of Kazakhstan of September 20, 2002 No. 949 "On the Concept of the Legal Policy of the Republic of Kazakhstan" (2002). Available from: http://adilet.zan.kz/rus/docs/U020000949
3. Criminal Code of the Republic of Kazakhstan of 1997. Vedomosti Parlamenta Respubliki Kazakhstan. 1997; 15-16:211.
4. Penal Enforcement Code of the Republic of Kazakhstan 1997. Vedomosti Parlamenta Respubliki Kazakhstan. 1997; 24:337.
5. Ryabova LV. Arrest as a type of criminal punishment: Criminal law and criminal enforcement aspects [dissertation]. [Stavropol].
6. Kazakh Enactment of the Criminal Code Act of July 16, 1997 No. 168-1. Vedomosti Parlamenta Respubliki Kazakhstan. 1997; 15-16:212.
7. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Fight against Crime No. 47-II. Vedomosti Parlamenta Respubliki Kazakhstan. 2000; 6:141.
8. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning punishment in the form of arrest, as well as the introduction of life imprisonment of December 31, 2003 No. 514-II. Vedomosti Parlamenta Respubliki Kazakhstan. 2003; 24:180.
9. Paragraph 4 of the Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Further Improvement of the System of Enforcement of Criminal Sentences and the Penitentiary System of December 10, 2009 No. 228-IV. Vedomosti Parlamenta Respubliki Kazakhstan. 2009; 24(2553):128.
10. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Further Humanization of the Criminal Legislation and Strengthening the Rule of Law in the Criminal Procedure of January 18, 2011 No. 393 – IV. Vedomosti Parlamenta Respubliki Kazakhstan. 2011; 2(2579):19.
11. Enforcement of the Penal Code of the Republic of Kazakhstan Act of December 13, 1997 No. 209. Vedomosti Parlamenta Respubliki Kazakhstan. 1997; 24:338.
12. Criminal Code of the Republic of Kazakhstan of 2014. Vedomosti Parlamenta Respubliki Kazakhstan. 2014; 13-II:83.
13. Penal Enforcement Code of the Republic of Kazakhstan of 2014. Vedomosti Parlamenta Respubliki Kazakhstan. 2014; 17:91.
14. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of the Criminal Enforcement Legislation of April 18, 2017 No. 58-VI. Vedomosti Parlamenta Respubliki Kazakhstan. 2017; 8:16.
15. Polenov GF. Criminal Law of the Republic of Kazakhstan. Almaty: Yurist; 1999.
16. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of Criminal, Criminal Procedure Legislation, Law Enforcement and Special State Bodies of July 12, 2018 No. 180-VI. Vedomosti Parlamenta Respubliki Kazakhstan. 2018; 16:56.
17. Amendments to the Criminal, Criminal Procedure, and Penal Enforcement Codes of the Republic of Kazakhstan concerning the Simplification of Procedures for the Investigation of Criminal Cases, the Decriminalization of Certain Offenses and the Improvement of Legislation for Administrative Offenses of December 9, 2004 No. 10-III. Vedomosti Parlamenta Respubliki Kazakhstan. 2004; 23:139.
18. Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan concerning the Improvement of the Criminal Enforcement Legislation of April 18, 2017 No. 58-VI. Vedomosti Parlamenta Respubliki Kazakhstan. 2017; 8:16.
19. Shnarbayev BK, Mizanbayev AY. Criminal Enforcement Law of the Republic of Kazakhstan. Kostanay: Kostanay branch of Chelyabinsk State University; 2017.
20. General Order and the System for the Keeping of Convicts in Military Prisons of Military Police Bodies of the National Security Committee of the Republic of Kazakhstan approved by the order of the Chairman of the National Security Committee of the Republic of Kazakhstan No. 319 of September 25, 2014 (2014). Available from: http://adilet.zan.kz/rus/docs/V14KN009842
21. General Order and the System for the Keeping of Convicts in Military Prisons of Military Police Bodies of the Armed Forces of the Republic of Kazakhstan Approved by Order No. 367 of the Minister of Defense of the Republic of Kazakhstan of July 20, 2017 (2017). Available from: http://adilet.zan.kz/rus/docs/V1700015525
22. Rules of Organization of Activities and General Order of Special Institutions Enforcing Punishments in the Form of Arrest approved by the Order No. 504 of the Minister of Internal Affairs of the Republic of Kazakhstan of July 26, 2017 (2017). Available from: http://adilet.zan.kz/rus/docs/V1700015551
23. Dzigar AL. Criminal policy and its reflection in the theory, legislation and practice. Rostov-on-Don; 2005.
24. Trakhov AI. Once again on the arrest as a type of punishment. The North Caucasian Law Bulletin. 1999; 1:134.
25. Zubarev SM. Ugolovno-ispolnitelnoe pravo: Kopspekt lekcij [Penal law: Lecture notes]. 4th Ed. Moscow; 2012.
26. Smyshlyayev V, Chuchayev A. Problemy sovershenstvovaniya ugolovno-pravovogo mekhanizma realizatsii lisheniya svobody [Problems of improving the criminal law mechanism for the implementation of deprivation of liberty]. Ugolovnoye pravo. 2000; 2:69.
27. Bazunov V. Arest kak vid ugolovnogo nakazaniya [Arrest as a type of criminal punishment]. Prestupleniye i nakazaniye. 1998; 4:53.
28. Azaryan YN. Prestupleniye. Nakazaniye. Pravoporyadok [Crime. Punishment. Law and order]. Saint Petersburg: Yuridicheskiy tsentr Press; 2004.
29. Gromov VG., Svirkina SO. Sistema mest lisheniya svobody nuzhdayetsya v reforme [The system of places of deprivation of liberty needs reform]. Sovremennoye pravo. 2010; 2:133.
30. Petrukhin I. Novyy Ugolovnyy kodeks: problema nakazaniya [New Criminal Code: the problem of punishment]. Ugolovnoye pravo. 1999; 3:42-44.

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PSYCHOLOGICAL AND PEDAGOGICAL ASPECTS OF THE IMPLEMENTATION OF INCLUSIVE EDUCATION IN THE WORK OF MODERN PRESCHOOL ORGANIZATIONS

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Abstract: The article deals with the issues of training educators to accomplish their professional activities in the context of implementing inclusive practices in the system of preschool organizations. The authors attempted to study this issue from the point of view of the professional readiness of a future educator in accordance with the requirements of modern society to the system of preschool education.

Keywords: Creativity, Critical thinking, Inclusive education, Preschool organization, Professional readiness.

1 Introduction

The President of the Republic of Kazakhstan N. Nazarbayev (1) notes in his message the need for a cardinal improvement in the quality of preschool education: "the emphasis in education is shifting towards the 4C model: the development of creativity, critical thinking, communication skills, and teamwork." Such strategies of preschool education in Kazakhstan are fully justified. These are the competencies that a future educator of the preschool system should possess in order to perform his or her functions professionally.

Psychological and pedagogical dominants of the development of children of preschool age are as follows: the development of speech, thinking, memory, attention, emotional and volitional sphere, the formation of self-esteem, initial moral ideas, etc. Professional personnel needs to own four C to mentor preschool age children.

Inclusive education as a new social and educational phenomenon becomes the subject of practical and theoretical research and requires meaningful clarification of concepts, as well as defining strategies for the effective implementation of the idea of inclusive education. One cannot but agree with the position of those authors who talk about the strategic direction of the development of modern education as a successful solution of socialization problems determined by the conditions of the organization of the educational space. (2, p132) It should be noted that these tasks are a high priority.

In pedagogical theory and practice, the term "educational space" is interpreted ambiguously:

- structured system of pedagogical factors and conditions of personality formation (3);
- a "place" existing in a society where sets of relations, connections, and special activities of different systems related to the development of an individual and his or her socialization are subjectively defined and carried out (4), as well as the most important socially demanded key competences are formed (5);
- an integrative unit of society and of the world educational space, normatively or spontaneously structured and having its own system of coordinates, which determine the possibilities for self-development and self-change of a person at different stages of its formation (6,7);
- one of the leading factors of social education of the younger generation (8-10);
- a holistic single entity consisting of interdependent and interacting lines-spaces, stages, layers, and "environments" of social-educational situations that provide activity, initiative, creativity, and potential in the process of subject-subject and subject-object relations, where an environment in space is an input element (5, p7);
- a system of hierarchically interrelated components, each of which has its own specifics determined by the content and level of complexity of the pedagogical tasks solved in a sector of the educational space (2, p135).

It is obvious that researchers, in general, are united in the understanding of the educational space as an integrative phenomenon with a component structure and performing certain functions. Researchers attribute organization, length, structure (interconnection and interdependence of elements), and content to the universal characteristics of the educational space. The extrapolation of the above items allows to define the "inclusive educational space" as an integrative unit of social space represented by a system of structural components and blocks that determine the specificity of its content, in which educational and interpersonal relations are realized, personal and social development opportunities, socialization, self-development and self-change are provided for each participant. Inclusive educational space has both general characteristics (organization, length in time and space, pithiness and structuredness) and specific ones: accessibility, poly-subjectness, variability (meaningful, temporary, and organizational one). The principles of organizing an inclusive educational space include:

- socializing principle of the educational process (socialization is considered the most important result of education);
- principle of individualization and personification of the educational space (organization of an inclusive educational space, taking into account the characteristics and needs of each student);
- principle of integrative support of subjects of an inclusive educational space (the result of a concerted joint activity of a child support group: teachers, educational psychologists, parents, educational defectologists, etc.);
- principle of value and tolerant attitudes towards the subjects of the educational process, their activities in an inclusive educational space.

The effectiveness of an inclusive educational space is ensured by the strategy of the accounting and the interaction of external and internal factors determining it, as well as of its components.

2 Materials and Methods

Currently, issues related to the implementation of inclusive education in the work of preschool organizations of Kazakhstan are relevant since the need of children with special educational needs to include them in society as full members is still unmet. The term "inclusive" education is used to describe the process of teaching children with special needs in general education (mass) schools (kindergartens), i.e. their inclusion in such institutions. It is based on an ideology that excludes any discrimination against children, ensuring equal treatment of all people and creating special conditions for children with special educational needs. The process of implementing inclusive education into the practice of preschool organizations depends on several factors:

- logistics capacity of a preschool institution (its capability of ensuring free access to premises for preschool children with special educational needs, etc.);
- readiness of teaching staff (competent in the implementation of education of preschoolers with special educational needs);

- readiness of peers and their parents to "accept" a preschooler with special educational needs in the children's team as a full member of society.

If the first factor is officially registered in the standards, i.e. noted in the rules and regulations for the inclusive practices in educational organizations, the next two factors directly depend on the level and the preparedness of teachers of preschool education to carry out their professional activities. To determine the professional competencies of a specialist of a preschool organization, the authors conducted an analysis of the primary document of the Educational Program concerning the specialty 5B010100 (Preschool education and mentorship). (11) As a result of the analysis, the following data were obtained (see Table 1).

Table 1. The Key Competencies of the Bachelor's Specialty 5b010100 (Preschool Education and Mentorship Implying the Possibility of Implementing Inclusive Education)

Names of competencies	Content of competencies implying the possibility of inclusive education
Social and ethical competencies	- ability to provide a high level of pedagogical culture and pedagogical ethics; - use of adequate methods of effective interaction with persons of different socio-economic groups; - developing and adaptation of approaches that take into account sociocultural differences. - knowing about the methods of establishing contacts with representatives of educational institutions (family, public, and media) with taking into account their influence in their professional activities.
Communicative competencies	- use of the media for pedagogical education and the formation of effective interaction between kindergarten, family and the public; - ability to listen to partners in interaction without prejudice, developing tolerance in relationships; - ability to differentiate between adequate and inadequate, verbal and non-verbal components of communication;
Interpersonal competencies	demonstration of ethics
Pedagogical competencies	- knowing the patterns of development and social formation of the personality of a preschooler as well as basic of anatomical, physiological and mental development of preschool age children; - knowing the scientific and theoretical foundations of psychodiagnosis and the psychological readiness to school; - ability to create a substantive and developing environment for independent, cognitive, and creative activities of preschool age children; - formation of the key competencies of preschool age children (cognitive, health saving, communicative and linguistic, social, and creative ones).
Constructive competencies	- indicators of competence development of children from one year to six years; - ability to identify and develop the makings, inclinations, abilities, and talents of each child on the basis of an individual approach, taking into account the development and state of health.
Organizational competencies	- knowing the innovative forms and methods of the parents' involvement in the educational process of preschool organizations; ability to organize learning and cognitive activities.

As it can be seen from the table of key competencies of the bachelor's specialty 5B010100 (Preschool education and mentorship), the presented professional qualities are common and universal for all pedagogical specialties, and specific, perhaps even specialized qualities are not distinguished. Most of the competencies, as evidenced by the educational program, are indirectly related to the content, idea, and principles of inclusive education. Insufficient attention is paid to the issues of diagnostic work, during the training of which the special skills necessary for the implementation of inclusive education in preschool organizations are formed. So, with the use of psychodiagnostic methods, individual psychological and pedagogical peculiarities of a child with special educational needs as well as optimal pedagogical routes provided by individual support of each child in a preschool organization can be identified. In addition, diagnostics allows to evaluate the dynamics of development and the effectiveness of corrective work.

The scientific and practical developments of S.D. Zabramna, I.Y. Levchenko, Y.A. Strebeleva, M.M. Semago, T.A. Drygina, G.G. Korchevskaya, N.L. Tataurova, I.A. Tirskaya, S.I. Shelipova, B.Z. Nogaybekova, G.K. Maksutova, and others can be used as sources of diagnostic tools. Diagnostics in the process of inclusive education should be focused on the main areas of the child's mental activities such as emotional, cognitive, behavior, and motor functions with highlighting quality indicators in each area (see Table 2). (12)

Table 2. Indicators of the Development of Child Mental Sphere

Emotional sphere	Activistic sphere	Cognitive sphere and motor functions
child contact peculiarities; emotional reaction to a survey situation; reaction to a commendation; reaction to failures; emotional state when performing tasks; emotional mobility; communication peculiarities; reaction to a result.	presence and persistence of interest in a task; attention peculiarities, understanding of instructions; task independence; nature of activities (focus and activeness); pace and dynamics of activities, features of regulation of activities; performance; help organization.	peculiarities of perception, memory, thinking, and speech; motor function peculiarities.

Particular attention in the organization of inclusive education should be given to the factor of readiness of peers and their parents to "accept" a preschooler with special educational needs in the children's team as a full member of society.

3 Results and Discussion

The diversity of the individual characteristics of children affects the communication between children, "building" intra-group relations. It is necessary to establish a positive atmosphere of

acceptance and support. When co-educated, taking into account the individual characteristics, children get experience in reconciling their interests with the interests of others.

The organization of children's life in an inclusive group relies on the following tasks:

- creating a community of children and adults based on respect and interest in the personality of each member of the group, in his or her individual characteristics;
- formation of the ability to establish and maintain relationships with different people (younger, peers, older, adults);
- formation of the ability to support each other;
- development of communication skills and a culture of communication, creating a positive emotional attitude;
- enhancing the ability to choose, plan their own activities, negotiate with others about joint activities, assign roles and responsibilities;
- development of skills of gaming, cognitive, and research activities;
- development of self-regulation and self-service skills.

The compulsory condition for the development of children, i.e. the interaction in microgroups with other children, is the formation of social skills of communication and interaction. Educators facilitate such an interaction via the organization of gaming, design and research activities. Additional developmental programs may be used. During the cooperation on solving problems and conflicts, children learn the skills to coordinate their actions. With the help of an adult, they learn to take into account the differences in the interests, abilities, and skills of each other.

The work with parents of healthy children should include a cycle of activities aimed at developing tolerance. Parents of healthy children often fear that their child's development may be delayed by the presence of those who require significant support. A situation in which parents of healthy children do not want inclusion is quite typical because they are afraid that children with disabilities will have some kind of negative impact on their healthy children. The main reason for fear, in this case, is the stereotypes and barriers arising due to lack of information. (13) It seems that when working with preschool age children, some techniques from the scope of remedial work can be used, for example, the lekotek. The first lekotek in Kazakhstan was founded in 1994 in the National Scientific Practical Center of Remedial Education of the Republic of Kazakhstan (Almaty). The first head of the Center, doctor of pedagogical sciences, professor R.A. Suleymenova was the initiator of its creation. Annually, remedial assistance in the form of educational toys is provided to almost 450 children.

Lekotek is a form of providing remedial developmental education for children with disabilities via stimulating toys. It combines psychological and educational experience in the selection and use of educational toys that are adequate to the needs of a child. An analysis of scientific sources has shown that the best results of remedial and developmental education for children with disabilities can be achieved only with creative and individual use of developing toys.

The Kazakh model of the lekotek is considered in the context of the implementation of the following activities:

- the selection of toys is carried out by experts with the participation of a lekotek manager;
- the use of toys is a didactic condition for the examination and correction of the child's development;
- the unity of the process of selecting and using toys determines the role of the lekotek in remedial developmental education of children with disabilities.

Educators help children with developmental disabilities by using the lekotek. They form prerequisites for learning activities, support the development of children's personality, and provide psychological and educational assistance to parents. The education is conducted in the form of a game. The lekotek educators are confident that adults raising a child with special needs should perceive the game as a vital necessity for young children. After all, this is the main source of knowledge, skills and good mood. Parents should be ready to play any situation. The actions of adults should be expressive, soft and adequate to the capabilities of the child. (14)

As part of testing the elements of the lekotek when working with preschoolers with special educational needs, the authors of this article organized experimental work in the Remedial School No. 1 in the city of Kokshetau. In this experiment, three main activities of the Kazakh lekotek model were taken into account:

- storage of toys, including the systematization, handling, and placement of toys in accordance with the functional content, monitoring the compliance of developing toys with the needs of children with disabilities;
- provision of toys, including the targeted selection and use of developmental toys in remedial developmental education;
- methodological support, including the updating of methods and techniques for the use of educational toys, analysis of the results of the use of educational toys, taking into account the pace and characteristics of the child's psychophysical development.

In the process of games with the use of lekotek toys, the same toy can be used several times for different children and for different remedial purposes. The authors had the opportunity at any time to get the necessary educational toys for classes.

The game material was in open access, the opportunity to choose exactly those toys that were designed for the specific child was given as much as possible, according to his or her age and psychological characteristics, taking into account the level of actual development or in accordance with the child's individual developmental training program.

The authors note the great developmental potential of the lekotek for healthy children, allowing them to use it freely in the process of implementing inclusive practices into the preschool education system.

Over the past decades, the number of children with impaired development in a wide variety of manifestations has increased in Kazakhstan. Parents more often began to raise such children in the family and not to abandon them or pass them to closed State institutions. In the end, this led to a sharp increase in the number of children left without the opportunity to receive an education and families deprived of socio-psychological assistance because of the lack of preparation of either legislative or remedial educational practices. In this regard, the child was isolated from society and gradually lost the chance to adapt to life in an ordinary social environment. (15)

Until recently, children were divided into educable and uneducable ones. At the same time, the child, who was considered "uneducable," was forced out of the educational system into the health care system, which could not solve the problems of mental development, but only aggravated them.

Today, world experience shows that the effectiveness of the rehabilitation of a child remaining in the family is much higher than that of a child placed in a boarding school. Therefore, the main task is to provide the family with the necessary assistance in the development and education of the child, to guarantee him a decent future, i.e. provide opportunities and realize the mutual integration of society and all its members. This is possible only with equal rights, and especially the right to education. (16)

Practice shows that the development of inclusive education is a complex process involving scientific, methodological and administrative resources. The educators and the administration of general education schools, which have adopted the idea of inclusive education, are in dire need of assistance in organizing the pedagogical process, in working out the mechanism of

interaction between all participants in the educational process, where the child is at the center. Inclusive space implies openness and accessibility not only for children but also for adults. The more partners educational institutions have, the more successful students will be. Taking into account the peculiarities of the development of children with disabilities, the knowledge of special psychology and remedial pedagogy is of particular importance for teachers of educational institutions. Many mass school teachers will need to revise the main provisions of the methods of teaching their subjects, master the techniques of remedial educational work, apply the didactic principles of individual and differentiated approaches, developing and visual teaching.

Here are the principles for the development of inclusive education (17):

- scientific nature: development of the theoretical and methodological foundations of inclusive education, program-methodical tools, analysis and monitoring of results, assessment of the effectiveness of the technologies used, independent expertise;
- systematic approach: early help - preschool education - general secondary education;
- remedial orientation: modular organization of educational programs, the inclusion of modules from special remedial programs into the basic program of education and mentorship;
- individual approach: the use of personality-oriented and differential approaches;
- family-oriented assistance: psychological and pedagogical assistance of the family, family-oriented psychotherapy, parent-child groups, i.e. active involvement of parents in each stage of the pedagogical process;
- child's independent activity: ensuring the child's independent cognitive activity, namely additionally developing programs (foreign language, clay modeling, drawing, etc.);
- interdisciplinary integration and social partnership: the joint work of a speech therapist, a psychologist, and a defectologist in the preparation or modification of the development program, as well as the joint work of various agencies and social services to optimize the process of educational integration of "special" children.

There are the following types of inclusion in an educational institution:

- combined integration: 1-2 children with a level of development corresponding to the age norm and close to it study in mass classes with an individual approach, while receiving remedial help from specialists;
- partial integration: 1-2 “special” children join mass classes only for part of the day (for example, at school for certain lessons such as design and technology, drawing, singing, and learning about the world; and for half a day in kindergartens);
- temporary integration: all children of a special class are joining with healthy children for various educational activities;
- full integration: a “special” child attends school on a par with his or her peers while receiving specialized assistance in remedial centers.

For the practical implementation of inclusive education, it is necessary to solve problems related not only to the logistics capacity but also to the teachers' unwillingness to carry out their professional activities in the new environment. Therefore, it is necessary to make changes in the process of training future teachers. Each specialist has to have a certain level of inclusive competence in the field of education.

The motivational component of teachers includes personal interest, a positive orientation in the performance of professional activities in the context of the inclusion of children with disabilities.

The cognitive component is defined as the ability to think pedagogically based on the system of knowledge necessary for the implementation of inclusive education.

The reflective component is manifested in the ability to analyze one's own educational, professional activity in the context of inclusive education.

The operational component of future teachers is defined as the ability to perform specific professional tasks in the pedagogical process in the context of inclusion: the use of the approaches of independent and quick resolution of pedagogical problems and the implementation of research activities.

The model of the formation of inclusive competence of future teachers in the process of their professional training is based on the technology of contextual learning, which consists of information-oriented, quasi-professional and activistic stages. The information-oriented stage is aimed at forming a positive motivation for pedagogical activity in the context of inclusion and the acquisition of a knowledge system for its implementation. The quasi-professional stage is the acquisition of practical experience and the analysis of one’s own educational and professional activities in the context of inclusive education. The activistic stage is aimed at the further development of the inclusive competence of future teachers and its application in practice. (18)

Teachers are people who meet the needs of students. When training teachers, particular attention should be paid to the socio-psychological aspect of inclusive education since the educational integration of a “special” child makes changes to the social and psychological portrait of a class. In the course of education, various conflict and stressful situations may appear that the teacher must prevent and adequately resolve. At the same time, the teacher needs to solve the problem of self-determination — how to treat a “special” child: as an equal or as a mentally retarded one; to help the child believe in his or her own strength or instill that he or she has a “ceiling” in development. A teacher can do a lot to create positive relationships between children. To do this, it must be remembered that every child is a unique personality, who has own characteristics, with considering which it is possible to provide optimal conditions for learning and adaptation. Efforts are needed to avoid requiring children to use a style optimal for the teacher. Meeting the needs of students is not a mistake. It is a mistake to believe that a teacher should spend more time on one student than on others, so a teacher must be fair to all and think about how knowledge and skills are assimilated. For this, it is necessary to think over and develop certain approaches in order to cope with difficult situations. Children with special needs must be taught at the pace in which they are able to perceive, remember, and demonstrate new information so that they learn what the teacher explained to them. The teacher is not able to force to learn more than children can do. The transition from what one knows to what one does not know should be gradual and the pace of this movement must be coordinated with the individual abilities of a student. (19)

According to the results of foreign studies, it turned out that the main strong feeling of teachers in inclusive education of children with developmental disabilities was fear. Most people are afraid not to cope with it and lose their jobs; they wonder how this situation will affect their career growth. They are afraid of responsibility and cannot fully control the situation. They have a fear to ask for help from others (students, parents, teachers), to admit that they do not have answers to absolutely all questions. In fact, teachers are afraid of facing imperfections since such children have always been thrown to the margins of society and have not been considered its equal members. In the beginning, of course, it will be uncomfortable and painful but the fears will go away. It all depends on the motivation of the teacher. However, some teachers, using the inclusive method, want, on the contrary, to raise their grades and hide or falsify the arising difficulties, indicators, and problems. As a result, the parents of children developing in a typical way express concern about the impact of the presence of the “special” students requiring significant support and attention on their children. World

experience shows that the performance of children developing in a typical way becomes better and higher in inclusive classes than in a simple mass school class. Schools that successfully teach children with special needs are also the best for all other students. With regard to behavior, social development and academic success, especially speaking, the achievements of students of an inclusive school or preschool organization is much higher.

At the moment, there are some barriers to implementing inclusive education:

- lack of flexible educational standards;
- discrepancy between the curriculum, the content of the mass school teaching, and special educational needs of a child;
- lack of special training of the pedagogical staff of an educational institution of a general type, lack of knowledge of the fundamentals of remedial pedagogy and special psychology;
- lack of awareness among teachers of mass schools about the peculiarities of the psychophysical development of children with disabilities, the methods and technology of organizing the educational and remedial process for such children;
- absence of additional tenures for medical workers, deaf-and-dumb educators, speech therapists, and educational psychologists in the job descriptions of educational institutions of general type.

4 Conclusion

Thus, the implementation of inclusive education in modern preschool organizations requires the implementation of a whole system of special work on the formation of preschool children's readiness to adopt a peer with disabilities; on the formation of additional competencies necessary for inclusive education, as well as on equipping preschool institutions with an appropriate logistics capacity (including a lekotek). The compliance with these conditions will allow for the intensive implementation of inclusive education in modern preschools.

In order to realize in practice the idea of introducing a "special" child into society, it is necessary to create an effective system for its rehabilitation. A family that has decided to raise such a child in the family should see models of the life route that the child will follow (preschool, school, then a profession, and what leisure should be for such children). Parents should see the entire perspective of the life path of a "special" child because only with it a chronic social tension is removed from the family.

Instead of the concept of integration, i.e. creating special conditions for children with special needs in the framework of the existing system, without changing the system itself, now greater preference is given to the concept of inclusive education, the main goal of which is to change schools in accordance with the needs of all students. (20)

The "school for all" approach was outlined in the Salamanca Declaration adopted in 1994 by 92 countries. It contains principles, proposals, and promotion of legislative initiatives in the field of inclusive education. Moreover, it is still perhaps the most important fundamental international document on special education.

The Salamanca Declaration defines inclusion as a reform that supports and welcomes the differences and peculiarities of each student. Its goals are to avoid social discrimination resulting from differences in the sex, race, culture, social class, ethnicity, religion, and individual capabilities and abilities. However, this concept has not found the universal application.

In schools around the world, inclusion is often seen exclusively as the education of children with disabilities in general education schools with their peers. (17)

However, the main task is to make all schools and institutions more friendly to children with disabilities. One of the main activities on this path, i.e. the elimination of all kinds of barriers in education, is based on a social approach to disability. (20)

Europe entered an integrative period at the stage of development of the already established and legally enshrined norms of democracy and economic growth.

In the West, there are rich traditions of charity, a wide network of non-state special institutions and financial incentives for philanthropists. Thanks to the policy pursued by the countries via the mass media, the idea of equality of a "special" person with the rest of society has taken root in the public consciousness.

In Kazakhstan, integration is declared as the need for a humane attitude towards people with disabilities.

As part of an inclusive approach, each school or institution even at the stage of planning its activities, educational programs, etc. takes into account the expected individual needs of all students. The Disability Discrimination Act and other legislative acts in force require this approach from schools. For this purpose, in coordination with the founder and taking into account the interests of parents (legal representatives), compensatory education classes can be opened; education authorities, in coordination with the founder, may open special (remedial) classes for students with developmental disabilities in a general education institution. The transfer of students to special (remedial) classes is conducted by education authorities only with the consent of parents (legal representatives) of students according to the conclusion of a commission consisting of psychologists, medical workers, and teachers.

Schools need to keep records of all children with disabilities, as well as children with special educational needs. This will allow all school employees to know about the individual characteristics of each child, not to treat disabled children with less attention or respect, and to make the necessary adjustments in their work. It will also instill additional confidence in the parents, who will receive all the necessary information, being confident of an adequate and respectful attitude towards their children. (16)

One of the dangers that lie in wait when including a student with developmental problems in a class is the emergence of an atmosphere of condescension towards him or her. Teaching a child with special needs in a regular classroom is not a charity act. He or she studies in it, because the rest of the children study there, because this is the best approach to learning and because this is where children meet each other most often.

Literature:

1. Nazarbayev NA. Novyye vozmozhnosti razvitiya v usloviyakh chetvertoy promyshlennoy revolyutsii [New development opportunities during the fourth industrial revolution]. Astana; 2018.
2. Bekker IL, Zhuravchik VN. Obrazovatelnoye prostranstvo kak sotsialnaya i pedagogicheskaya kategoriya [Educational space as a social and pedagogical category]. Izvestiya Penzenskogo gosudarstvennogo pedagogicheskogo universiteta im. V. G. Belinskogo. Obshchestvennyye nauki. 2009; 12(6):132-140.
3. Yasvin VA. Obrazovatelnaya sreda: ot modelirovaniya k proyektirovaniyu [Educational environment: from modeling to planning]. Moscow; 2001.
4. Leonova O. Obrazovatelnoye prostranstvo kak pedagogicheskaya realnost [Educational space as a pedagogical reality]. Alma mater. 2006; 1.
5. Khutorskoy AV. Sovremennaya didaktika [Modern didactics]. Moscow; 2007.
6. Pogrebova NB. Obrazovatelnoye prostranstvo litseya kak usloviye razvitiya issledovatelskoy funktsii pedagoga [Educational space of a lyceum as a condition for the development of a research function of a teacher] (Unpublished doctoral dissertation). Stavropol; 2006.

7. Bocharova VG. Sotsialnaya pedagogika [Social Pedagogy]. Moscow; 2004.
8. Plotkin MM. Sotsialnoye vospitaniye shkolnikov: monografiya [Social education of schoolchildren: monograph]. Moscow; 2003.
9. Ponomarev RY. Obrazovatelnoye prostranstvo kak osnovopolagayushcheye ponyatiye teorii obrazovaniya [Educational space as a fundamental concept of the theory of education]. Pedagogicheskoye obrazovaniye i nauka. 2003; 1:29-31.
10. Chumichova RM, Redko LL. Teoreticheskiye podkhody i proyektirovaniye obrazovaniya v sovremennykh usloviyakh [Theoretical Approaches and the Education Planning in Modern Conditions]. Stavropol; 1996.
11. Educational Program concerning the specialty 5B010100 (Preschool education and mentorship). Kokshetau: S. Ualikhanov University (2015).
12. Stestsyuk YA. Osobennosti raboty pedagoga-psikhologa DOU po psikhologicheskomu soprovozhdeniyu detey s ogranichennymi vozmozhnostyami zdorovya [Work peculiarities of a preschool educational psychologist regarding psychological support of children with disabilities]. Belgorod; 2013.
13. Pochukhayev MM, Samsonov YV. Inklyuzivnoye obrazovaniye: metodicheskiye rekomendatsii po organizatsii inklyuzivnogo obrazovatelnogo protsessa v detskom sadu [Inclusive education: guidelines for the organization of an inclusive educational process at kindergarten]. Moscow: Shkolnaya Kniga; 2010.
14. Baymuratova AT. Opyt organizatsii metodicheskogo podkhoda k podboru razvivayushchikh igrushek v usloviyakh korrektsionnogo obucheniya detey [Experience of organizing a methodical approach to the selection of educational toys in the context of remedial education of children]. Psikhologicheskaya nauka i obrazovaniye. 2000; 4:104-111.
15. Malofeyev NN. Inklyuzivnoye obrazovaniye v kontekste sotsialnoy politiki [Inclusive education in the context of social policy]. Vospitaniye i obucheniye detey s narusheniyami razvitiya; 2009. 6.
16. Zaretsky VK. Desyat konferentsiy po problemam razvitiya osobennykh detey — desyat shagov ot innovatsii k norme [Ten conferences on the development of special children - ten steps from innovation to the norm]. Psikhologicheskaya nauka i obrazovaniye. 2005; 1:83-95.
17. Khafizullina IN. Formirovaniye inklyuzivnoy kompetentnosti budushchikh uchiteley v protsesse professionalnoy podgotovki [Formation of inclusive competence of future teachers in the process of professional training] [dissertation]. [Astrakhan]; 2008.
18. Shevchenko SG. Organizatsiya spetsialnoy pomoshchi detyam s trudnostyami v obuchenii v usloviyakh doshkolnykh uchrezhdeniy, kompleksov "Nachal'naya shkola - detskiy sad." [Organization of special assistance to children with learning difficulties in pre-school institutions and “Primary school-kindergarten” complexes]. Defektologiya. 2000; 6:37.
19. Kerne S., editor. Integratsiya v obshchestvo lyudey s osobymi potrebnostyami: Doklad [Integration of People with Special Needs into Society: Report]. First Moscow International conference on Down syndrome issues and helping people with mental disabilities; 1995; Moscow.
20. Shmatko ND. Sovmestnoye vospitaniye i obucheniye detey s ogranichennymi vozmozhnostyami zdorovya i normalno razvivayushchikhsya doshkolnikov [Joint mentorship and education of children with disabilities and normally developing preschoolers]. Vospitaniye i obucheniye detey s narusheniyami razvitiya. 2010; 5.

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

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Abstract: The article discusses the state and ways of development of the education system of Kazakhstan, taking into account international trends in the modern world. The signing of the Bologna Declaration by Kazakhstan in March 2010 faced the country with the necessity of modernizing significantly the education system, including continuous natural science education. At the same time, the transition from the "knower" concept i.e. armed with a system of knowledge and skills, to "a person prepared for life", i.e. a person who is able to think and act actively and creatively, as well as to self-improve intellectually, morally and physically. In this direction, the modernization of the education system is a factor for a successful future.
The implementation of the provisions of the Bologna Declaration made it possible to make changes to the goals, content, forms, and methods of teaching subjects to students in secondary school and to pedagogical staff in higher education institutions. Over time, this will enable the country to successfully enter the global educational space.

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

1 Introduction

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

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

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

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

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

The main objectives of the model were:

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

To implement the assigned tasks it was necessary to create:

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

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

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

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

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

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

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

2 Materials and Methods

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

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

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

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

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

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

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

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

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

3 Results and Discussion

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

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

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

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

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

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

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

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

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

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

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

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

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

This program assigned to Kazakhs the tasks aimed at continuing the updating of the content of education, which will be completed in 2021. It includes such issues as the introduction of new state mandatory education standards, curricula, and textbooks, enhancing the quality of teaching the mathematical and natural sciences at all levels of education, the transition to teaching in English certain natural sciences in the 10th and 11th grades.

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

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

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

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

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

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

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

The updated State mandatory standard

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

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

The content difference of the updated curriculum is

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

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

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

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

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

The "Natural History" subject is a propaedeutic course for studying independent subjects such as "Biology", "Physics", "Geography", and "Chemistry" at subsequent educational levels, and also lays the foundation for research skills important for any field of knowledge.

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

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

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

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

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

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

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

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

At the level of general secondary education, specialized training is carried out in natural-mathematical and social-humanities areas based on a combination of compulsory subjects and optional majors. Academic training is also provided for students to enter higher education institutions based on a combination of advanced and standard levels of study in academic subjects. The students are offered a flexible system of choosing subjects at two levels of study, and they choose subjects of advanced and standard levels of study they feel important for themselves. A greater number of hours is devoted to advanced-level majors than to standard-level study subjects. Non-core academic subjects are studied at the standard level. (12)

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

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

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

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

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

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

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

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

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

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

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

The level III (basic) is higher pedagogical education.

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

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

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

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

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

The authors' long experience in the work at a pedagogical higher education institution shows that the teaching of natural sciences must be correlated with the methodology of teaching a school subject, i.e. for the professional readiness of a future teacher, a balance of special discipline-based and methodical training is necessary. In this regard, professionally and pedagogically oriented natural science education should start from the first years of study at higher education institutions and then be studied in depth when learning methodological disciplines.

4 Conclusion

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

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

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

Literature:

1. Abylkassymova AE, Tuyakov EA. On modernization of the system of continuous pedagogical education in the republic of Kazakhstan in modern conditions. PONTE International Journal of Sciences and Research. 2018; 74(1):113-118. DOI: 10.21506/j.ponte.2018.1.28.
2. Abylkasymova AY, Ryzhakov MV, Shishov SY. Sovremennyye tendentsii razvitiya nepreryvnogo pedagogicheskogo obrazovaniya: Monografiya [Modern trends in the development of continuous pedagogical education: Monograph]. Almaty: Atamura; 2017.
3. Abylkasymova AY, Ryzhakov MV, Shishov SY. Modernizatsiya pedagogicheskogo obrazovaniya v usloviyakh innovatsionnogo razvitiya: strategicheskiye napravleniya [Modernization of pedagogical education in the conditions of innovative development: strategic directions]. Vestnik Moskovskogo gosudarstvennogo universiteta im. V.P. Goryachkina. 2015; 4(68):7-12.
4. Kazakh Education Act No. 319-III of July 27, 2007 with amendments and additions as of July 11, 2017 (Jul. 11, 2017).
5. Decrees of the Government of the Republic of Kazakhstan No. 1080 of August 23, 2012 "On Approval of State Mandatory Educational Standards for the Corresponding Levels of Education" (Aug. 23, 2012).
6. Order of the Minister of Education and Science of the Republic of Kazakhstan of April 3, 2013 "On approval of model curricula for general education subjects, elective courses and electives for general education organizations" (Apr. 3, 2013).
7. OECD [Internet]. Reviews of National Policies for Education: Secondary Education in Kazakhstan, OECD Publishing; 2014. Available from: http://dx.doi.org/10.1787/9789264205208-en
8. Abylkassymova AE, Kalney VA, Shishov SE. Formation of Public Consciousness, Spiritual and Moral Culture of Students in

the System of Continuous Pedagogical Education. Journal of History Culture and Art Research. 2018; 7(1):26-33. ISSN: 2147-0626. DOI: http://dx.doi.org/10.7596/taksad.v7i1.1460.
9. Abylkasymova AY, Ryzhakov MV, Shishov SY. Strategicheskiye napravleniya modernizatsii pedagogicheskogo obrazovaniya v usloviya innovatsionnogo razvitiya Kazakhstana. Teoreticheskiye i metodicheskiye problemy sovremennogo obrazovaniya [Strategic directions of modernization of pedagogical education in terms of the innovative development of Kazakhstan. Theoretical and methodological problems of modern education]. Moscow: Vash format; 2016.
10. Nazarbayev, N. Kazakhstanskiy put – 2050: Yedinaya tsel, yedinyye interesy, yedinoye budushcheye [The Kazakhstani Way - 2050: Common Goal, Common Interests, Common Future]. Astana; 2014.
11. Decree of the President of the Republic of Kazakhstan No. 205 of March 1, 2016. State Program for the Development of Education and Science of the Republic of Kazakhstan for 2016-2019 (Mar. 1, 2016).
12. Order of the Minister of Education and Science of the Republic of Kazakhstan No. 604 of October 31, 2018 "On approval of state educational standards of all levels of education" (Oct. 31, 2018).
13. Shuinshina SM, Alpeisov EA, Zhakupov AA, Burunbetova KK. Continuity of Natural Science Education in the System of "School-University." Sino-US English Teaching. 2018; 15(5):242-252.
14. Shuinshina S, Kopeyev Z, Tuyakov Y, Mubarakov A. Continuity in education: definition, essence, and analysis of the problem. Anais da Academia Brasileira de Ciencias. 2018; 3268-3282.

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FIGURE OF THE STATUE IN PUSHKIN'S TRAGEDY "THE STONE GUEST" AND P. MERIMEE'S NOVEL "THE VENUS OF ILL": COMPARATIVE ASPECT

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Abstract: The article deals with the comparative aspect of the works of Russian and French literature: the "small tragedy" of A.S. Pushkin's "The Stone Guest" and the novel by Prosper Merimee "The Venus of Ill". The similarities and differences between the two works at the genesis, plot-figurative, compositional levels, as well as in the ways of realization of the artistic convention are revealed. At the same time, genre differences in the article are not considered. Attention is paid to the creative collaboration of two writers.

Keywords: A.S. Pushkin, P. Merimee, "The Stone Guest", "The Venus of Ill", the image of a statue.

1 Introduction

Alexander Pushkin and Prosper Merimee are two great classics of Russian and French literature, closely and with interest watched each other's works. Merimee, who sincerely admired "Eugene Onegin", translated into French such works by the Russian writer as "The Queen of Spades", "The Shot", "The Gypsies", the poems "Gusar", "Anchar", "The Prophet", "What a Night! Frost bitter...". Pushkin, in turn, created the Songs of Western Slavs, focusing on Merimee's book "The Guzla, or a Selection of Illyric Poems Collected in Dalmatia, Bosnia, Croatia, and Herzegovina", noting in the preface to them the talent and originality of the French writer.

The creative collaboration of two artists of the word developed in parallel, sometimes touching on topics such as, for example, in the aforementioned "Songs of the Western Slavs" and "Guzla"; the image of Don Juan Tenorio was depicted by Pushkin in "The Stone Guest", and the image of Don Juan de Marana by Merimee in the novel "The Soul of the Purgatory", the revived statue operates in the same "Stone The Guest" and the novel "The Venus of Ill" by Merimee.

A comparison of the last two works of A. Pushkin and P. Merimee reveals their difference in the processing of one theme at the plot-compositional and figurative levels, as well as in the ways of implementing artistic conventionality. However, their generic differences in the article are not considered. Comparative analysis allows us to trace the originality of the development of Russian and French literature. At the same time, it should be noted that Pushkin could not have known "The Venus of Ill" published by Merimee in the year of the death of the Russian colleague.

2 Materials and Methods

A comparative analysis of the two works is proposed to be carried out at the following levels: genesis, plot-figurative, compositional, method of realization of artistic conventionality.

If we talk about the plot, the Russian and French writers drew it from a different source: A.S. Pushkin used the popular folk story about the libertine and sinner Don Juan, processed by the Spanish playwright Tirso de Molina, but is famous to Pushkin by opera "Don Juan" (1787) by Mozart and Molière's comedy "Don Juan, or, The Stone Banquet" (staged in 1665), and the plot of the Merimee's short story, by his own admission, goes back to the ancient Greek satirist writer Lucian of Samosata and the medieval legend from the book of the German historian Marquard Freher, "I decided to write this story after reading a medieval legend from Freher. In addition, I borrowed some details from Lucian, who tells about the statue that beats people" (1, p499) As if emphasizing the source of the plot, Merimee's epigraph to the novel takes lines from Lucian's "Lover of Lies, or Nevers", which tells about the copper statue of Corinthian commander Peliha, which could cure the sick. At night she came to life, wandering through the garden. When one of the grooms dared to steal the gold coins that were presented to the statue as a sign of gratitude for healing, she punished him cruelly: he died, and bruises were visible all over his body.

The given plot is "superimposed" on the story of a dead bride who kills her fiancé, who was actively exploited by European romantics at the beginning of the 19th century, for example, I.V. Goethe's ballad "The Bride of Corinth" (1797), D.G. Byron's poem "The Siege of Corinth" (1816), T. Moore's ballad "The Lake of the Dead Bride" (1803), V. Irving's novel "The Adventure of the German Student" (1824), and others.

French researchers of P. Merime works indicate the following sources of "The Venus of Ill" :

1) the legend, written in the chronicle of the twelfth-century English historian William of Malmesbury, "De gestis Regum Anglorum libri quinque" (Acts of the English Kings) (1125), which was used by the French composer P. Merimee's contemporary F. Gerold in his opera "Tsampa, or the marble bride" (1831). The libretto of the opera as a whole is repeated in the novel Merimee, "a certain Roman, by playing ball with the guests on his wedding day, put his wedding ring on the finger of the statue of Venus. When he then tried to remove the ring from the finger of the stone goddess, it bent, and the young man could not get the ring back. After some time, the finger straightened, but the ring was no longer on it. That same night, the newlyweds were visited by a female demon in the form of Venus, who declared herself the legitimate bride of a young man. Having lost his masculine strength, the latter turned for help to a priest, a black magician, and he banished the demon but paid for it with his own life." (2)
2) Italian diplomat Count Constantin Nigra in a letter to the author of the book "Merime and His Friends" A. Philo wrote that "Venus Illas is a parody based on an Italian legend told by an old chronicler. This story is in the works of other authors: "The History of Gregory VII" by A.F. Villemain. Merimee found out about the legend from Villemain." This letter Philo quoted in his book.
3) Merimee, who knew English, could be inspired by the relevant passage from the "The Anatomy of Melancholy" of the seventeenth century English thinker Robert Burton, where the author examined the essence and causes of melancholy, generated, including witchcraft and magic.

In both works, there is a love triangle: but in Pushkin's work, there are two men and one woman, and in Merimee's work, on the contrary, two women and one man. The general scheme of the story is the same, it is the revenge of the resurgent statue, which led to the death of the hero, and death comes from the fact that the statue squeezed the victim in his cold embrace. And in this and another work, a person provokes a statue: in "The Stone Guest" Don Guan invites the statue of the Commander to come on his love meeting with the widow of the deceased, at Merimee Alfons de Peyrarad puts on Venus's finger a wedding ring with the inscription, "Forever with you", thereby recognizing her as his wife. Merimee seems to lose the situation opposite to the Greek myth of Pygmalion and Galatea: what would have happened if Pygmalion had not fallen in love with a statue, but on the contrary, the statue would have fallen in love with a person? Of course, the complete metamorphosis of an idol into a living woman occurs in the myth of Pygmalion and Galatea, and thus, the triumph and power of love are affirmed. Pushkin and Merimee's statues do not cease to remain cold statues, reviving only for a while.

R.G. Nazirov in the detailed and interesting article "The plot of the reviving statue" considers three types of such statues: the patroness statue, the avenger statue and the eerie "statue in love". (3, p28) In "The Stone Guest", according to the classification of R.G. Nazirova, we meet with a statue of the

avenger, in “The Venus of Ill” with a statue in love (it was not for nothing that a phrase in Latin was written out on the base of the statue “Watch out for the loving one”). Hence, the plot differences between the two works. The motive of the statue in love appears again in Merimee in his other novel “Lane of Mrs. Lucretia” (1846), where the plot of “The Venus of Ill” is practically repeated, except for mutual love between the statue and the man. The story about this is introduced in the novel as an episodic dialogue between the abbot and the narrator:

“- Just twenty years ago, a statue strangled an Englishman in Tivoli.

- The statue? - I exclaimed. - How did this happen?

- A certain milord has carried out excavations at Tivoli. He found a statue of Empress Agrippina Messalina... I do not remember which one. Anyway, he ordered her to be brought to his house, and all the time he looked at her, admired and eventually became unduly infatuated with her. <...> He called her his wife, his lady, kissed her, although she was marble. He said that the statue comes to life every night to please him. One fine morning, my milord was found dead in bed. And believe it or not? I found another Englishman who bought this statue. I would let her go on the lime.” (1, p411)

The repeated motive about the killing statue testifies to its importance for the poetics of Merimee, in other words, “those aspects of reality, objects, and phenomena of the world that are most important to the poet are constantly present in his mind and determine the features of the author’s word usage.” (4, p102) It is no coincidence that Merimee considered “The Venus of Ill” as his best short story: in a letter to Madame de la Rochejaclin dated February 18, 1857, P. Merimee writes, “Did you read the ghost story I wrote about Venus of Ill? In my opinion, this is my masterpiece.” (1, p127)

In Pushkin, although the drama is called “The Stone Guest”, the statue of the Commander appears only in the penultimate scene, and the whole action develops around the adventures of Don Guan. In Merimee, the story of the found “idol” keeps in suspense from the first to the last pages. Venus is always a topic for conversations of all the characters of the novel, described several times (by the narrator’s guide, the narrator himself, Mr. de Peyrarad), they turn to her, they talk to her like with a woman (“rascal”, “hellcat”).

In building “The Stone Guest”, Pushkin, in our opinion, was guided by antique patterns, as evidenced by his use of such a dramatic technique of the ancient Greek tragedy as deus ex machina (literally: god from the machine). The huge statue of Commander (“Nephilim”), like God, appears in the final scene of Pushkin's drama and punishes the sinner with his heavy right hand. Pushkin knew the ancient tragedy perfectly well and on this occasion noted in the article “On classical and romantic poetry” (1825), “I don’t consider it necessary to talk about the poetry of the Greeks and Romans; every educated European should have a sufficient concept of immortal creatures of stately antiquity.” (5, p36) According to researcher N.A. Buranok, “Pushkin's reasoning about the essence of dramatic works testifies to his deep knowledge in the field of drama theory and, in particular, the ancient theory developed in the poetics of Aristotle and Horace.” (6, p129)

In a completely different way, Merimee follows the development of the composition of his novel, in which the architectonics of the European Gothic novel is guessed with its supernatural "horrors", mysticism, and emotional intensity, increasing as the plot moves to the outcome.

Both Don Guan and Alphonse de Peyrarad are jaded libertines, but unlike the calculating groom from the novel Merimee, who married not a young attractive girl, but on her rich inheritance, Don Guan in the last minutes of his life experiences a sincere feeling of love and dies with the name Doña Ana on the lips.

The statues are different in two works: in one case it is a man, and in the other is the statue of a beautiful woman, the ancient Roman goddess Venus. The “material” of which the statues are made is also different: stone and copper/bronze. Appearing at the end as a deus ex machine, the Commander, along with Don Juan, falls into hell, thus the statue of Pushkin is thought of as God's retribution to the sinner. As Anna Akhmatova writes in her article “The Stone Guest” by Pushkin, “The statue of the Commander is a symbol of retribution, but if she took Don Guan with her to the cemetery, there would also be no tragedy, but rather a horror theater.” (7, p388) Pushkin, as you know, hadn't gone down this path. This development of the plot suggested Merimee. In the Merimee's novel, the statue was initially perceived as something satanic: when the statue was removed from the ground, it smashed the leg of one of the people dragging it, but when after all the sad events (deaths of the son and father de Peyrarad), it was melted into a church bell, then the new appearance of the “rascal” is damaging, “Since the new bell tolls in Illa, the vineyards have already suffered twice from the frost.”

For the first time, the appearance of Venus is described by the nameless conductor of the narrator, who was present at the time of the initial discovery of the statue. The fact that Venus is being dug out of the ground, i.e. as if extracted from the underworld, in the eyes of simple peasants it is proved by its blackness (“a black hand appeared, resembling the hand of a dead man, climbing from the ground”, “a huge black woman, almost completely naked, from pure copper”), “with an unkind expression” of the face and with an “evil” gaze (“she looks at you with her large white eyes... as if she stares at me”, “he has an unkind expression... and she herself is evil”). The next time she gives a rebuff to the two revelers who talk to her like with a street girl, “Are you here, rascal? <...> Are you still here? You broke Jean Kohl's leg! If I got you, I would have turned your neck." And after one hooligan tried to throw a stone at her, the stone bounced off and hit him in the head, “She threw a stone back at me!” the Catalan cries out, now confident that she is dealing with evil spirits.

The statue of Venus, beautiful and perfect in its forms, evokes fear not only among ordinary peasants but even among narrators: “It was not the calm and stern beauty of Greek sculptors, who by tradition always gave the features of a stately stillness. Here the artist clearly wanted to portray perfidy, turning into anger. All the features were slightly strained: the eyes were slightly sloping, the corners of the mouth were raised, the nostrils were slightly swollen. Contempt, ridicule, cruelty could be read on this incredibly beautiful face. <...> This expression of satanic irony was still intensified, perhaps, by the contrast between her brilliant silver eyes and the blackish-green patina imposed by time on the whole statue. These brilliant eyes created a certain illusion of reality that seemed alive. I remembered the words of my guide, who asserted that she was forcing those who were looking at her to lower their eyes. It was like the truth, and I even became angry with myself for having felt some kind of awkwardness in front of this bronze figure.” (1, p138) After the death of Alphonse, the expression on the face of Venus acquires an evil and mocking expression, and the narrator compares it to the "infernal deity is exultant over the misfortune."

In the Merimee's novel, the statue wounds with its love not only the son, but also his father: only the son she wounds in the literal meaning of the word, and the father is in the figurative, for you can see that the elder Peyrarrad is in love with Venus, according to Roman mythology, the goddess of love and beauty. For her, he appoints his son's wedding day on Friday, since “Friday is Venus's day <...> I chose Friday for her sake!” (1, p145), thereby ignoring the fact that, in the Christian tradition, Friday is perceived as the day of sorrow and mourning, since it was on this day that Jesus Christ was crucified. He is going to offer her sacrifices, lay a wreath of roses and lilies on her head and says that if Venus broke his leg, he would not have regretted it a bit. So in the novel, in addition to the classic love triangle - he (Alphonse), she (the bride) and the third wheel (Venus), there is another triangle: the father - the son - Venus. But this is not the

traditional triangle of lovers, because father and son do not compete with each other for the love of Venus. This is a triangle of complex relationships between people and the "idol". In his humorous speech, the father offers his son the choice of two Venuses, "Choose yourself what Venus you want - Roman or Catalan. <...> The Roman is black; the Catalan is white. The Roman woman is cold, the Catalan catches burn everything that approaches her." (1, p150). So, the father, comparing the two "brides" of his son, predicts a terrible outcome: in the marriage bed are two Venus, waiting for his betrothed.

The name of Pushkin's drama "The Stone Guest" testifies that for him the main character was, after all, not Don Guan, but a statue of the Commander. Here, a love triangle is built - Don Guan, Dona Ana, and the statue, and "the role of an opponent jealous of the dead clearly falls to the lot of Don Guan". (8, p150, 9-11) Thus, Pushkin's jealous man is not a statue, like Merimee, but a living person, a "demon", as A. Akhmatova's article proves, "Pushkin's Guan, in spite of its elegance and its secular manners, is much worse than its predecessors. (12-13)

Both heroines, each in their own way, say this: Dona Ana, "You are a demon"; Laura, "Rake, the devil".

If Laura, maybe, just scolding, then the "demon" in the mouth of Dona Ana accurately conveys the impression that Don Guan was supposed to produce according to the author's plan. (7, p384)

Thus, Pushkin radically "overturns" the situation of Merime, whose demonic force is, on the contrary, the statue of Venus. (14)

Roman Jacobson in the article "A Statue in Pushkin's Poetic Mythology," by examining the image of the statue on the examples of Pushkin's works "The Stone Guest", "The Bronze Horseman" and "The Tale of the Golden Cockerel", seems to contradict himself, first claiming that the image of the statue is Pushkin is the "master of human destiny" (8, p172), and in another place he writes that the Orthodox tradition inspired Pushkin "a solid association of statues with idolatry, with satanic forces, with witchcraft" (8, p173, 16). Only God and his divine manifestation can be the executor of human destiny in the same Orthodox tradition, and, as we believe, Pushkin gives this interpretation to the image of the Commander in his "little tragedy".

So, we can observe that the role and functions of the two statues in Russian and French literature are different.

Different in both works and ways of implementing the artistic convention. Interestingly, in his article "Alexander Pushkin" (1868), Merimee notes "sobriety and art" as a distinctive feature of the "magic tales" style of the Russian writer, and citing as an example the poem "Ruslan and Lyudmila", says Pushkin reduces his "scary" novels, "His giants are like scarecrows, they lose almost all their dignity as soon as they cease to inspire fear in us. On a dark night, he leads his character through the steppes and leads him to one of the ancient mounds, the so-called kurgans, left in the valleys of Russia by some unknown tribe. Suddenly, Ruslan's horse rears up. I am expecting the appearance of something terrible, I am ready to share the fear of the mount... At the top of the hill lies the head of a sleeping giant. It is a bit like a pie stuffed with partridges sticking their heads out from under the top crust. To wake the giant, Ruslan tickles his nostrils with a spear; the giant sneezes, the steppe shakes... and then the end of everything miraculous. Who will be afraid of a sneezing giant?" (1, p250-251) The feature caught by Merimee can also be attributed to "The Stone Guest": the author does not have the task to frighten the reader, instill in him a mystical horror, but to show the inevitability of divine retribution for the crimes committed. Merimee, as mentioned above, develops a mystical story, following all the canons of the genre: infernal subjects, otherworldly characters, events that cannot be explained logically, supernatural phenomena, the expectation of fear and mystique accompany the reader throughout history. (15)

Thus, if Pushkin creates artistic convention by using the category of the fantastic, then Merimee, following the Gothic novel, uses mysticism for this purpose.

3 Results and Discussion

The figure of the resurgent statue, which was transformed into Pushkin's drama from a legend, was interpreted by him in his own way. There is no trace of religious and moral content. This is not the messenger of the angry sky, the punishing atheist and libertine. There is no hint of this idea in the words of the statue. Pushkin's statue is an inexorable, inexorable "fate" that destroys Don Guan at the moment when he is close to happiness. Recalling the whole traditional biography of Don Guan, it is easy to decipher the meaning of the image of the statue of the Commander, as a symbol of all the past of Doi Guan, of his frivolous, unaccountable life, of everything he has accomplished: the grief of abandoned women, the resentment of deceived husbands, the blood of the opponents killed in fights... No matter how Don Guan "reborn" under the influence of Don Anna's love, the past cannot be destroyed, it is as solid as a stone statue, and at the hour when happiness seems finally achieved, this past comes to life and becomes between Don Guan and his happiness. This thought and the resulting call for a serious, caring attitude to their actions, which sooner or later will have a particular impact on the fate of a person, and is, one might think, the idea that Pushkin put into his interpretation of the traditional plot. (18-20)

One of the most important principles of fiction is the principle of coherence, i.e. internal matching elements of the fantastic to each other. Thus, the revival of the statue in the finale of the novel P. Merimee "The Venus of Ill" is perceived as reliable due to previous events that prepare the arrival of the statue to the house (perceiving it as a living creature, Alfons's marriage, a story with a ring that the hero puts on the statue's ring finger etc.). In other cases, such coherence of a fantastic "image of the world" is achieved by a multiplicity of points of view on an "irrecoverable" event, each of which not only denies it but on the contrary, confirms the fact of accomplishment, highlighting new facets of what happened.

4 Conclusion

Brief conclusions on the comparative analysis of works of Russian and French literature are presented in Table 1.

Table 1. Comparative Analysis

Compared criteria	**"The Stone Guest", "The Venus of Ill" by A.S. Pushkin**	**"The Venus of Ill" by P. Merimee**
Similarities		
▪ presence of a love triangle; ▪ both heroes of Pushkin and Merimee are libertines and sinners; ▪ in its sculptural form, the statue is beautiful, but at the same time formidable and terrifying; ▪ a person provokes the statue to actions: by Puskin, Don Pushan invites her to him, by Merimee, Alphimes puts the wedding ring on the statue's finger; ▪ revenge of the resurgent statue; ▪ death is caused by the statue that squeezed the victim in her arms; ▪ death of the character.		
Differences		

Plot source	Folklore legends and cultural and historical interpretations of the "eternal image" of Don Juan.	Mythological and medieval legends about the resurgent statue and the dead bride.
Story-shaped level	The love triangle consists of 1 woman and 2 men.	The love triangle consists of 2 women and 2 man.
	Statue's sex: male	Statue's sex: female
	The material from which the statue is made is stone	The material from which the statue is made is copper.
	The role and function of the statue is God's retribution to the sinner.	The role and function of the statue is devilish revenge on the groom.
	Attitude to love: Don Guan for the first time in his life fell in love and died with the name of his beloved on his lips.	Attitude to love: Alphonse refers to his marriage as a money transaction.
	Resolution: Commander and Don Guan fail in hell.	Resolution: the statue that came out of the underworld is poured into the church bell, i.e. trying to use on divine affairs.
Compositional level	Focus on the ancient samples (the dramatic technique of the ancient Greek tragedy deus ex machine).	Focus on the architectonics of the European Gothic novel.
	The appearance of the statue of the Commander (moving) at the very end of the last scene.	The story of digging up the statue is the premise of the plot, which keeps in suspense until the very last pages.
Ways of implementing the artistic convention	Through fiction to show the inevitability of divine retribution for the crimes committed.	Through mystic to frighten the reader, instill in him a mystical horror.

So, a comparative analysis allowed to determine the originality of each work of Russian and French literature, their ideological and aesthetic originality, trace their contact-genetic connections and typological affinity, see the creative and ideological interplay of Alexander Pushkin and Prosper Merimee and, thereby, reveal the dialogue of cultures in the literary the process of Russia and France in the 1830s.

Literature:

1. Merime P. Sobraniye sochineniy v 6-ti tomakh [Works in 6 volumes]. Moscow: Pravda; 1963.
2. Gerold F. Opera "Tsampa, ili mramornaya nevesta" [Opera "Zampa, or the Marble Bride"]. Availbale from: http://classic-online.ru/ru/production/21550#
3. Nazirov RG. Syuzhet ob ozhivayushchey statuye [The plot of the reviving statue]. Folklor narodov Rossii. Folklor i literatura. Obshcheye i osobennoye v folklore raznykh narodov. Ufa: Bashkirskiy universitet; 1991: 24-37.
4. Cherednik NV, Fomenko IV. Chastotnyy slovar kak osnova interpretatsii poeticheskoy kontseptsii [Frequency dictionary as the basis for the interpretation of the poetic concept]. Istoriya russkogo literaturnogo yazyka i stilistika. Sbornik nauchnykh trudov. Kalinin: Kalininskiy gosudarstvennyy universitet; n.d.: 99-112.
5. Pushkin AS. Polnoye sobraniye sochineniy v 19-ti tomakh [Complete works in 19 volumes]. Moscow: Voskresenye; 1994-1997.
6. Buranok NA. A.S. Pushkin ob antichnoy dramaturgii [A.S. Pushkin about ancient drama]. Kultura i tekst; 2001. Available from: https://cyberleninka.ru/article/n/a-s-pushkin-ob-antichnoy-dramaturgii
7. Akhmatova AA. Polnoye sobraniye poezii i prozy v odnom tome [The complete collection of poetry and prose in one volume]. Moscow: Alfa- kniga; 2009.
8. Yakobson R. Statuya v poeticheskoy mifologii Pushkina [Statue in Pushkin's Poetic Mythology]. Moscow: Progress; 1987.
9. Rosenthal A. Mérimée and the supernatural: Diversion or obsession? Nineteenth-Century French Studies. 1973; 1(3): 138-54.
10. Rakhmanova AS, Mandzhiyeva BV. Semantika obraza statui v tragedii A.S. Pushkina "Kamennyy gost" [The semantics of the image of the statue in the tragedy of A.S. Pushkin's "The Stone Guest"]. Studencheskaya Nauka XXI Veka. 2017; 1(12):305-7.
11. Zolotarev IL. P. Merimeé kak perevodchik fantasticheskikh proizvedeniy russkikh pisateley XIX veka [P. Merimeé as a translator of Russian writers fantastic works of the 19th century]. Vestnik moskovskogo gosudarstvennogo oblastnogo universiteta. 2009; 1:130-6.
12. Solntseva NM. Syuzhet o statuye [The plot of the statue]. Vestnik rossiyskogo universiteta druzhby narodov: literaturovedeniye, zhurnalistika. 2014; 2:29-35.
13. Bondarev AP. "Kamennyy gost" A.S. Pushkina v kontekste istoricheskikh retseptsiy legendy o Don Zhuane [A.S. Pushkin's "The Stone Guest" in the context of historical recipes legends about Don Juan]. Vestnik Literaturnogo instituta im. A.M. Gorkogo. 2007; 2:61-74.
14. Panofsky GS. "Kamennyy gost" Pushkina i yego prototipy [Pushkin's "The Stone Guest" and its prototypes]. Russ. Lit. Amsterdam. 2000; 46:313-40.
15. Yurchenko TG. Sotsialnyye i gumanitarnyye nauki. Otechestvennaya i zarubezhnaya literature [Social and Human Sciences. Domestic and foreign literature]. Referativnyy zhurnal: Literaturovedeniye. 2002; 3:130-2.
16. Zababurova NV. Tragediya Pushkina "Kamennyy gost" v kulturno-esteticheskom kontekste yevropeyskogo XVII veka [Pushkin's tragedy "The Stone Guest" in the cultural and aesthetic context of the European XVII century]. Barokko i klassitsizm v istorii mirovoy kultury: Symposium. 2001; 17:136.
17. Bowman F. Narrator and Myth in Mérimée's "Vénus d'Ille". The French Review. 1960; 33(5):475-82.
19. Pushkin AS. Dramaticheskiye proizvedeniya [Dramatic works]. Moscow; 1984.
20. Fortin JE. Intellectualization in Merimee's "La Venus d'Ille". Nineteenth-Century French Studies. 2005; 33:3-4.

Primary Paper Section: A

Secondary Paper Section: D, G, L

B PHYSICS AND MATHEMATICS

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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

A REVIEW OF MOVEMENT TO THE GENERAL THEORY OF RELATIVITY AND GRAVITATIONAL WAVES (100 YEARS OF EXPECTATIONS)

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Abstract: The general key ideas leading to the creation of the General theory of relativity and the prediction of gravitational waves are considered in the paper. The material is presented using a historiographical method which allows tracing the origination and further movement of the concepts that became kinematic and dynamic innovations in theoretical physics. The main objective pursued by authors is to develop an algorithm of actions for teachers for familiarizing of interested students of non-physical areas with scientific content of the General theory of relativity, its role in fundamental knowledge system in our days and prospects for experimental detection of gravitational waves for science and civilization.

Keywords: theory of relativity, gravitational waves, Einstein, Gauge Principle, Principle of General Covariance.

1 Introduction

A remarkable event of the year 2017 was the Nobel Prize in physics awarded by American scientists Rainer Weiss, Barry Barish, and Pile Thorn for experimental discovery of gravitational waves. Simultaneous detection of gravitational waves emitted during the merger of two massive black holes by two LIGO detectors was officially announced on February 11, 2016. (1-2) This was after more than a hundred years of waiting since the creation of the General theory of relativity and prediction of gravitational waves. It was a result of about half a century of efforts in trying to detect them (beginning with experiments of John Weber in 1969).

As a consequence of the General theory of relativity (GR), distribution of space-time perturbations in the form of waves was described by A. Einstein (3) in his paper "On Gravitational Waves" published in 1918. All variants of theories of gravity which are based on special relativity predict the existence of gravitational waves. The modern theory of gravity describes events which occur at the confluence of two astrophysical black holes almost in the same way –strong distortion of the space-time requiring enormous energy with subsequent relaxation in the form of fading gravity wave.

From a theoretical point of view, the existence of gravitational waves, at first glance, does not give something new for fundamental physics – mathematical derivation of the wave equation for metric perturbations from the equations of General relativity was performed correctly a long time ago, the process possibility is predicted, the wave parameters are estimated. It seems that analysis of the most complex process occurring in areas of the strong curvature of space and its possible observable consequences promise nothing particularly new for the physics of space-time being one of the bases of a holistic scientific worldview.

However, it seems apparent that the confirmed discovery (existence and main features of gravitational waves were recorded repeatedly since the first observation) shows not only the power of the human mind, efficient interaction of scientists from different countries and growing possibilities of modern technologies, but also absolutely unimaginable in earlier times advance of research of early stage of the Universe by means of new science - gravitational-wave astronomy.

While speaking about physical education in high schools, all the more in secondary schools, we face the challenge in explanation to students of scientific content and general prospects of such grandiose achievements of civilization. On the one hand, such discoveries for which Nobel prizes are awarded may be of interest for students, but, on the other hand, this is opposed to a set of clichés such as "we will not understand this", "what's in it for me", "why should I think about the prospects of all mankind", "that's interesting, but so far away from me." In this situation, it becomes problematic to evaluate the significance of such great discovery. In this paper, authors offer algorithm of the action taking into account that the General theory of relativity is not included, as a rule, into lesson plans in physics in many areas of education at all levels, both in technical and pedagogical universities, etc.

2 Materials and Methods

That is why we have chosen the historical-genetic method of description, namely: how the original idea appeared and became clear, which way did they go in theory and practices, what is the place of theory in fundamental knowledge system now and what are prospects of this discovery for the theory of gravity itself, for science and civilization in general. Surely, when possible, our paper should be focused on a clear presentation of ideas and their consequences, avoiding technical details, detailed descriptions of mathematical equations and procedures.

The purpose of the presented in the paper material is to take a path that led to theoretical proof of the existence of gravitational waves and to their detection without going into details of mathematical subtleties of the theory, but also to explain that high evaluation which was given to this really epoch-making proof of the Einstein gravitation theory.

2.1 Starting point: problems considered in the Special theory of relativity (SR)

We would like to emphasize that the basic idea of SR is a generalization of the Galilean principle of relativity (invariance) for classical mechanics by the inclusion of electromagnetic interactions. Within SR, taking into account all types of interaction, laws of motion have the same form in all inertial frames of reference; the way of these laws writing down in a form which is invariant to reference system is found. Implementation of this postulate and postulate of the speed of light constancy lead to a new kinematics in the framework of space-time forming a unified 4-dimensional manifold.

2.2 Was Albert Einstein satisfied with the degree of SR generality?

For this, it is very important to analyze those driving reasons that lead Einstein to the generalization of the principle of relativity to non-inertial frames of reference. It should be noted that the formulating of the General theory of relativity begins in the paper "On the Relativity Principle and the Conclusions Drawn from It", published in December 1907 in journal "Jahrbuch der Radioaktivität und Elektronik", from section V "Principle of Relativity and Gravitation". Speaking about the possibility of applying the principle of relativity to systems of reference moving relative to each other with acceleration Einstein (4) says that "...this question has to arise before everyone who follows closely implementation of the principle of relativity so far, I cannot but express the opinion on this matter here." The paper shows that the gravitational mass equal to E/c^2 corresponds to the gravitational field energy E. Thus, the law of interdependence, equivalence of energy and mass, is valid not only for the inertial mass, as established by Einstein in 1905, but also for the "gravity" masses (5). The basis for the approach is the idea of the field of gravity interpretation in as a reference system moving uniformly accelerated.

In the book on Einstein scientific activities, A. Pais (6) quotes Einstein's manuscript that has not been published yet and now is

stored in Pierpont Morgan library in New York City. In the manuscript, the idea that principle of equality of inertial and gravitational masses can be applied for implementation of the principle of relativity in non-inertial reference system was called "the happiest thought of my (of A. Einstein – authors) life." A. Pais wonders why Einstein thought about the gravity problem? To include gravity in SR or to expand the area of SR application? And he comes to the conclusion that as soon as he wanted to include gravity in the STO, he immediately, or almost immediately, realized that it is possible to expand the scope of his theory (6). So, the Equivalence Principle is a basis of the General theory of relativity: if inertial and gravitational masses are equal, motion in a uniform gravitational field is indistinguishable from motion in a uniformly accelerated system of reference. In other words, no experiment carried out in the laboratory can answer the question whether this laboratory is moving with acceleration or is at rest in the corresponding gravitational field (we will add that this is true in sufficiently small regions of space where the field is uniform, or in the void). Obviously, this is a generalization of Galileo's principle of relativity: no experiment using the laws of mechanics can distinguish one inertial system from another.

3 Results and Discussion

3.1 Critical Analysis of the Equivalence Idea

Let us note some important points:

1. The equivalence principle cannot be included in the theory of relativity because in this case, Global Lorentz Invariance is not valid. On the other hand, maybe it is good to abandon the equivalence principle to which Einstein had remained faithful during the whole time from the moment when this the happiest thought came to him, or it should rise a question about finding a larger group of transformations than the Poincare's group. Namely, the inclusion of an internal "coordinate" system allows formulating the ideas of gauge invariance, generalizing and deepening study of fundamental interaction on the basis of more complete symmetry group;

2. In an inertial frame of reference, in Cartesian coordinates, the 4-dimensional interval $ds^2 = c^2dt^2 - dx^2 - dy^2 - dz^2$

is invariant under Lorentz transformations at the transition from one inertial reference system to another. However, when you transfer to the non-inertial frame of reference, ds^2 cannot be represented as a sum of squares of the four coordinate differentials. Einstein proved this with the example of a uniformly rotating coordinate system. In 1912, in (7) it was stated that, in a uniformly rotating system, due to Lorentz contraction, the ratio of a circumference to diameter should differ from π. The scale is the same as the coordinate axes, which are conventionally presented in the form of rigid rods, although, according to the theory of relativity, absolutely rigid rods cannot exist. Einstein did not doubt that the principle of relativity should remain valid, and raises the question of the necessity of such relativity theory generalization "in order that the theory contains scheduled earlier static gravity fields theory as a special case". Thereby change in the physical concept of world interval is necessary.

In the Special theory of relativity, world lines of free motion are defined as geodesic lines in Minkowski geometry. From the point of view of variance approach, movement along the geodesic lines corresponds to an extremum of the path between two points. In inertial reference systems, the shortest distance between two points is a familiar straight line. In non-inertial reference systems, the geodesic lines have non-zero curvature, and world interval should be expressed not only by coordinates difference (given above differentials represent, in fact, infinitely small differences between the coordinates) but the introduction of quantities describing at each point the curvature of space-time is required. Thus, square of the world interval in a non-inertial frame of reference has the form:

$$ds^2 = g_{ik}dx^i dx^k,$$

where g_{ik} is a function of spatial coordinates x^1, x^2, x^3 and time coordinate x^4. A four-dimensional coordinate system in non-inertial reference systems is curved, and value g_{ik} determines the space-time metric, representing a single object – 2nd rank symmetric metric tensor. For an arbitrary selection of coordinates, a number of different space-time functions is 10; 4 of them have the same indexes, 6 - different indexes. When taking into account symmetry $g_{ik} = g_{ki}$

Physical phenomena should be described by the equations which are invariant under all space-time coordinate systems – this is a principle called by Einstein the General Covariance Principle. The general covariance requirement led Einstein to use of tensor calculus because the equations are explicitly covariant with this language. In the paper written in 1913 together with M. Grossmann (8), in the second, mathematical, part written by M. Grossman is said, "Given the results by Christoffel, Ricci and Levi-Civita developed own method of absolute, i.e. independent of the coordinate system, differential calculus, which allows giving invariant form to differential equations of mathematical physics". Further, in the paper, systematic description of developed by the authors tensor analysis is given. Thus, they are tensor equations which do not distinguish coordinate systems.

The main author objective is to derive the equations, constructed in such a way that invariance of the interval was followed by the covariance of the corresponding system of equations. In the above paper, the equations of gravity are not yet derived, but Riemann curvature tensor g_{ik} appears and the relationship between the gravitational field and tensor determining the interval between world points, i.e., a space-time metric, is clearly formulated.

Einstein, together with Grossman (8), comes to a wrong conclusion that the gravitational field equations can be covariant only with respect to linear transformations. Only in the paper, after a long search, he finally retracted this position (9). Finally, Einstein comes to two ideas – on the gravitational field nonlinearity and local implementation of the principle of equivalence. That is, Lorentz invariance is no longer a global property but plays a central role as a local invariance. The local Lorentz invariance requirement is defined by the difference of field equivalent to non-inertial reference systems from "true" gravitational fields. First, this difference appears in relation to their properties at infinity. "True" gravitational field tends to zero at infinity; the field that is equivalent to the acceleration of the moving system increases unlimited or remains finite at infinity. (10) Second, the true gravitational field cannot be excluded by selection of reference system, while the fields which are equivalent to non-inertial reference systems disappear at the transition to an inertial frame of reference. Thus, the "true" gravitational field can be compensated only in the infinitesimal neighborhood of one point. In this regard, a variety of reference systems are introduced in GR as, in the case of a variable gravitational field, the space metric is not only non-Euclidean but also non-stationary, i.e. depends on the time.

In the General theory of relativity, compared with the Special theory of relativity, the meaning of the reference system concept differs. In the presence of the variable gravitational field, the reference system is a set of an infinite number of bodies, uniformly filling entire space together with arbitrarily running clocks associated with each body (10). Transformations of a curved Riemannian space to itself are transformations from one class of frame of reference to another class. Selection of the class is defined by some additional gauge conditions imposed on the space-time metric.

A. Pais (6) notes that, in GR, new kinematics is closely intertwined with new dynamics. He considers the fact that "Lorentz invariance is deprived of its global validity but

continues to play a central role as a local invariance." Dynamic innovation is the gauge principle, the importance of which was not immediately properly understood. Nowadays, it is now known that all physical interactions can be described through local gauge invariance being the conceptual basis of modern physics of high energies and generalizing Einstein covariance principle.

If equations for a physical system in Minkowski space are known, to obtain these equations in an arbitrary reference system in the presence of gravitational field procedure for replacement of tensor differentials with covariant differentials and replacement of partial derivatives with covariant ones should be applied. The procedure for such replacement is described in the paper. (10) It is important to emphasize that the rule of covariant differentiation consists is adding of an additional term. In GR, Christoffel symbols which express a change of vector components in a parallel translation play the role of additional components. Thereby free scaling at the transition from one space point to another that means the trajectory curvature is possible. Requirement for physical law invariance in covariant notation relative to local transformations requires introduction of a gravitational field which have to compensate the effects caused by gauging at transition from point to point (by change in scale – let us note that the term "gauging" is entered into the physics from railway terminology and has a sense of change of the reference level or scale, though now it has a different meaning). The fact is that the gravitational field is not postulated here but is derived as a result of invariance under a group of local transformations, and means a gauge approach to the description of the interaction. This is GR where a representation of the gauge principle, according to which a requirement of invariance of Lagrange function containing all information about the system, introduces for consideration new gauge fields (for example – connectivity, in other words, the Christoffel symbols). Without taking into account interaction with these fields (and their self-acting), the theory is locally invariant.

Gravity is no longer considered as just a force interaction of bodies and fields, the gravitational field cannot be reduced to the scalar gravitational potential of Newton's theory, but it constitutes a specific form of the contained matter - deformation, curvature of space-time and metric of this space-time is a dynamic characteristic of space-time. The gravitational field is a metric field defined as a second rank symmetric tensor field on a smooth manifold in a 4 dimensional metric space, in space-time. Metric defines all of the characteristics of the gravitational field, for example, the gravitational field intensity – connectedness of space-time. The deepest sense is laid in the term "metric tensor": it is this subject which was used by Einstein to describe gravity not only as a physical field similar to the electromagnetic field, but also as an occurrence of changing metric of space-time defined by g_{ik} components.

Thus, implementation of the equivalence principle can be a sequence of mathematically expressed steps: local Lorentz invariance → gauge principle → general covariance.

3.2. The equations of the General theory of relativity.

B. Hoffman notes: "it is impossible to tell <...> about all the difficulties that Einstein had to overcome. Two years (1914 – authors) he was going in the wrong direction, before he figured out (among other things) that from a physical point of view, there is no argument against equivalence of all coordinate systems and, ultimately, the principle of general covariance does not contradict the causality principle". (11) The purpose of the next step was to find ten gravitational equations.

Covariance of the global interval $ds^2 = g_{ik}dx^i dx^k$ required searching of a new geometry and it was the Riemann geometry. Einstein says: " Auxiliary mathematical apparatus necessary for the General theory of relativity already existed in the form of the "absolute differential calculus", whose foundation was laid in the researches of Gauss, Riemann and Christoffel dedicated to non-Euclidean spaces; this calculus, brought in the system by Ricci and Levi-Civitas, have already been used for solving problems of theoretical physics". (12) It is known that Gauss discovered a method which allowed extracting from two-dimensional metric tensor the information about the internal space curvature described by this tensor. The Riemann tensor (Riemann-Christoffel), also called a curvature tensor, appears in the application of Gauss method for the multidimensional case. Einstein could derive the Riemann tensor solely from the metric tensor. This resulted in a deepening understanding of the space-time in which the four-dimensional pseudo-Euclidean space is curved. The most complete information about the curvature is contained, as already mentioned, in the Riemann tensor R^l_{imk}, from which Ricci tensor $R_{ik} = R^l_{ilk}$ and scalar curvature $R = g^{ik}R_{ik}$ can be derived by convolution. Convolution and the operation of the raising and lowering of indices are made by covariant g_{ik} and contravariant g^{ik} components of the metric tensor. Covariant components define an invariant interval of space-time.

The principle of covariance implies that all physical quantities appearing in the laws of physics are representation of a group of diffeomorphisms (a group of arbitrary transformations of 4–coordinates in a Riemannian space-time), and all the members in the ratio having a status of physical laws or being a consequence of them, have the same tensor dimension.

Einstein is an author to the postulate that the tensor of energy-momentum is a source of the gravitational field. The energy-momentum tensor is a second rank tensor; it combines all parameters that determine the acceleration of moving medium in mechanics of the Special theory of relativity - internal forces caused by the environment and its inert properties. Einstein energy-momentum tensor is considered as a physical factor due to which the components of the Riemann tensor become non-zero and this is interpreted as a description of the space-time curvature. In other words, geometric characteristics of space-time in the neighborhood of each point defined by some functional of the curvature tensor $G_{ik}\{R_{lmns}\}$ are related to the amount of located here gravitating matter defined by energy-momentum tensor $T_{ik.}$. The G_{ik} tensor is called Einstein tensor.

It is important to mention that the Riemann tensor - a fourth rank tensor - has 20 independent components, and the energy-momentum tensor has ten components. At that, the Riemann tensor can be expressed in the form of two parts, one of which may be connected with the energy-momentum tensor, and the other cannot be connected. G_{ik} are components of a second rank tensor equivalent to that part of the Riemann tensor, which can be included in the gravity equation with the tensor of energy-momentum. Without loss of generality, it can be agreed that the G_{ik} functional has the same unit of measurement as the curvature tensor - inverse square of length. The unit of measurement of the energy-momentum tensor, as a rule, is selected as the density of energy.

British mathematician Clifford suggested that space should have its own elasticity. It is possible to say that the General theory of relativity is an evolution of this idea. The ratio between geometrical characteristics of space-time and pulse–energy characteristics of matter are written in the form of the law of space-time elasticity: $G_{ik} = -\chi T_{ik.}$ χ constant included in this ratio is interpreted as the coefficient of elasticity of space-time. The idea of elasticity of Riemannian spaces was later developed by A.D. Sakharov (13) who considered gravity as the metric elasticity opposing the curving of space-time.

So, the measure of the curvature of 4-dimensional space-time manifold is the gravitational field. Sources of curvature, that is,

sources of the gravitational field, are non-gravitational physical field describing the diversity of elementary particles (in the physics, are conditionally united by the term "matter"). Local characteristics of the "matter" are the energy-momentum tensor T_{ik}. These are Einstein equations which establish a relationship between the space-time curvature in the neighborhood of a point and "matter" in the neighborhood of the same point. (10)

The following principle formulated by Einstein can be called the Principle of conservatism. The meaning of the principle is that T_{ik} cannot be arbitrary, any motion has to comply with the laws of conservation of energy and momentum. Pais notes that, for a certain period of time, conservation laws were a weak point in Einstein theory, is just a limitation of the theory, and not an automatic consequence of general covariance. Initially, Einstein tried to derive the conservation laws without using the variational principle, although in earlier papers he used just the variational principle when trying to find the correct gravitational field equations. (6) Variational principle appears again, but conservation laws still are not a consequence of invariance. (12) Generally, covariant conservation laws of momentum and energy were derived from gravitational field equations together with the postulate of general covariance without using the field equations for the matter. (14) Here we should also mention the Herculean efforts of Einstein followers Weyl, F. Klein, D. Hilbert, Pauli, T. Levi-Civita, Lorentz, E. Schroedinger, and others in giving the General theory of relativity consistency and clarity in these complex issues.

According to Einstein, the conservativeness condition for the tensor of energy– the momentum of matter $T^{k}_{i;k} = 0$ has to be an identical relation in the equations of matter motion compatible with the equations of the gravitational field. Thus, the principle of conservatism for a tensor of energy-momentum of matter can be regarded as a generalization of local formulations of the conservation laws of energy and momentum for the case of curved space. Combining this principle with the law of elasticity of space-time, it can be concluded that the functional $G^{k}_{i;k}$ should also meet the condition of conservatism identically: $G^{k}_{i;k} = 0$, and this identity must be a consequence of the definition of geometrical quantities.

Another principle adopted by Einstein could be called the criterion of simplicity, according to the principle, the simplest equations of the gravity theory have to be a second order differential equation for the metric tensor g_{ik}. B. Hoffman notes, "Einstein's skill appears in the fact that he gave a description of the theory of gravity with only ten g_{ik} values". (11) The functional G_{ik} which is linear with respect to the curvature tensor meets this criterion.

Particular attention should be paid to the phenomena of gravitation which are described by another part of the Riemann tensor - Weyl tensor. The effects defined by Einstein tensor vanish outside bodies where the energy-momentum tensor is equal to zero, but the gravity effects existing outside the bodies are defined by Weyl tensor. In other words, Weyl tensor describes just the "true" gravitational field. There is a well-known procedure in General theory of relativity by which, after defining of the metric tensor, full Riemann tensor, and Einstein tensor too, and Weyl tensor can be calculated.

The principle of conservatism allows obtaining of G_{ik} functional in the form of Einstein tensor with Λ – term, was first introduced by Einstein in 1917 with the aim to derive a static solution of the cosmology equations (15):

$$G_{ik} = R_{ik} - g_{ik}\frac{R}{2} - g_{ik}\Lambda_{grav},\ \Lambda_{grav} = const. \quad (1)$$

From a phenomenological point of view, the term containing the Λ_{grav} constant has the status of a conservative member of zero order relative to curvature in the left (geometric) part of the equations of gravitation theory. The other two terms have the status of a conservative member of first order relative to curvature. Conservative terms containing higher derivatives of the metric and the higher degrees of curvature can be formally included into functional G_{ik}. However, such complicated formulas do not satisfy the criterion of simplicity.

The current understanding of the constant physical meaning will be analyzed in connection with the concept of vacuum, especially due to the fact that there are good reasons for identifying of so-called Dark Energy, a medium with negative pressure, with a cosmological vacuum.

It is clear that the scope of this paper does not allow for a detailed discussion of certain topics which can demonstrate "what the General theory of relativity became now." We deliberately left outside the scope of paper a review of the experimental verification of the theory. A lot of publications analyzing details of the origins, formation and current status of the General theory of relativity are devoted to this issue. However, it should be noted that the discrepancy of classical, Newtonian, theory and experiment in determining the perihelion shift of mercury (the axis of Mercury's orbit rotates so that perihelion shifts for 100 years, the calculated angular velocity is 526.7'', the observed shift is 565'') was always the center of Einstein attention despite the fact that the main purpose of his arduous search was formulation of correct equations of General theory of relativity. This issue seemed to him important because the correct theory of gravity was required to explain the discrepancy between measurements and theory. This explanation was obtained by Einstein in direct calculations using GR.

3.3 Vacuum and Gravitational Waves: Some Fragments of the Subject "What is the General Theory of Relativity now"

Let us take a look at the Einstein equations in the form of the law of space-time elasticity.

$$R^{k}_{i} - \frac{1}{2}\delta^{k}_{i}R - \delta^{k}_{i}\Lambda_{grav} = \chi T^{k}_{i}, \quad (2)$$

where - χ - coefficient of elasticity, equal to $\frac{8\pi G}{c^4}$ and called the Einstein gravitation constant, G is the Newton gravitation constant, C – the speed of light. Two fundamental constants appear in Einstein's theory: constant characterizing the space-time itself, and χ constant characterizing intensity of relationships between matter and geometry.

Ya.B. Zeldovich (16) raised the question: do Einstein's equations permit the existence of Minkowski empty flat space-time? Riemann tensor has to be equal to zero in flat space-time, and, accordingly, all of the Riemann tensor convolutions: $R_{ik} = R^{l}_{ilk} = 0$ and $R = g^{ik}R_{ik} = 0$. The problem of correct definition of empty space is less trivial. Of course, in empty space, there are no particles and waves that move to macroscopic distances. It seems that in this case (when there is void) tensor of energy–momentum of matter should be simply put equal to zero everywhere: $T_{ik} = 0$ in all space-time. However, this definition of empty space, or in equivalent terminology - vacuum, is not the most general. And this is due to the General theory of relativity, namely, due to the necessity of multiple observers. "Matter" is necessary for the physical realization of

the observations program, i.e. the necessity of observer who is exploring this matter together with its inherent geometry, the geometry is defined by the spatial-temporal distribution of matter itself, taking into account its dynamic characteristics. In other words, the existence of "matter" with some dynamics and structure means, as already mentioned, that various reference systems can be implemented at the relevant material bodies equipped with different systems of spatial coordinates and different ways of time measuring.

The motion of matter is represented differently in different reference systems, and this appears in the dependence of the numerical values of components of energy-momentum tensor of "matter" on the selection of the 4-coordinate system. Ya.B. Zeldovich drew attention to the following circumstance: it is necessary for the relativistic theory that the energy density (vacuum) is the same for any observer, i.e. in the most general case, the vacuum should be determined not as the environment with zero tensor energy-momentum $T^k_{i(vac)} = 0$, but as a relativistic invariant environment with the tensor of energy-momentum not changing when the reference system is changed: $T^{k'}_{i(vac)} = T^k_{i(vac)}$. That is, it is impossible to relate any system of reference without matter with a relativistic invariant environment. The only possible tensor that satisfies this definition has the form $T^k_{i(vac)} = \delta^k_i \varepsilon_{vac}, \varepsilon_{vac} = const$ where ε_{vac} is the energy density of the vacuum. Requirement $\varepsilon_{vac} = const$ leads to the situation that the pressure (tension) P is the same for all directions and equal to $P = -\varepsilon_{vac}$. It is important to note that ε_{vac} can be both positive and negative, while ordinary matter and ordinary fields, considered as excitations of vacuum, always make only a positive contribution. So, the physical meaning ε_{vac} is the density of vacuum energy of non-gravitational physical fields. Modern experimental data prove the existence of two vacuum subsystems - quark-gluon condensate (QGC) and Higgs condensate (HC). It was found that $\varepsilon_{vac} < 0$ for data of vacuum subsystems.

The Einstein equations for empty space–time with the substitution of T_i^k by T^k_{ivac} and transfer of $\delta^k_i \Lambda_{grav}$ into the right part of the equation, with the substitution of Λ_{grav} by $\chi\varepsilon_{grav}$, has the form:

$$R^k_i - \frac{1}{2}\delta^k_i R = \chi\delta^k_i(\varepsilon_{grav} + \varepsilon_{vac}). \quad (3)$$

Two important conclusions follow from the equations (2). First, the geometric constant Λ_{grav} after trivial changing of notation (in fact, after selecting the system of units) can be interpreted as the energy density of the gravitational vacuum. This interpretation is not surprising. This is because, as noted above, each fundamental interaction has its own vacuum subsystem in existing and experimentally confirmed theory of elementary particles: Higgs condensate with energy density $\varepsilon_{eW} \approx -$ (246 GeV)^4 corresponds to electromagnetic and weak interactions, united in the Salam–Weinberg theory in electroweak interaction; quark-gluon condensate with energy density $\varepsilon_{QCD} = -$ (265 MeV)^4 corresponds to strong (chromodynamic) quarks interaction. And this is despite the fact that the observed vacuum energy density in the Universe is only + (0.002 eV) ^{4}!

It is natural to assume that some particular vacuum subsystem corresponds to the gravitational interaction; the nature and microstructure of this system are currently unknown. The existence of gravitational vacuum subsystems is represented on the phenomenological level in the geometric part of the Einstein equations with a null member of conservative expansion of the tensor by curvature orders.

The second conclusion may be considered as an attempt to answer this question. The Einstein gravity theory permits the existence of empty flat Minkowski space under the condition that the gravitational vacuum energy completely balances the energy of vacuum non-gravitational physical fields:

$$\Lambda = (\varepsilon_{grav} + \varepsilon_{vac}) = 0. \quad (4)$$

The summary constant is naturally interpreted as the energy density of a balanced vacuum in 4–dimensional space-time.

If Einstein's equations are written for the case when the total density of vacuum energy is equal to zero and there are no particles and waves of non-gravitational nature, it can be found that empty space-time can curve itself. Einstein's equation for "void" $R^k_i - \frac{1}{2}\delta^k_i R = 0$ permits solutions which not only describe Minkowski space with Riemann tensor $R^l_{imk} = 0$ but a curved space-time for which the equality to zero of the Ricci tensor ($R_{ik} = 0$) take place at non-zero Riemann tensor ($R^l_{imk} \neq 0$) included the Weyl tensor. The solution with $R^l_{imk} \neq 0$ is obtained in the case when the metric tensor defining the Minkowski space is represented in the form of "background field + small perturbation", $g_{ik} = g^{(0)}_{ik} + h_{ik}$. Using a formula of Riemann geometry, the Einstein equations for "void" can be obtained and, after averaging of these equations - equations for the background gravitational field. By subtracting from the exact equations the averaged ones, the equation for the gravitational wave, i.e. normal wave equation for perturbations of h_{ik} metric, can be obtained. So, the theory says that gravitational field propagates in vacuum with the speed of light, and this is interpreted as a gravitational wave. Thus, gravity waves propagating in space-time curve the space-time itself. In the course of more detailed analysis, it was found that gravity waves are radiated by only a couple of interacting massive objects (so-called quadrupole radiation), the gravitational waves amplitude - dimensionless relative change in the distance between the points of space-time - is directly proportional to the first derivative of acceleration and mass of the radiating system. Detection of waves with very small amplitude is possible only in the case of large masses and large changes of acceleration.

3.4 Gravitational Waves: A New Tool of Knowledge

Indirect evidence for the existence of gravitational waves was obtained long enough - approaching of close binary stars' systems was accompanied by a loss of energy, which was interpreted as the emission of gravitational waves (Nobel prize in physics for the study of the pulsar PSR 1913+16, R. A. Hulse, J. G. Taylor, 1993).

Meanwhile, due to the already mentioned smallness of amplitude, direct detection of gravitational waves was delayed for quite a long time since their theoretical prediction; massive radiation sources were necessary. Two main kinds of recordable gravitational waves sources are considered in modern astrophysics: 1) collapse of dual black holes; 2) merger of black holes or black hole and a neutron star. Accordingly, experimental strategies have been implemented over the past decade to improve resonant detectors of gravitational waves that went the way from the first John Weber resonance detector to detectors operating in many countries - in Russia (Moscow State University, SAI), Switzerland (CERN), Japan, Netherlands, etc.

The main contribution to their creation was made by Russian scientists B. B. Braginsky, V. I. Panov, A. M. Cherepashchuk, V. N. Rudenko, etc. (17)

However, the second experimental strategy was more successful, it was the creation of laser interferometers which started with the work of the Russian physicists M. E. Gertsenshtein and V. I. Pustovoit (18) "On the Detection of Low-Frequency Gravitational Waves. It was shown in the paper that the sensitivity of the electromechanical experiments for gravitational waves detection using resonant detectors is 10 orders less than predictions of Weber, and a new strategy for their detection was proposed. Thanks to the improvement of technology, use of new materials, growth of computer software capabilities, improvement of the equipment sensitivity, LIGO Observatory implementing laser interferometers was established on the initiative of American scientists K. Thorne, R. Weiss, R. and Dreaver, and based on the ideas of M. E. Gertsenshtein and V. I. Pustovoit (18). The project was developed, implemented and tested beginning from 1993, although the whole ideology of new tool for nature learning was theoretically proved much earlier. (19) The first successful detection of gravitational waves was performed in LIGO Observatory on 14 September 2015 by two gravitational-wave antennas: first, by L1 (Livingston), then by H1 (Hanford), the distance between these antennas was approximately 3,000 km. (19) This was a signal from the merger of two massive black holes (with masses of 29 and 36 solar masses) obtained during the test run of the instrument (!); it is the presence of the two observatories made it possible to capture and compare parameters of moving through the Universe space-time of outburst generated in a massive distortion of space-time at a distance of about 1.3 billion light-years from Earth.

Currently, laser interferometers are applied not only in the USA but also in Italy (VIRGO), Germany (GEO 600), Japan (underground detector KAGRA); measurements at the gravitational-wave antenna LIGO-India will begin in a few years. Detector system under development will be effective not only for detecting of gravitational waves but also for successful triangulation: defining of radiating sources location in the Universe. It should be added that capabilities of space observatories in the search for long-wavelength gravitational perturbations (eLISA project) are already actively tested. Then it will become possible to study supermassive black holes that are expected to be located in the centers of galaxies.

4 Conclusion

Why the discovery of gravitational waves is so important for the development of modern physics? One of the most important problems of modern science is the question of what is the carrier of Dark Energy. According to cosmology observation, Dark Energy makes 73-76% of the energy balance of the Universe unlike elementary particles (4%) and Dark Matter (20-23%). Dark Energy is not structured and it fills the Universe homogeneously and isotropic. If a carrier of Dark Energy in the modern Universe is the balanced vacuum (20), then there is a hope that the observational cosmology data will rather accurately define a value which are fundamental constants of physics. Study of gravitational waves has tremendous potential for solving this problem.

Gravitational waves are the one agent that is able to penetrate into any powerful cataclysm (merging of black holes or neutron stars, supernova collapse, and explosion) in the Universe and to tell what is a mechanism of such process that causes a noticeable space-time deformation. It is only necessary to "catch" and properly "interrogate" the caught, deriving all important information. With the increased sensitivity of detectors, it may be also possible to capture signals generated by massive objects before the actual merge.

It is possible that deviation from Einstein's theory would be detected by analyzing of various known variants of the gravity theory in terms of propagation and characteristics of gravitational waves, for example, in strong gravitational fields. There is hope that the study of gravitational waves will allow us to look into the processes occurred before the Big Bang and processes which lead to this explosion, in particular, to add arguments "for" and "against" in the development of the inflationary Universe model (21), superstring theory (22), to answer the question on the vacuum as the source of abstraction of our world (23-24) and much more else.

The 21st century started with a few great discoveries in physics – the discovery of the Higgs boson, oscillations of massive neutrinos, gravitational waves. In addition, no doubt that many discoveries which have tremendous importance not only for fundamental science but for the whole of human civilization, for each person of the Earth are ahead of physicists.

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Literature:

1. LSC News. Available from: https://www.ligo.org/news/index.php#nobel
2. Cherepashchuk AM. Discovery of gravitational waves: a new chapter in black hole studies. Physics Uspekhi. 2016; 186(9):1001-10.
3. Einstein A. Über Gravitationwellen. Sitzungsberichte der preussischen Akademie der Wissenschaften. 1918; 1:154-67.
4. Einstein A. Über die Relativitätprinzip und die aus dem selben gezogenen Folgerunge. Jahrbuch der Radioaktivität und Elektronik. 1907; 4:411-62.
5. Einstein A. Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig? Annalen der Physik. 1905; 18:639-64.
6. Pais A. 'Subtle is the Lord...' The Science and the Life of Albert Einstein. Oxford University Press; 2005.
7. Einstein A. Lichtschwindigkeit und Statik des Gravitationsfeldes. Annalen der Physik. 1912; 38:355-69.
8. Einstein A, Grossmann M. Entwurf einer verallgemeinerten Relativitätstheorie und Theorie der Gravitation. Zeitschrift für Mathematik und Physik. 1913; 62:225-61.
9. Einstein A. Zur allgemeinen Relativitätstheorie. Sitzungsberichte der preussischen Akademie der Wissenschaften. 1915; 44(2):778-86.
10. Landau LD, Lifshitz EM. Course of Theoretical Physics: The Classical Theory of Fields. Moscow: Nauka; 1988.
11. Hoffmann B, Dukas H. Albert Einstein. Creator and Rebel. New York: The Viking Press; 1972.
12. Einstein A. Die Grundlage der allgemeinen Relativitätstheorie. Annalen der Physik. 1916a; 49:769-822.
13. Sakharov AD. Vacuum Quantum Fluctuations in Curved Space and the Theory of Gravitation. Doklady. Earth Sciences. 1967; 177(1):70-1.
14. Einstein A. Des hamiltoniesches Prinzip und allgemeine Relativitätstheorie. Sitzungsberichte der preussischen Akademie der Wissenschaften. 1916b; 2:1111-6.
15. Einstein A. Kosmologische Betrachtungen zur allgemeinen Relativitätstheorie. Sitzungsberichte der preussischen Akademie der Wissenschaften. 1917; 1:142-52.
16. Zeldovich Y. The Vacuum Theory, may be, Solved the Riddle of Cosmology. Physics Uspekhi. 1981; 33(3):479-503.
17. Pustovoit VI. On the Direct Detection of Gravitational Waves. Physics Uspekhi. 2016; 186(10):1034-52).
18. Gertsenshtein ME, Pustovoit VI. On the Detection of Low-Frequency Gravitational Waves. JETP. 1962; 43(2/8):605-7.
19. Press WH, Thorne KS. Gravitational-Wave Astronomy. Physics Uspekhi. 2016; 110(1):569-606.
20. Vereshkov GM, Minasyan LA. The Concept of Vacuum and Evolution of the Early Universe. Modern Cosmology: Philosophical Horizons. 2011:308-38.

21. Golubjeva ON, Ilyin VG, Minasyan LA. The Inflationary Model of the Universe. Physics in the System of Modern Education (PSME). Rostov-on-Don: Don State Technical University; 2017.
22. Green B. The Fabric if the Cosmos: Space, Time, and the Texture of Reality. New York: Alfred A. Knopf; 2004.
23. Vereshkov GM, Minasyan LA, Sachenko VP. Physical Vacuum as the Source Abstraction. Russian Journal of Philosophical Sciences. 1990; 7:20-9.
24. Latipov NB, Beylin VA, Vereshkov GM. Vacuum, Elementary Particles and the Universe. Moscow: MSU; 2001.

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DN ENVIRONMENTAL IMPACT ON HEALTH
DO PROTECTION OF LANDSCAPE

FREQUENCY OF SYSTEMIC PATHOLOGY AT PATIENTS WITH HCV AND HBV – INFECTIONS

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Abstract: Chronic Viral Hepatitis (CVH) is a widespread progressive liver disease. A viral hepatitis B and C cause development of cirrhosis and hepatocellular carcinoma. From 500 to 700 thousand people annually die due to HBV infection, and 350 thousand people die due to CVH all over the world. But mortality rate due to the systemic pathology associated with HCV and HBV is not considered to be a result of hepatitis C and B. The purpose of the article is to study frequency and nature of systemic comorbidity at patients with a chronic viral hepatitis B and C. The research is aimed to: find out what pathologies the patients with CVH the most often have; to know what disease was usually revealed at patients with HCV infection, and what diseases were the most often observed at patients regarding the hematopoietic system. Our main task is to reveal, study, and analyze the frequency of systemic pathology at patients with HCV and HBV – infections, compare them and then make the underlying conclusions. According to these conclusions, we will understand a full clinical presentation of the pathology.

Keywords: Chronic viral hepatitis B and C, digestive tract, cardiovascular and genitourinary system, diabetes mellitus, HCV, HBV, pathology.

1 Introduction

We began our research because hepatitis is one of the most dangerous diseases among people all over the world which cause death. We are going to make the research on this topic in order to observe, to know, reveal, analyze, learn, and understand the nature, mechanism, the main Factors, objects, reasons of systemic pathology, and namely two types of the disease (hepatitis B and C). We need to understand the pathology caused by hepatitis, and the process of the disease and its impact on the human body. Naturally, we have to find out the differences between the first and the second type. Then it is required to reveal the origins of hepatitis' occurring.

Hepatitis B and C are a very widespread and insidious disease which affects a very great number of people all over the world. That is one of the most harmful diseases that are often mortal. So, our research is very important for modern medical science, medicine, and should contribute to the improvement of diagnostics, prevention, treatment of two types of hepatitis.

In 57% of cases chronic viral¬ hepatitis B and C cause the development of cirrhosis, in 78% of cases, they cause hepatocellular carcinoma (HCC). More than 500 thousand people annually die due to HBV infection, and more than 300 people die due to CVH C all over the world. (1) Chronic hepatitis C makes significant challenges for timely diagnosis and treatment, as it is revealed occasionally during an examination in 70-80% of cases regarding other diseases or through contact with people sick with VH. (2)

In 15 -30% of cases CVH, in -25-50% of CVH C, in 70 -80% CVH D leads to cirrhosis, averagely 15-20% of patients have hepatocellular carcinoma based on cirrhosis. (3-5)

In some cases, diverse pathology of other organs and systems that defines the disease prognosis dominates along with hepatitis by itself. These signs may be independent pathology (regardless of the patient's chronic HCV or HBV infection) or may show the systemic nature of HCV or HBV infection. Immune reactions as a response to virus replication in the liver and beyond it are mainly important for the development of systemic pathology associated with HCV or HBV. (6-7)

According to comparative analysis of clinical, laboratory and immunological data people that with CVH may be divided into two groups: patients dominated by symptoms and syndromes caused by hepatic injuries; patients with system pathologic features of CVH, dominated by the symptoms which are not related to hepatic injuries (pathology of joints, neurological symptoms, hematological pathology, endocrinopathy, kidney and heart damages, etc.), but quite often specifically they determine the disease prognosis. (8-9)

In real clinical practice, it can be difficult to prove cause-and-effect link of HCV or HBV infection and pathology of organs and systems, which may be either a virus-associated or develop only independently. (10-11)

2 Materials and Methods

213213 patients with a Chronic Viral Hepatitis B and C were examined. The examination of patients with CVH was carried out according to the clinical protocol in 2 stages. ELISA diagnostics was carried out using test systems of CJSC Vektor-Best/Koltsovo, the Russian Federation. The polymerase chain reaction was carried out using the test systems and the equipment for PCR diagnostics (Litekh/Moscow). All the patients with CVH took genotyping by the PCR method. They took laboratory tools and techniques of a research according to the clinical protocol.

The work was carried out in the hepatological centre in Shymkent from 2014 to 2016. People sick with CVH were directed for examination from health care centres in Turkestan, Kentau, Taraz, Shymkent. The patients were examined and cured mainly on an outpatient basis. The data of 213 patients with CVH B and C were analyzed. Among the examinees, men were 50% (107), women – 50% (106) (Figure 1).

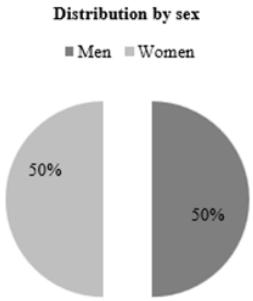

Figure 1. Distribution by Sex

The number of patients with CVH C and B of age 20-29 was 32 (15%), 30-39 – 68 (32%), 40-49 – 76 (36%), 50-59 – 28 (13%), 60-69 was 9 (4%) (Figure 2).

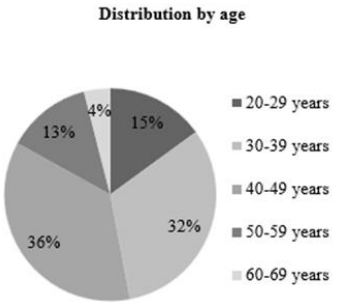

Figure 2. Distribution by Age

Examination of people with CVH was carried out according to the order of the Minister of Health of the Republic of Kazakhstan "On approval of the regulations to examine and cure patients with viral hepatitis" as of February 17, 2012 No. 92 in 2 stages. Stage 1: Serological examination. Diagnosis of HBV infection is approved by finding HBsAg and HBeAg in ELISA. When the antiHBe, antiHbcoreIgM and IgG are revealed, diagnosis is verified in PCR DNAHBV. Diagnosis of HCV infection was set on the basis of the revealed total anti-HCV and RNAHCV. If hepatitis B is revealed, the patients were examined for HDV infection using Elisa (anti-HDV) and PCR methods (HDVDNA). ELISA diagnostics was carried out using test systems of CJSC "VektorBest"/Koltsovo, the Russian Federation. The polymerase chain reaction was carried out using the test systems and the equipment for PCR diagnostics (Litekh/Moscow). All the patients with CVH took genotyping by the PCR method. The researches using PCR and ELISA methods were carried out at LEGAL FIRM "CLINICAL AND DIAGNOSTIC LABORATORY OLYMPUS" LLC (the laboratory chief Gramotikopulo A. A.) at diagnostic center "INVIVO" LLC (the laboratory chief Popova M. A.). Among 213 examinees 77% (164) of them were with CVH C, 33% (49) – with CVH B. Only 9% (19) of patients had coinfection: 7% (15 patients) – CVH B + C, 2% (4 patients) – CVH B + D (Figure 3). During the analysis of the clinical signs, we compared a group of patients with HCV monoinfection and a group of patients with HBV infection mono along with HCV and HDV

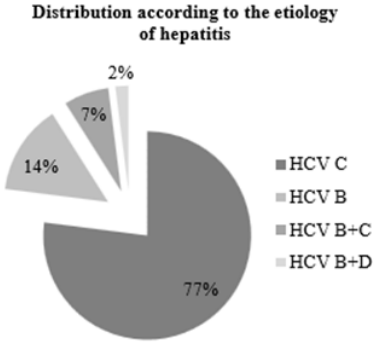

Figure 3. Distribution According to the Etiology of Hepatitis

When genotyping HCV are set as follows: genotype 1ab – 79 (48%) patients, 2a genotype – 23 (14%), genotype 3 ab – 52 (32%), and 10 (6%) patients whose genotype is not typed (Figure 4).

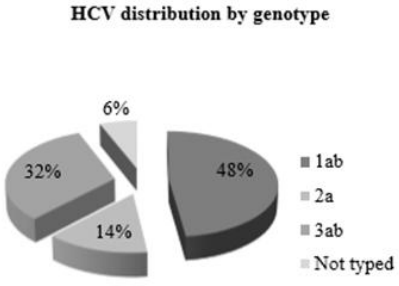

Figure 4. HCV Distribution by Genotype

To define the fibrosis level patients took liver elastometry using "FibroScan" device. Liver elastometry was carried out at the regional clinic in Shymkent. Among 213 examined patients 48 of them had F-0-1 that was relevant to 23% of patients, 71 (33%) had F-2, 66 (31%) had F-3, and 28 (13%) patients had F-4, which corresponds to cirrhosis (Figure 5).

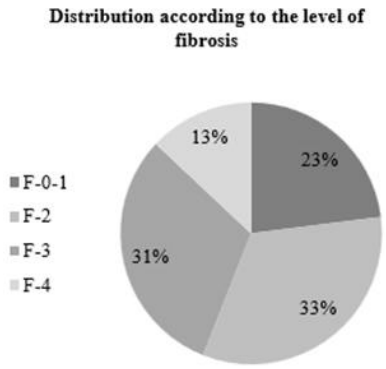

Figure 5. Distribution According to the Level of Fibrosis

Table 1 shows that among examinees 30 patients have CVH B monoinfection, 164 patients have CVH C, while the remainder is for mixed hepatitis. The average age of patients with CVH B is 35.9 ± 7.5, while the average age of those with CVH C ranges from 36.3 ± 8.9. Among examined patients with CVH B men suffer more frequently (59%) than women (41%), while with CVH C women suffer more often (53%) than men (47%). According to the activity of infection process among patients with CVH B 25 (51%) patients had the minimal level of activity, 13 (27%) – low level, and 11 (22%) patients – moderate level (Figure 6).

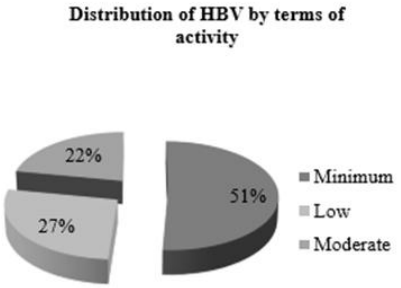

Figure 6. Distribution of HBV by Terms of Activity

Among the patients with CVH C 101 (62%) of them have a minimal level, 46 (28%) – low level and 17 (10%) – moderate level of activity (Figure 7).

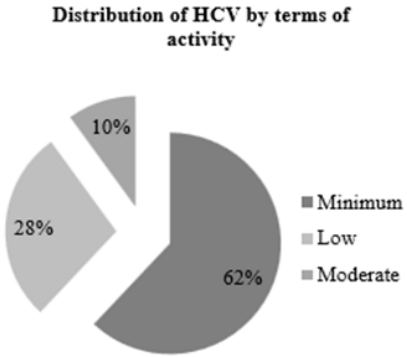

Figure 7. Distribution of HCV by Terms of Activity

Among the examined patients were those who had drug and alcohol addiction in their medical history. In the group of patients with CVH C, 6 patients have drug, and 7 of them have alcohol addiction in their medical history. The same results were in the group of patients with CVH B: 7 patients have a drug addiction and 5 – alcoholism in their history.

Table 1. Features of Groups

	CVH B	CVH C	Total
Monoinfection	30	164	194
B+D	4		4
C+B		15	15
average age, in years	35.9 ± 7.5	36.3 ± 8.9	36.1 ± 8.2
of men	29	78	107
of women	20	86	106

minimal activity	25	101	126
low activity	13	46	59
moderate activity	11	17	28
drug addiction	7	6	13
alcohol addiction	5	7	12

Clinical examination of patients with HBV and HCV infections included detailed interview, defining of the epidemiological history and anamnesis morbi (Table 2).

Table 2. Risk Factors for Infection of Viral Hepatitis

Epidemiological history	**abs.**	**%**
Acute Viral Hepatitis in history	36	16.9
visited the dental office	49	23
surgical and gynaecological interventions	33	15.5
contact inside family	18	8.4
sexual way	15	7
blood transfusion including plasma transfusion	15	7
injection drug use	13	6.1
medical manoeuvres at the hospital	11	5.2
professional contact of medical worker	11	5.2
possible prenatal infection	7	3.4
tattoo	5	2.3
Total:	**213**	**100**

The table shows that the most common risk factor for infections is treatment at the dentist (23% of cases), and various surgical gynecological interventions (15.5% of cases). Only in 17% of cases patients noted experienced acute viral hepatitis. Its etiological deciphering is either unknown or not record. Perinatal infection was supposed when viral hepatitis of the same etiology was revealed at the patient's mother. The clinical signs were seen at an early age.

According to the protocol all patients were treated by the following research methods:

- Specialist advice: gastroenterologist, neurologist, endocrinologist, cardiologist, therapeutist, infectiologist, hematologist, skin venereologist, allergologist;
- Ultrasound investigation of the liver, gall bladder, pancreas, and spleen;
- Esophagogastroduodenoscopy;
- Rheoencephalography, doppler sonography of brain vessels, brain computed tomography and MRI;
- Ultrasound investigation of the prehyoid gland;
- Definition of prehyoid gland hormones;
- Definition of glucose in blood;
- ECG, echo-cardiography. (12-14)

3 Results and Discussion

It was found out that patients with CVH B the most often had pathology of digestive tract, cardiovascular and genitourinary system. The most often diabetes mellitus was revealed at patients with HCV infection ($p < 0.01$) among comorbidity. The hypoplastic anemia (22% in case of HCV and 8.2% in case of HBV) and thrombocytopenia (22.1% and 10,2% respectively) were the most often observed at patients regarding the hematopoietic system.

According to instrumental methods of examination, the pathology from the digestive, urinary, cardiovascular, endocrine, reproductive, blood and autonomic nervous system were revealed at patients. (15-16)

According to a laboratory and instrumental examinations patients frequently had symptoms of gastritis, duodenitis, cholecystitis, and pancreatitis from the digestive system. Among the diseases of a digestive tract, a diagnosis of cholecystitis and pancreatitis is the most common. In the group of patients with CVH C 114 patients (69.5%) was diagnosed with cholecystitis as well as 42 patients (85.7%) ($R<0.001$) in the group of CVH B. In the first group of 85 patients (51.8%) with CVH C, and in the group 25 patients (51%) with CVH B pancreatitis was rarely seen. In 29.9% of cases (49 patients) patients with CVH C were diagnosed with gastritis. In 31.1% of cases (51 patients), they have verified the diagnosis of duodenitis. In the second group of patients with HBV infection 15 patients (30.6%) from 49 had gastritis.17 patients (34.7%) had duodenitis.

According to an examination of ultrasound investigation, urinary tests and specialist advice pathologic features of the urinary system were revealed. Lithic diathesis was one of the kidney disorders. It was featured by high urates level in a simple urine test and equally often was seen in groups of patients with HCV and HBV infection. In 11% of cases (18 patients) people with CVH C and 10.2% of cases (5 patients) people with CVH B. Diagnosis of the urinary system, infection was set to 54 (32.9%) of 164 patients with HCV infection and 19 patients (38.8%) with the HBV.

According to the record of diagnosis and treatment of CVH all the patients had a cardiologist consultation. 42 patients were revealed to have arterial hypertension of different severity. 30 of 42 patients included the group of patients with CVH C. That was 18.3%. The other 12 patients (24.5%) suffered from CVH B. Also according to the ECG and thorough clinical interview patients were diagnosed with ischemic heart disease. Patients with CVH B had ischemic heart disease more frequently than patients with HCV infection. In 4.9 % of cases (8 patients) in the group of patients with CVH C, and in 18.4% of cases (9 patients) people with HBV ($R < 0.05$).

Among the patients with CVH disorder of the endocrine system was seen. That was clinically seen as diabetes mellitus, autoimmune thyroadenitis, and Basedow's goiter. Female patients with CVH often suffered from mastopathy, adnexitis, disorders of the menstrual cycle, endometriosis, stillbirth, and miscarriage. Also, there were cases when women were diagnosed with natural sterility and various tumors in the female genital zone. (17-18)

The frequency of diabetes mellitus was a bit different among patients depending on viral hepatitis etiology. In the group with CVH C patients had diabetes 2 times more than groups with CVH B reliably $R < 0.01$. In 13.4% of cases (22 patients) people with HCV infection and 6.1 % of cases (3 patients) the people with CVH B.

Female patients with HCV and HBV with the same frequency had such co-morbidities as natural sterility, endometriosis and benign tumors in the female genital zone. In 4.3 % of cases (7 patients) people with CVH C and 4.1% of cases (2 patients) people with CVH B have endometriosis. In 1.8% of cases (3 patients) people with HCV had sterility. In 4.9 % of cases (8 patients) people had tumors. The same results were found among patients with CVH B (sterility – 2.0%, tumors – 4.1%). Patients with the HBV most often suffered from menstrual cycle disorders. 20 (12.2%) and 14 patients (28.6%) with the HBV (R <0.05) in groups with CVH C had menstruation disorder.

According to the research, patients with HCV more often had adnexitis, mastopathy, and miscarriages. In 14% of cases (23 patients) people with CVH C and in 10.2% of cases (5 patients) people with the HBV were diagnosed with adnexitis. Patients with CVH C had mastopathy in 5.5% of cases (9 patients), and miscarriages in 9.1% of cases (15 patients). 2 % (1 patient) – mastopathy, 6% (3 patients) – miscarriages. Patients with an HBV were diagnosed with them.

Males of both groups were diagnosed with prostatitis with the same frequency. 15 patients (9.1%) from the group with CVH C and 5 patients (10.2%) from the group with CVH B suffered from the disease.

The pathology of the hematopoietic system was also revealed during the examination. Patients with CVH C in 22 % of cases (36 patients) had thrombocytopenia. The latter was approved laboratorially as a decrease of blood plates within 113-140x109/l. Diagnosis “hemophthisis” was verified among 36 patients (22 % of cases) and described as a decrease of hemoglobin level from 85-118g/l. In the group of patients with CVH B, these indexes differ. Thrombocytopenia was diagnosed among 5 patients (10.2%) (P < 0.05), hemophthisis – among 4 patients (8.2%) (P < 0.001) (Table 3).

Table 3. Intercurrent/systemic diseases among patients with CVH

n = 213	CVH C		CVH B		P
	n = 164		n = 49		
Comorbidity	abs.	M ± m	abs.	M ± m	
Digestive system					
Gastritis	49	29.9 ± 3.6	15	30,6 ± 6,6	
duodenitis	51	31.1 ± 3.6	17	34.7 ± 6.8	
cholecystitis	114	69.5 ± 3.6	42	85.7 ± 5.0	<0.001
pancreatitis	85	51.8 ± 3.9	25	51.0 ± 7.1	
Urinary system					
Urinary system infections	54	32.9 ± 3.7	19	38.8 ± 7.0	
lithic diathesis	18	11.0 ± 2.4	5	10.2 ± 4.3	
Cardiovascular system					
arterial hypertension	30	18.3 ± 3.0	12	24.5 ± 6.1	
ischemic heart disease	8	4.9 ± 1.7	9	18.4 ± 5.5	<0.05
Endocrine system					
diabetes mellitus	22	13.4 ± 2.7	3	6.1 ± 3.4	<0.01
Reproductive system					
prostatitis	15	9.1 ± 2.3	5	10.2 ± 4.3	
menstrual cycle disorders.	20	12.2 ± 2.6	14	28.6 ± 6.5	<0.05
adnexitis	23	14.0 ± 2.7	5	10.2 ± 4.3	
benign tumors in female genital zone.	8	4.9 ± 1.7	2	4.1 ± 2.8	
endometriosis	7	4.3 ± 1.6	2	4.1 ± 2.8	
mastopathy	9	5.5 ± 1.8	1	2.0 ± 2.0	
natural sterility	3	1.8 ± 1.1	1	2.0 ± 2.0	
stillbirth, miscarriage	15	9.1 ± 2.3	3	6.1 ± 3.4	
Autonomic nervous system					
Vegetovascular dystonia	13	7.9 ± 2.1	3	6.1 ± 3.4	
Hematopoietic system					
hemophthisis	36	22.0 ± 3.2	4	8.2 ± 3.9	<0.001
thrombocytopenia	36	22.1 ± 3.2	5	10.2 ± 4.3	<0.05
Other					
systemic candidiasis	4	2.4 ± 1.2	1	2.0 ± 2.0	
lichen acuminatus	1	0.6 ± 0.6	1	2.0 ± 2.0	
herpes recidivicus	3	1.8 ± 1.1	1	2.0 ± 2.0	
hemorrhoid	5	3.0 ± 1.3	4	8.2 ± 3.9	
allergosis	25	15.2 ± 2.8	5	10.2 ± 4.3	

Patients with HVG provided objectively more complaints. These complaints were mainly the sign of as the novegetative syndrome and syndrome of gastric indigestion. Nature of complaint and objective examination data mainly indicate the development of diverse pathologies of the intestine organs among patients with CVH B that is more frequent compared to the patients with CVH C: chronic gastritis, cholecystitis, pancreatitis. (19)

Often complaints regarding the pathology of the digestive tract are firstly responsible for a patient's visit to a doctor. Upon further examination, they are diagnosed with chronic HBV and/or HCV infection. Pathogenesis of gastrointestinal tract

disorder is not clear enough. Development of gastritis, duodenitis, pancreatitis may be due to any virus. Otherwise, this is a reactive state. (2,20)

Higher regular gastrointestinal pathology among patients with viral hepatitis is related to some factors. Development of gastritis, duodenitis, pancreatitis may be due to replication of the viruses B and C in the cells of the mucous membrane. However, such replication is probably less important. Apparently, the more frequent reason is dysfunctions related to the actual process of chronic liver pathology, a disorder of fine regulation of the digestive processes by "small" hormones and regulatory proteins such as cholecystokinin. (3,21-22)

In the case of CVH, there is a bile outflow due to the development of biliary dyskinesia. In the case of biliary dyskinesia on the hypotonic type, reactive cholecystitis proceeds with stratification of infection (due to development of stagnant processes). Biliary dyskinesia on hypertonic type provides an increase of ductus choledochus pressure which can lead to an outflow of pancreatic secretion. (23) So, biliar-dependent pancreatitis is formed. In the case of hepatoenteric circulation, disorder bile flows chaotically into the duodenum. That hinders digestion and absorption of fat and other substances of lipid nature, reduces the bactericidal activity of duodenal content, leads to microbial semination of duodenum, weakens growth and functioning of normal intestinal microflora. Affected by microflora, bile acids are subject to an early deconjugation. At the same time, the mucose membrane of the duodenum, small intestine, and colon are hurt. Reflux gastritis, duodenitis, enteritis, and colitis proceed. Besides, dysbacteriosis itself increases pressure in the duodenum (due to fermentation and gasification processes), and then the bile is flown into stomach along with following irritation of mucous membrane and the development of reflux gastritis. Thus, all the above mentioned processes are closely interrelated. (4,24)

Reasonably, more frequent development of digestive tract pathology (which is either concomitant or systemic sign of CVH) in case of HBV infection is most probably due to the fact that all the pathogenetic mechanisms that are important in the pathology of the tract (virus replication, dysfunctions, immunocomplex vasculitis) are more prominent with HVH B.

Pathology of the blood system is a special group in case of HCV and HBV infection. Chronic viral hepatitis is often accompanied by anaemic and thrombocytopenic syndromes. Nosological entities are a special group of HBV and HCV infection. Direct cytopathic effect of viruses and/or the following development of immune disorders is important in the pathogenesis of these nosological entities: anaemia, immune cytopenias, peripheric pancytopenia, thrombocytopenia. (25)

Changes in the structure and metabolism of peripheral blood erythrocytes are very important to cause disorder of red blood system in case of chronic viral hepatitis. They typically precede quantitative changes in red blood indexes and are an early index of an erythron to be involved in the pathological process.

Endocrine disorders typical for CVH: diabetes mellitus, menstrual cycle disorders, adnexitis, benign tumors of the female genital zone, endometriosis, mastopathy, natural sterility, stillbirth, miscarriage. The frequency to reveal diabetes mellitus type II reaches 15-20% among patients with HCI infection. It depends on a patient's sex, age and the stage of disease (cirrhosis). Besides, among diabetics is a higher frequency of HCV infection than among the population. Mechanisms to procceed diabetes type II in case of HCV infection are rather vague. But it is found that α glucose tolerance increases due to interferon therapy. Despite insulin resistance may proceed regardless of VHC, a great number of clinical and experimental researches suggest that VHC is important in its pathogenesis. This aspect is important because insulin resistance may not only accelerate the development of cirrhosis and hepatocellular carcinoma in the outcome of CVH C but also may reduce the response to antiviral therapy. (2,26-27)

The fact that VHC may cause diabetes mellitus was firstly supposed by Allison et.al. in 1994. Since that time dozens of research papers have been published to study the relationship between VHC and diabetes mellitus type II. Based on some researches carried out in various parts of the world we found that from 13% to 33% of patients with chronic CVH C more often have diabetes mellitus type 2. (3-4,28-29)

Adnexitis, benign tumors of female genital zones, endometriosis, mastopathy were the most common among patients with CVH C. (30) More frequent sign of hemorrhagic syndrome and dysmenorrhea among patients with hepatitis B also have to be explained. It should be noted that reproductive function disorder in case of HBV and HCV infections are due to the general vascular lesion. Immunocomplex vasculitis leads to degenerative changes in the pituitary-hypothalamic area, followed by the development of dysfunction in hormonal homeostasis.

Kidney damage with chronic infection due to HBV may be provided in multiple forms such as chronic glomerulonephritis, tubulo-interstitial nephritis, and nephropathy as part of vasculitis in case of giant cell arteriitis along with HBV infection. Pathogenesis of nephropathy associated with HBV is due to the formation of immune complexes which contain HBV antigens: HBsAg, HBcAg, HBeAg. (31-32)

Various viral agents of infections including those caused by hepatitis viruses are polysyndrome. Viruses are often considered to be etiological factors of myocarditis. Considering the clinically latent period of primary chronic forms of myocarditis we may suggest that in case of HCV infection myocarditis is far more seen than diagnosed. In the pathogenesis of myocardium disorder, the following things are discussed: the possibility of HCV replication in myocardium tissue, affect of cellular immunity responses on tissue virus antigens and autoantigens induced by it, and the role of immune complexes. The role of cytokines produced by immunocyte activated by the virus is discussed, which causes negative inotropism and lesion of the heart muscle through the mechanism of nitric oxide production increase.

Systematic destruction which may occur in the case of HCV and HBV infections shows the general nature of HBV infections involving many organs and tissues in the pathological process. That hinders early diagnostics and treatment of chronic hepatitis. A variety of system extrahepatic pathology which often exceeds the clinical presentation of hepatitis as a whole, taking a label of other disease and prevails over the moderate and low observed liver process for many years means that any specialist may meet chronic HCV and/or HBV infection and its outcomes. (33-34)

A systematic lesion which is observed in case of HCV and an HBV infection reflects the general nature of those viral infections involving many organs and tissues in the pathological process. Due to that early diagnostics and treatment of chronic hepatitis is complicated. That fact is to be considered by doctors of any qualification. Screening of HCV and HBV serum markers, as well as transaminases level, is appropriate at all patients with any chronic disease.

4 Conclusion

The reason to begin our research was the fact that chronic hepatitis is one of the most dangerous diseases among people all over the world which is often mortal. Nature, mechanism, the main factors, objects, reasons of systemic pathology, and namely two types of the disease (hepatitis B and C) were observed, known, revealed, analyzed, learned, and perceived. The pathology caused by hepatitis, the process of the disease and its impact on the human body are described in the article. The differences between the first and the second type were found out. The origins of hepatitis' occurring were revealed in the paper.

Hepatitis B and C affect a very great number of people all over the world. These diseases are ones of the most harmful diseases that often lead to death.

Cirrhosis occurs due to chronic viral hepatitis B and C in 57% of cases, whereas hepatocellular carcinoma – due to that in 78% of cases. The number of people who annually die due to HBV infection, and people dying due to CVH C at the global level is provided in our article. Significant problems for timely diagnosis and treatment of chronic hepatitis C are described.

The main idea of our article was implemented. We provided a definition of Chronic Viral Hepatitis, shown and researched the difference between hepatitis B and C, HBV infection and CVH C. We found out in what way Chronic Viral Hepatitis leads to systemic pathology, and how this pathology proceeds. The methods, laboratory tools and techniques to diagnose and reveal hepatitis B and C and systemic pathology were provided in the paper.

Literature:

1. Zarski JP, Sturm, Guechot J, et al. Comparison of nine blood tests and transient elastography for liver fibrosis in chronic hepatitis C: the ANRS HCEP-23 study. J Hepatol. 2012 Jan.; 56(1):55-62.
2. Thomson BJ, Finch RG. Clin Microbiol and Infect. 2005; 11(2):86-94.
3. Boursier J, de Ledinghen V, Zarski JP, et al. Comparison of eight diagnostic algorithms for liver fibrosis in hepatitis C: New algorithms are more precise and entirely noninvasive. Hepatology. 2012 Jan; 55(1):58-67.
4. EASL Clinical Practice Guidelines: Management of hepatitis C virus infection, Journal of Hepatology. 2011; 55:245-64.
5. Feldstein A, Kleiner D, Kravetz D, Buck M. Severe hepatocellular injury with apoptosis induced by a hepatitis C polymerase inhibitor. J Cli Gastroenterol. 2009; 43(374):81.
6. EASL Clinical Practice Guidelines: management of chronic hepatitis B. European Association For The Study Of The Liver. J Hepatol. 2009 Feb; 50(2):227-42.
7. Ghany M, Nelson D, Strader D, Thomas D, Seeff L. An Update on Treatment of Genotype 1 Chronic Hepatitis C Virus Infection: 2011. Practice Guideline by the American Association for the Study of Liver Diseases. Hepatology. 2011; 54(4):1433-44.
8. Kohli A, Shaffer A, Sherman A, Kottilil S. Treatment of hepatitis C: a systematic review. JAMA. 2014; 312:631-40. Available from: ncbi.nlm.nih.gov/pubmed/25117132
9. Innes HA, McDonald SA, Dillon JF, et al. Toward a more complete understanding of the association between a hepatitis C sustained viral response and cause-specific outcomes. Hepatology. 2015; 62:355-64. Available from: ncbi.nlm.nih.gov/pubmed/25716707
10. Hsu YC, Ho HJ, Huang YT, et al. Association between antiviral treatment and extrahepatic outcomes in patients with hepatitis C virus infection. Gut. 2015; 64:495–503. Available from: ncbi.nlm.nih.gov/pubmed/25398770
11. Hsu YC, Lin JT, Ho HJ, et al. Antiviral treatment for hepatitis C virus infection is associated with improved renal and cardiovascular outcomes in diabetic patients. Hepatology. 2014; 59:1293–302. Available from: ncbi.nlm.nih.gov/pubmed/24122848
12. Cacoub P, Gragnani L, Comarmond C, Zignego AL. Extrahepatic manifestations of chronic hepatitis C virus infection. Dig Liver Dis. 2014; 46(5):16573. Available from: ncbi.nlm.nih.gov/pubmed/25458776
13. Sherman AC, Sherman KE. Extrahepatic manifestations of hepatitis C infection: navigating CHASM. Curr HIV/AIDS Rep. 2015; 12:35361. Available from: ncbi.nlm.nih.gov/pubmed/26208812
14. Gragnani L, Fognani E, Piluso A, et al. Long-term effect of HCV eradication in patients with mixed cryoglobulinemia: a prospective, controlled, open-label, cohort study. Hepatology. 2015; 61:1145-53. Available from: ncbi.nlm.nih.gov/pubmed/25431357
15. Gragnani L, Fabbrizzi A, Triboli E, et al. Triple antiviral therapy in hepatitis C virus infection with or without mixed cryoglobulinaemia: a prospective, controlled pilot study. Dig Liver Dis. 2014; 46:833-7. Available from: ncbi.nlm.nih.gov/pubmed/26853322
16. Saadoun D, Resche Rigon M, Pol S, et al. PegIFNalpha/ribavirin/protease inhibitor combination in severe hepatitis C virus-associated mixed cryoglobulinemia vasculitis. J Hepatol. 2015; 62:24-30. Available from: ncbi.nlm.nih.gov/pubmed/25135864
17. Makara M, Sulyok M, Csacsovszki O, Sulyok Z, Valyi-Nagy I. Successful treatment of HCV-associated cryoglobulinemia with ombitasvir/paritaprevir/ritonavir, dasabuvir and ribavirin: a case report. J Clin Virol. 2015; 72:66-8. Available from: ncbi.nlm.nih.gov/pubmed/26414149
18. Gragnani L, Piluso A, Urraro T, et al. Virological and clinical response to interferon-free regimens in patients with HCV-related mixed cryoglobulinemia: preliminary results of a prospective pilot study. Curr Drug Targets. 2016. Available from: ncbi.nlm.nih.gov/pubmed/26853322
19. Sise ME, Bloom AK, Wisocky J, et al. Treatment of hepatitis C virus-associated mixed cryoglobulinemia with direct-acting antiviral agents. Hepatology. 2016; 63:408-17. Available from ncbi.nlm.nih.gov/pubmed/26474537
20. Visentini M, Tinelli C, Colantuono S, et al. Efficacy of low-dose rituximab for the treatment of mixed cryoglobulinemia vasculitis: phase II clinical trial and systematic review. Autoimmun Rev. 2015; 14:889-96. Available from: ncbi.nlm.nih.gov/pubmed/26031898
21. Arcaini L, Vallisa D, Rattotti S, et al. Antiviral treatment in patients with indolent B-cell lymphomas associated with HCV infection: a study of the Fondazione Italiana Linfomi. Ann Oncol. 2014; 25:1404-10. Available from ncbi.nlm.nih.gov/pubmed/24799461
22. Michot JM, Canioni D, Driss H, et al. Antiviral therapy is associated with a better survival in patients with hepatitis C virus and B-cell non-Hodgkin lymphomas, ANRS HC-13 lympho-C study. Am J Hematol. 2015; 90: 197-203. Available from: ncbi.nlm.nih.gov/pubmed/25417909
23. Tasleem S, Sood GK. Hepatitis C associated B-cell Non-Hodgkin lymphoma: clinical features and the role of antiviral therapy. J Clin Transl Hepatol. 2015; 3:134-9. Available from: ncbi.nlm.nih.gov/pubmed/26357640
24. Rossotti R, Travi G, Pazzi A, Baiguera C, Morra E, Puoti M. Rapid clearance of HCV-related splenic marginal zone lymphoma under an interferon-free, NS3/NS4A inhibitor-based treatment. A case report. J Hepatol. 2015; 62:234-7. Available from: ncbi.nlm.nih.gov/pubmed/25285757
25. Romagnoli D, Marrazzo A, Ballestri S, Lonardo A, Bertolotti M. Sofosbuvir-based therapy cures hepatitis C virus infection after prior treatment failures in a patient with concurrent lymphoma. J Clin Virol. 2015; 69:74-7. Available from: ncbi.nlm.nih.gov/pubmed/26209383
26. Sultanik P, Klotz C, Brault P, Pol S, Mallet V. Regression of an HCV-associated disseminated marginal zone lymphoma under IFN-free antiviral treatment. Blood. 2015; 125:244-67. Available from: ncbi.nlm.nih.gov/pubmed/25858892
27. Lim LY, La D, Cserti-Gazdewich CM, Shah H. Lymphoma remission by interferon-free HCV eradication without chemotherapy. ACG Case Rep J. 2015; 3: 69–70. Available from: ncbi.nlm.nih.gov/pubmed/26504885
28. Oliveira LP, de Jesus RP, Boulhosa RS, et al. Factors associated with insulin resistance in patients with chronic HCV genotype 1 infection without obesity or type 2 diabetes. J Am Coll Nutr. 2016; 2:1-7. Available from: ncbi.nlm.nih.gov/pubmed/26933768
29. Younossi ZM, Stepanova M, Nader F, Younossi Z, Elsheikh E. Associations of chronic hepatitis C with metabolic and cardiac outcomes. Aliment Pharmacol Ther. 2013; 37:647-52. Available from: ncbi.nlm.nih.gov/pubmed/23384408
30. Safi SZ, Shah H, Siok Yan GO, Qvist R. Insulin resistance provides the connection between hepatitis C virus and diabetes. Hepat Mon. 2015; 15:239-41. Available from: ncbi.nlm.nih.gov/pubmed/25741369
31. Pavone P, Tieghi T, d'Ettorre G, et al. Rapid Decline of Fasting Glucose in HCV Diabetic Patients Treated with Direct Acting Antiviral Agents. Clin Microbiol Infect. 2016. Available from: ncbi.nlm.nih.gov/pubmed/26812446
32. Morgello S, Murray J, Van Der Elst S, Byrd D. HCV, but not HIV, is a risk factor for cerebral small vessel disease. Neurol

Neuroimmunol Neuroinflammation. 2014; 1:27. Available from: at ncbi.nlm.nih.gov/pubmed/25340079
33. Lucchese A. A potential peptide pathway from viruses to oral lichen planus. J Med Virol. 2015; 87:1060-5. Available from:ncbi.nlm.nih.gov/pubmed/25776836
34. Blackard J T, Kong L, Huber A K, Tomer Y. Hepatitis C virus infection of a thyroid cell line: implications for pathogenesis of hepatitis C virus and thyroiditis. Thyroid. 2013; 23:863-70. Available from: ncbi.nlm.nih.gov/pubmed/23259732
35. Zeni LP, Viera PD, Michalczuk MT, Birkhan OA, Vilela MA, Alvares-da-Silva MR. Hepatitis C virus induces abnormalities in surface and intraocular pressure: a comparative study. Eur J Gastroenterol Hepatol. 2013; 25:411-5. Available from: ncbi.nlm.nih.gov/pubmed/23470265.

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DEVELOPMENT OF THE TECHNOLOGICAL SCHEME OF WASTEWATER TREATMENT FROM OIL

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Abstract: The article considers the problem of realization of the cognitive and communicative approach in language education. The concept of a cognitive and communicative approach in the language education of students, which is based on the integration of cognitive and communicative approaches, has been given. In linguodidactics, the emphasis was primarily on language and communication aspects, but with the development of cognitive science, the priority of the communicative approach has been replaced by a cognitive and communicative approach in recent decades. In teaching languages, the problem of revealing the connection between communicative and cognitive approaches to the organization of linguistic education became relevant because essential characteristics of the cognitive process are predetermined by the integrative study of language as a means of learning, cognition and as a means of communication. This relationship of cognitive and communicative aspects in linguodidactics is based on the integration of the two main functions of the human language: communicative and cognitive.

Keywords: cognitive and communicative approach, language education, methodology, didactics.

1 Introduction

One of the most important tasks of the fuel and energy complex is to increase the reserves of hydrocarbons and the development of new fields. During oil production, the formation of stable oil emulsions occurs, which leads to large losses of oil, and pollution of wastewater. Watering out of productive layers of oil fields causes serious complications in the extraction, gathering, and preparation of oil associated with the formation of oil-water emulsions.

In the process of extraction in many fields, the formation water, with its pressure, displaces oil from porous rock to the wells. (1-2) Depending on the properties of the layers, the rate of withdrawal of oil, its viscosity, etc., the water flow in the well with the oil may be different. Usually, in the initial extraction period, anhydrous or low-water cut oil is extracted at a new field, but over time, the water cut of the oil increases and reaches 80–90% in old production fields, forming stable oil emulsions. (3-4)

The increase in the volume of oil production is increasingly provided by the involvement in the development of fields with hard-to-recover oil reserves. Whereby, the unit weight of heavy, high-viscosity oil production in the total volume of oil extraction increases. The difficulties of developing new fields, increasing the efficiency of wells, require the development of new technologies.

The most important problem in the extraction of heavy and high-mineralized oil is its water cut, which leads to a decrease in the oil recovery factor. In this regard, the solution to the above problem is devoted to many scientists' researches.

Groundwater on the territory of the field is opened by wells at a depth of 3-8 meters and is confined to lower quaternary and recent sediments. The water-bearing materials are sand streaks with a thickness from 4-6 m to 25-30 m, poorly continuous to the strike and occurring at different depths. The depth of bedding of the sand streaks increases in the direction towards the intercupolar areas from 50-97 m to 400-500 m and more. In terms of chemical composition and dynamics, the water indices are rather monotonous: highly mineralized up to 170.2 g/l - chloride-sulphated and sodium. (5-6)

A network of observation wells was created at the studied fields, consisting of 4 monitoring wells.

In accordance with the environmental control program, sample drawings were taken for carrying out the overall chemical composition and the presence of pollutants, including the following components: pH, dry residue, phenols, ammonium ions, petroleum products, nitrites, nitrates, copper, zinc, lead, cadmium, COD, synthetic surfactant, BOD5, hydrogen sulfide.

Laboratory analysis showed that groundwater is saline, mineralized. Due to the high salinity, these waters do not belong to the sources of drinking water supply. The increased groundwater salinity is due to natural factors.

Wastewater of fields is characterized by different mineralization and chemical composition. The salinity of water reaches 3.6–29.3 g/dm3, predominantly of chlorine-calcium and sodium sulphate composition. The amount of salts reaches 200-350 g/l, the content of chlorine ion - 37.40 g/l, sulfates - 3.8 g/l. With an increase in mineralization, sodium salts increase from 58 to 72%, the number of sulfates, alkalinity, and pH of the medium decrease. (7)

It was established that the oil content in the wastewater exceeds the MPC of 0.4 mg/dm3 by 3-4 or even more times. The content of synthetic surfactants is 0.65 mg/dm3. Very weak contamination up to 0.9 mg/dm3 is noted in the wells of 3, 5, 16, 20, 21. By the remaining samples, an excess of 3-6 times with an average value of 2.8 times. Biochemical oxygen demand (BOD) is the oxygen consumption on the neutralization (oxidation-reduction) of living microorganisms. The oxygen consumption is predominantly within the norm of 3 mg O2/dm3 and only by a few samples, exceedance of statutory criteria by 3-4 times is observed.

Chemical oxygen consumption (COD) - oxygen consumption for chemical dissolution of pollutants (petroleum products, salts of heavy metals, etc.). A certain consumption was 450 mg O2/dm3, which indicates a high degree of contamination.

The study of wastewater by the method of infrared spectroscopy (IR) showed that the main pollutant component is petroleum hydrocarbons. In addition, in small quantities (up to 3-5% of the total content), the presence of oxidized compounds and oxygenated substances was noted. Experimental studies of the treatment process were carried out in a laboratory setup.

In the laboratory conditions conducted research on the selection of binding materials and found the optimal ratio and concentration of binding additives. The optimal conditions for drying the granules and their strength was determined by the known method for agglomerates.

Experimental batches of granules of sorbents of different diameters for laboratory and integrated experiments on the sorption of oil were well-established.

Work was carried out to determine the optimal technological conditions and parameters of the process of wastewater treatment from oil deposits with composite materials and the influence of various factors on the process was investigated. In the course of works carried out, the influence of size (0.8-4.0 cm), shape (in the form of a tablet and a small ball), thickness of the granules (1.0-5.0 mm) and drying temperature (70-110°C) of well-established samples of sorbents KM-1a and GKM on the process of oil sorption. Experimental data showed that KM-1a and GCM preparations made in the form of tablets have the best sorption activity. For example, by the concentration of oil in water is 250 mg/l, for 30 minutes of the process by using a sorbent of 1.0 cm in size in the form of a tablet, the degree of water treatment from oil was 80.21 and 80.73%, and in the form of a small ball - 42, 94 and 41.09%.

In this regard, further work was carried out using sorbents KM-1a and GKM of the specified form.

2 Materials and Methods

Today, oil and oil products are one of the main types of wastewater pollution. Sources of oil and its products are oil companies, the delivery of petroleum products, their storage, processing, and use. Separate water objects contain more than a hundred cubic meters of oil pollution. (8) Built in the middle of the last century, storage facilities for the oil refining industry today are sources of pollution.

UNESCO called petroleum products the most dangerous water pollutant. They are dissolved in some liquids, and on water, they most often form a surface insoluble layer.

In the protection of nature should be guided by the principles:

- the amount of non-regenerating natural resources should be used to avoid their complete exhaustion;
- waste from the oil industry must be in a safe amount and form for wildlife. (9)

Reservoirs are not only the main source of fresh water for humans but also the living environment of many living organisms. Water makes a complete cycle of the circulation, which is important for human life.

Oil is an unrestorable natural resource. Its extraction, transportation, and processing are very harmful to the environment. The problem of oil pollution today is the most important nature of the defenders.

The question should be solved from all sides: economics, politics, and law. The technical problem can be solved with the help of individual tasks for each enterprise related to oil.

A couple of years ago it was believed that oil could not be dissolved in water. Today it is known that many products of the petroleum industry under the influence of certain factors dissolve. With the direct interaction of water and oil over time, many components become part of the composition of water. For example, at 2 hours of joint storing, the concentration of oil is 0.2 mg/l, with an increase in the period of 60 times leads to a sevenfold increase. If we consider gasoline, then the methylene and methyl groups should be taken into account. So for A76, with an increase in the duration from 2 hours to 120, the content of gasoline in water will increase from 1.4 to 11.9 mg/l, and for aromatic carbons from 2.6 to 34 mg/l. (10-11)

One of the most common man-made types of water pollution, as a result of which it cannot only be drunk, but also often used for industrial needs - these are impurities of various petroleum products.

It includes fuel oil impurities, kerosene pollution, gasoline pollution, impurities of various petroleum oils. All of the above compounds are highly toxic, which is why they are extremely dangerous for the ecological state of the environment. These oil impurities are brought into the soil along with drains, and already from it are spread through natural and artificial reservoirs, on which water intakes are installed, supplying civil and industrial facilities. (11)

Oily waste is an effluent polluted with petroleum products, as well as suspended solids and in some cases specific compounds.

In wastewater, petroleum products can be in a free, bound and dissolved state. Coarse, free petroleum products are removed as a result of thickening. For the removal of finely divided and adjacent petroleum products, flotation purification methods, electrocoagulation and electroflotation methods are traditionally used. As a result of these processes, oil products up to 20 mg/l remain in the water. Deeper treatment from finely divided, especially emulsified petroleum products up to 10 mg/l is achieved in the filtration processes. Removal of dissolved impurities up to 0.5-1 mg/l occurs at the stage of sorption purification. (12-14)

For the production of oil sorbents, a variety of raw materials are used. (15-18) By structural type, the sorbents are divided into fibrous and bulk-porous (with a closed or open pore structure). Fibrous materials are a system of thin filaments chaotically laid loosely distributed in space. As a rule, they have a spatially non-oriented structure that allows contamination to come into contact with a large surface per unit of time. In the process of absorbing oil, the fibers of the sorbents are able to move apart, creating a specific structure of the sorbent-oil, which, after collecting, gradually begins to contract under the action of gravity and drain out -25% of the collected oil product. (19-20)

Among the currently existing methods of cleaning oil-contaminated water the most effective are the following: mechanical, chemical and biological methods.

The essence of the technology of mechanical purification of water from petroleum products is that wastewater passes through several stages of filtration. At the same time, it undergoes a repeated process of settling in special equipment. This type of specialized equipment includes oil separators. In such cleaning systems of a mechanical type of action, special materials with a porous structure are used. These materials are used as water treatment filters. In this case, the principle of the system is based on the passage of oil-contaminated water through the pores of the filters, through which small water molecules pass further, while large molecules of oil, fuel oil or kerosene remain in the filter. Mechanical water purification is capable of purifying water only from about 60% of chemicals containing oil, therefore in most cases, this method is considered preparatory for the subsequent purification process. (21)

The essence of the chemical method of purifying water from petroleum products is to add special chemicals to the polluted water. In the process of interaction with polluted water, the molecules of these reagents are in contact with petroleum products, as a result of which a chemical reaction is formed. (22-23) As a result, petroleum products precipitate in the form of substances that cannot be dissolved. In most cases, surfactants are used as such chemicals or in other words reagents, as well as various oil-water emulsions. In addition, special adsorbents are quite effective, among which aluminum oxide has found wide application. Thanks to the chemical method of water purification, it is possible to achieve a sufficiently high degree of removal of oil products, the rate of which can approach the mark of 98%. (24)

Physico-chemical treatment methods characterize sorption as the absorption from the purified water by the sorbent of the solid consistency of harmful impurities that are present in it, including petroleum products. (25-26) Sorbents can be a variety of materials having a porous structure: peat, ash, silicate gel, and various types of active clays. Experts consider different types of activated carbon as the most effective sorbents.

This is due to the high rate of their porosity, as well as the large value of their specific surface. The porosity of this material varies from 60 to 70 percent, and its specific surface area (depending on what technology such coal is made) ranges from five hundred to one and a half thousand square meters per gram. (27-28)

The high degree of industrialization of modern society leads to the fact that in the course of their economic activities, a person causes significant damage to the ecology of his environment. In this regard, issues of environmental safety in general, and water purification from oil and petroleum products pollution are very important and relevant. (29-30).

3 Results and Discussion

It is established that an increase in the size of sorbents from 0.8 to 1.5 cm contributes to an increase in the degree of water treatment from oil, and a further increase in the size of the

sorbent to 4.0 cm leads to a certain decrease in this indicator. For example, by the concentration of oil in water of 250 mg/l, for 30 minutes of the process, when using KM-1a sorbent with a size of 0.8 cm, the degree of water treatment from oil from the Zhylankabak deposit is 76.30%, under these conditions, when used, cm - 80.21%, 1.5 cm - 82.63%, 2.0 cm - 80.00%, 2.5 cm - 74.70%; 3.0 cm - 69.60; 3.5 cm - 67.70% and 4.0 cm - 64.50%. From the analysis of the obtained data, it follows that when composite materials with a size of 1.5 cm tablets are used as sorbents, maximum water treatment from oil is observed.

Analysis of the obtained data showed (Figure 1) that the thickness of sorbent tablets influences the oil treatment process. So, by the content of oil in water is 300 mg/l, for 30 minutes of the sorption process by using tablets of the KM-1a preparation of 1.5 cm in size at a thickness of 1.0 mm tablets the degree of water treatment from oil is 67.70%, and the use of tablets with a thickness of 2.0 mm, respectively - 78.00%, 3.0 mm - 88.33%, 4 mm - 86.64% and 5.0 mm - 82.30%.

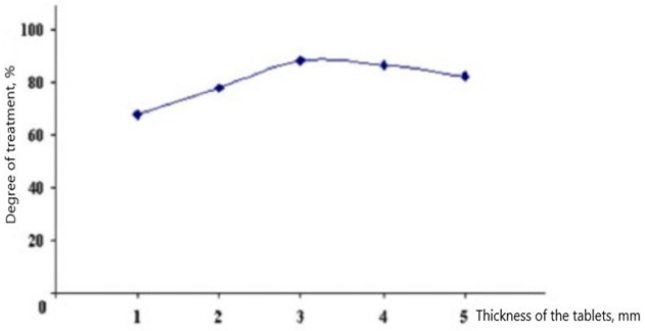

Figure 1. The Dependence of the Degree of Water Treatment on the Thickness of the Tablets of Composite Materials

The effect of the drying temperature (70-110°C) of well-established samples of sorbent KM-1a on the process of sorption of oil (Figure 2) was established. From the analysis of the data obtained, it follows that the degree of water treatment from oil decreases with an increase in the drying temperature of more than 90°C. So, the above conditions, when using a sorbent of 1.5 cm in size, dried at a temperature of 70°C, the degree of water treatment from oil is 82.63%, and at temperatures of 80, 90, 100 and 110°C, respectively, 85.30%, 87.44%, 86.25% and 84.30%. On the basis of the conducted research, the optimal conditions and parameters of the process of preparing sorbents from composite materials that are designed for cleaning wastewater from oil are determined: the form of the sorbent is a tablet, the size of the sorbent is 1.5 cm, the thickness of the tablets is 3.0 mm, the drying temperature of the sorbent is 90°C and drying time is 60 min. Experimental samples of KM-1a and GKM preparations were made in the form of tablets 1.5 cm in size and 3.0 mm thick, the drying temperature of the sorbent was 90°C, and the drying time was 60 minutes. Experimental samples of KM-1a and GKM preparations were produced in the form of tablets 1.5 cm in size and 3.0 mm thick, the made samples were dried in a drying stove at a temperature of 90°C for 60 minutes.

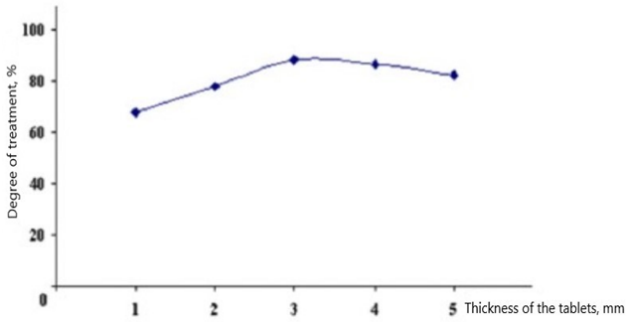

Figure 2. The Effect of Sorbent Drying Temperature on the Degree of Water Treatment From Oil With Composite Materials

The approbation of the assembled laboratory setup was carried out; during the tests, the conditions for water treatment from oil from the "Zhylankabak" field were determined. The process of sorption treatment of water was carried out in two versions: 1) using the KM-1a preparation; 2) using the GKM preparation.
According to the first variant: on the model set, there is established the influence of oil concentration (100-300 mg/l), temperature (20-60℃), time (5-60 min) and amount of sorbent (0.02-1.0 w.p.) on the wastewater treatment process of the "Zhylankabak" field (Atyrau Region).

Analysis of the data obtained (Table 1) shows that with an increase in the concentration of oil from 100 to 1000 mg/l, the degree of water treatment with KM-1a is 98.21% and 68.21%. It has been established that a further increase in the oil content does not contribute to an increase in the degree of water treatment. For example, when the concentration of oil in water is 3000 mg/l, the degree of water treatment from oil is 43.03%. The obtained results made it possible to determine the optimal ratio of the initial components of the oil from the "Zhylankabak" field and composite materials.

Table 1. The Effect of Oil Concentration on the Degree of Water Treatment (by m (KM-1a) - 0,5 w.p., t - 30 min, T- 20℃)

Oil concentrations, mg/l	Amount of a sorbed oil, g	Degree of treatment, %
100	0.0196	98.21
300	0.0568	94.64
500	0.0843	84.32

1000	0.1364	68.21
1100	0.1323	60.14
1500	0.1793	59.90
2000	0.2086	52.16
3000	0.2581	43.03

On the basis of experimental data, it was established that with an increase in the amount of sorbent KM-1a from 0.02 to 1.0 w.p. regardless of the process temperature, the degree of treatment of water from oil increases. For example, for 30 minutes of the process when the concentration of oil in water is 200 mg/l by using the KM-1a preparation in an amount of 0.02 w.p., the degree of water treatment is 27.42%, and by the amount of 1.0 w.p. - 98.03%.

Analysis of the infra-red spectrum showed that with an increase in the amount of sorbent KM-1a, the intensity of the absorption bands characteristic of oil from the "Zhylankabak" field increases. For example, the absorption bands of valence vibrations - CH2- and - CH3- groups of aliphatic molecules in the region of 2920.2855 cm-1, the deformation vibrations of the CH-groups at 1460-1455 cm-1, the deformation vibrations of the

OH-groups in the region of 1140.1100 cm-1 and valence vibrations of halogen derivatives of alkenes in the region of 670 and 600 cm-1 were found out. From the analysis of infrared spectroscopy, it follows that with an increase in the amount of the KM-1a preparation, the content of oil sorbed on the surface of the oil composite material increases.

It was established that with an increase in the duration of the sorption process from 5 to 60 min, the degree of water treatment increases from 66.10 to 95.70% (Figure 3). A further increase in the duration of the process does not lead to a noticeable increase in the efficiency of sorption; most of the oil is sorbed for 30 minutes.

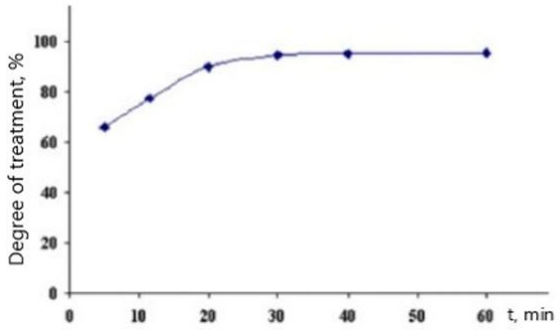

Figure 3. Dependence on the Degree of Water Treatment on time (Co- 300mg/l, m (KM-1a) – 0,5 m.p., T- 20°C)

It has been established that with an increase in the time of the sorption process, the intensity of the absorption bands of the sorbed oil from the "Zhylankabak" field increases. For example, in the infra-red spectrum of the samples obtained, absorption bands at 2924 and 2855 cm-1 were observed, which are characteristic of valence vibrations C-H- bonds in the methylene groups, absorption at 1604 cm-1 refer to planar vibrations of C=C- bonds of aromatic compounds, and in the region of 1457 and 1376 cm-1, the absorption bands of antisymmetric and symmetric deformation vibrations of C-H- bonds in the C-CH3- groups are manifested.

In the second variant, the dependence of the degree of water treatment on the concentration of oil (oil content in water 100-3000 mg/l) and the amount of sorbent (1.0-5 w.p.), temperature (20–80°C) and time (5-60 min) were established; as a sorbent, the GKM preparation was used in the form of tablets.

The obtained data showed (Figure 4) that with an increase in the concentration of oil from 100 to 3000 mg/l, the degree of water treatment decreases. So, when the content of oil in water is 100 mg/l at a process temperature of 20°C for 30 minutes, the sorption process by the amount of GKM sorbent is 1.0 w.p., the degree of treatment is 96,50%, and by oil content of 3000mg/l - 44,70%. Apparently, under these conditions, the pores of the GKM preparation are filled with oil, and its sorption capacity decreases. During the tests on the enlarged set, it was revealed that an increase in the amount of sorbent from 1.0 to 3.0 w.p. (Table 2) leads to an increase in the degree of water treatment from 93.60 to 98.60%, and with further increases in the amount of sorbent to 5.0 w.p., there is a slight increase in the degree of water treatment from oil from the "Zhylankabak" field. It follows that the optimal amount of the GKM preparation is 3.0 w.p.

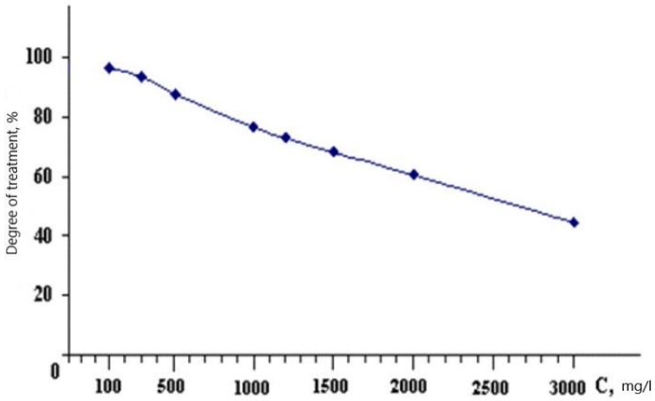

Figure 4. Dependence of the Degree of Water Treatment on the Concentration of Oil (m (GKM) - 1,0 m.p., t - 30 min, T - 20°C)

Table 2. Influence of the Amount of the GKM Preparation on the Process of Water Treatment from Oil (Co-300 mg/l, t - 30 min, T- 20°C)

Amount of GKM, m.p.	Amount of sorbed oil,g	Degree of treatment,%
1,0	0.0562	93.60
2,0	0.0576	96.03
3,0	0.0592	98.60
4,0	0.0593	98.71
5,0	0.0594	98.92

Experimental data show that increasing the temperature of the process of cleaning oil-polluted water from 20 to 80℃ leads to a slight increase in water treatment by the GKM preparation. So, at 20℃ for 30 minutes, the contact of the GKM preparation with contaminated oil (at an oil concentration in water - 200 mg/l), the degree of water treatment is 95.70%, and when the temperature rises to 80, the degree of water treatment reaches to 99.43%. From the analysis of the research results, it follows that most of the oil is sorbed at a temperature of 20-30.

Analysis of the data presented in Figure 5 shows that the degree of wastewater treatment from oil by the GKM preparation depends on the duration of the sorption process. For example, after 5 minutes of contact, the degree of water treatment from oil is 61.20%, and with a sorption duration of 10, 20, 30, 40 and 60 minutes, respectively, 73.0; 86.2; 93.6; 94.1 and 94.6%.

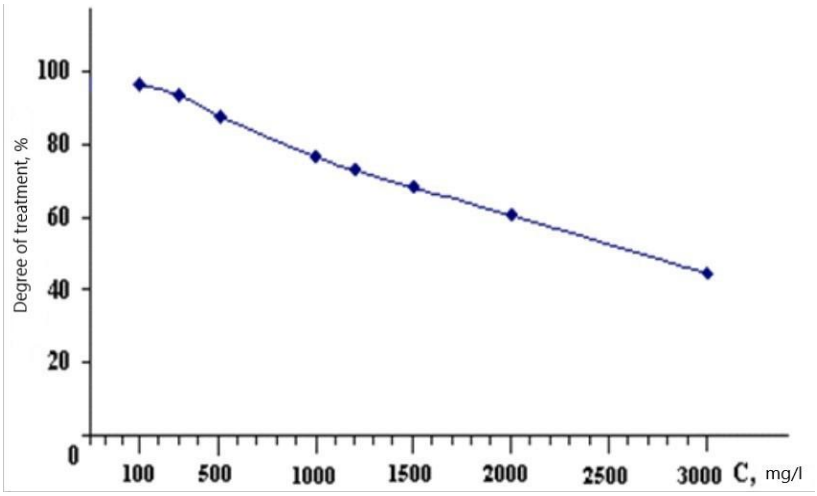

Figure 5. Dependence of the Degree of Water Treatment on Time (Co– 300mg/l, m (GKM)- 1,0 m.p., T- 20℃)

On the basis of the obtained results, it was established that the sorption process intensively proceeds within 30–40 min.

To achieve this goal were identified:

- the water cut of the productive layers of oil fields and wastewater pollution;
- viscosity, mineralization, and congelation of the extracted oil; and the following tasks are set:
- to investigate the physicochemical properties of composite materials to determine their effectiveness in the dehydration of oil and the sorption of oil-containing wastewater.
- theoretically and experimentally to develop an effective technology for the process of oil dehydration and the process of sorption of oil-containing wastewater using composite materials.

3.1 The degree of readiness of the problem

Researches from Russia, the USA, Canada, Japan, and others are engaged in research into the physicochemical and technological patterns of the processes of oil dehydration and sorption of oil-containing wastewater for oil fields. Firms that develop and supply various composite materials and other demulsifying reagents based on Organic compounds that provide effective separation of oil-water emulsions operate in many countries. However, the most effective technological solution to dehydration of oil and sorption of oily wastewater using composite materials is practically absent in practice.

3.2 Methods

The most important component of integral technology is a hypertextual representation of knowledge, intended for mastering a linguistic material, which is aimed at teaching the understanding of the text of learning, hence, conscious remembering of the information obtained. (5) We believe that this work sheds light on the subject of our research due to the fact that due to the cognitive-communicative approach, the implementation of integrated technology is possible.
In the mainstream of this approach, the theoretical basis is the position about the activity nature of language, according to which language is viewed as a cognitive process carried out in communicative activity and provided with special cognitive structures and mechanisms in the human brain. (9)

The paper presents the results of studies of changes in the degree of cleaning water from oil, depending on the amount of KM-1a; infra-red spectrum of wastewater samples obtained after cleaning with the KM-1a preparation; water characteristics after cleaning with KM-1a preparation; the effect of the concentration of oil on the degree of treatment of water (at m (KM-1a) - 0.5 w.p.); technological scheme of water treatment from oil at the "Zhilankabak" field with composite materials.

At the industrial site of the oil terminal "Zhamansor" (Atyrau Region). Enlarged tests of the wastewater treatment process from the oil of composite materials based on brown coal were carried out.

Table 3. The Change in the Degree of Water Treatment from Oil Depending on the Amount of the KM-1a Preparation (C - 300 mg/l)

Amount of KM-1a, w.p.	Amount of sorbed oil, g	Degree of treatment, %
0.02	0.0540	89.93
0.05	0.0548	91.27
0.10	0.0553	92.15
0.50	0.0567	94.52
1.00	0.0575	95.06
1.50	0.0575	95.90
2.00	0.0576	96.04

During the tests, the KM-1a preparation was used in the form of a tablet with a size of 1.5 cm and a thickness of 3.0 mm of the following composition m. %: W - 11.2; A - 13.8; C, 73.70; H - 5.34; O - 19.84; N - 1.12.

In the course of the tests carried out, the effect of the amount of the KM-1a preparation (0.02-2.0 w.p.) and the oil content (100–3000 mg/l) on the degree of water treatment from oil from the "Zhilankabak" field was determined. The sorption process was carried out at a temperature of 20°C for 30 minutes. The results of the work are shown in table 4. The data obtained show that increasing the amount of sorbent from 0.02 to 2.0 w.p. contributes to an increase in the degree of water treatment from oil.

Table 4. The Effect of Oil Concentration on the Degree of Water Treatment (at m (KM-1a) - 0,5 w.p.)

Oil concentrations, mg/l	Amount of sorbed oil, g	Degree of treatment, %
100	0.0196	98.17
300	0.0567	94.52
500	0.0842	84.20
1000	0.1340	67.02
1500	0.1792	59.73
2000	0.2080	52.00
3000	0.2565	42.74

It was established that the maximum degree of water treatment from oil is achieved when the amount of the KM-1a preparation is 0.5 w.p., and the degree of treatment is 94.52%. A further increase in the amount of sorbent leads to a slight increase in the degree of water treatment from oil.

From the data of table 4 it can be seen that when using the KM-1a preparation in the amount of 0.5 w.p. when the oil content in water is 100 mg/l, the degree of water treatment is 98.17%, and with further increase in the amount of oil to 3000 mg/l, the degree of treatment drops to 42.74%.

Table 5. Characteristics of the Water, after Cleaning by the KM-1a Preparation

Denomination of pollutants, mg/l						
Petroleum products	Suspended matters	SO^{2-4}	I^-	Dissolved oxygen	H	BOD
2-3	till 6	500	00	1.5	-8.5	2-3

Table 2. Effect of Fertilizers on the Content of Nutrient Elements in the Soil, mg/kg

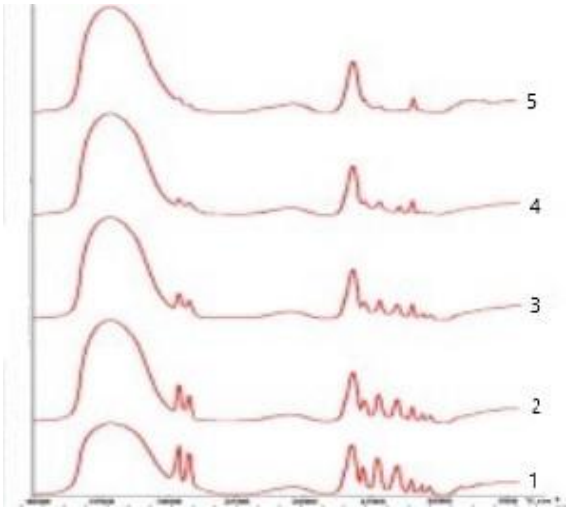

Figure 6. Infra-red Spectrum of Wastewater Samples Obtained after Cleaning with the KM-1a Preparation

1 - oil polluted wastewater; water samples with different oil content obtained after cleaning with the KM-1a preparation, mg/l: 2 - 3000; 3 - 2000; 4 - 1000; 5 - 200

It should be noted that when the oil content in water is 200 mg/l in the studied samples (Figure 6 - curve 5), the absorption bands of oil after water treatment with the KM-1a preparation are practically absent. The data obtained indicate the effectiveness of the use of composite materials for water treatment from oil.

As noted earlier in the infra-red spectrum of the samples under study, as the number of sorbent increases, the intensity of the absorption bands characteristic of oil increases.

Comparison of the spectrum shows the high efficiency of the process of sorption water treatment from oil with composite materials based on brown coal. On the basis of the conducted research, a technological scheme of the process of treatment of wastewater from oil with composite materials is proposed (Figure 7). This scheme has enclave nature; the spent sorbent can be used as a solid fuel.

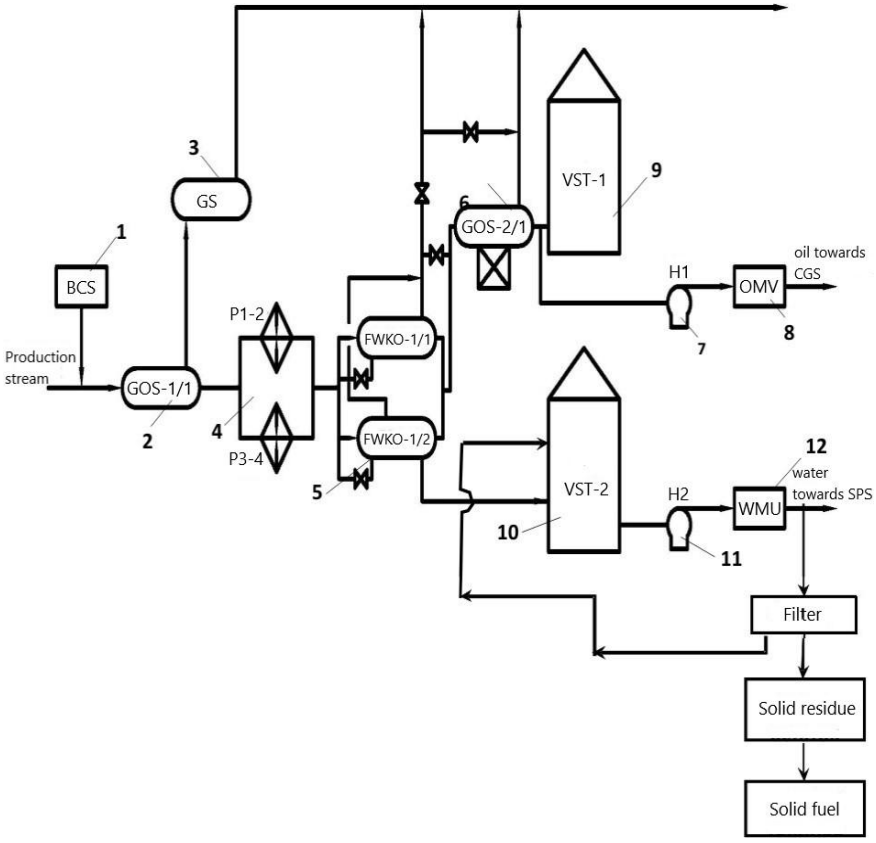

Figure 7. Technological Scheme of Water Treatment from Oil Field "Zhylankabak" by Composite Materials

1 - BCS - demulsifier dosing skid; 2 - GOS 1/1-2 - first stage separator; 3 - GS – gas separator; 4 - P-1-4 - reboiler (PP-1,6); 5 - FWKO 1/1-2 - three-phase separator; 6 - GOS-2/1 – second stage separator; 7 - H1 - oil pumping transfer; 8 - OMU - oil metering unit; 9 - VST-1 – oil vessel; 10 - VST-2 – sump tank for water treatment; 11 - H2 - pumping water transfer; 12 - WMU - water metering unit

4 Conclusion

Thus, the conducted tests have shown the possibility of using composite materials based on brown coal of Kazakhstan for the treatment of wastewater from oil by the composite materials. A flowchart of the process of cleaning wastewater from oil with composite materials has been developed. It should be noted that when the oil content in water is 200 mg/l in the studied samples (Figure 6 - curve 5), the absorption bands of oil after water treatment with the KM-1a preparation are practically absent. The data obtained indicate the effectiveness of the use of composite materials for water treatment from oil.

Literature:

1. Srna R, Thum A. Advanced Concepts in Wastewater Treatment. The Military Engineer. 1982; 74(481):292-7.
2. Peters R, White T, Ku Y, Engelder C, Anand P, Shedroff S. (1986). Wastewater Treatment: Physical and Chemical Methods. J (Water Pollution Control Federation). 1986; 58(6):481-490.
3. Emelin YaI. Novyie sorbtsionnyie materialy i dlya ochistki stochnyih vodotneftepro duktov i fenola [New sorption materials for the purification of waste water from petroleum products and phenol]; 2017. Available from: https://dspace.tltsu.ru/bitstream/123456789/4611/1/Ем..
4. Dolgopolova VL, Patrusheva OV. Sposobyi ochistki morskih akvatoriy ot neftyanyih zagryazneniy [Methods for cleaning offshore areas from oil pollution]. Molodoy uchenyiy. 2016; 29:229-34. Available from: https://moluch.ru/archive/133/37456/
5. Bespalov VI, Bespalova SU, Wagner MA. Nature protection technologies on the thermal power plant. Tomsk: TPU publishing house; 2007.
6. Kharitonov V. Great green hope. Results and prospects of alternative power engineering. Chaskor; 2009. Available from: http://www.chaskor.ru/article/alternativnye_istochniki_energii_alternativnaya_energetika_2517
7. Ruggeri AA. Huge cash infusion it tough time. The Energy and Environ Issue. 2009; 28-30. New York.
8. Vialkova E, Maksimova S. Features of wastewater treatment systems of the oil and gas field infrastructure. Conf Ser: Earth Environ Sci. 2018;181.
9. Chen G. Electrochemical technologies in wastewater treatment. Separation and Purification Technology. 2004; 38(1):11-41.
10. Kamenschikov FA, Bogomolnyiy EI. Udalenie nefteproduktov s vodnoy poverhnosti i grunta [Removal of

petroleum products from the water surface and soil]. Moscow: Izhevsk; 2006.
11. Halilova HH, Mamedov MK. Sposob ochistki vodyi ot neftyanyih zagryazneniy [The method of water purification from oil pollution]. Himiya i tehnologiya vodyi. 2008; 3:30-7.
12. Sirotkina EE, Novoselova Y. Materials for adsorption of water from oil and oil products. Chem for Sustainable Dev. 2005; 13:359-77. Jesse K. Evolution of a wastewater system. ReNew: Technology for a Sustainable Future. 2004; 88:38-41.
13. Zadvernyuk H. Sorption Capacity of Clay Minerals for Oil and Oil Products from Water Areas. In: Broekmans M, editor. Proceedings of the 10th International Congress for Applied Mineralogy (ICAM). Springer, Berlin, Heidelberg; 2012.
14. Fathya M, El-Sayed M, Ramzic M, Abdelraheemd OH. Adsorption separation of condensate oil from produced water using ACTF prepared of oil palm leaves by batch and fixed bed techniques. Egyptian J of Petroleum. 2018; 27(3):319-26
15. Roev GA, Yufin VA. Ochistka stochnyih vod i vtorichnoe ispolzovanie nefteproduktov [Wastewater treatment and recycling of petroleum products]. Moscow: Nedra; 1987.
16. Kamenschikov FA, Bogomolnyiy EI. Neftyanyie sorbentyi [Oil sorbents]. Moscow: Izhevsk; 2003.
17. Arthur JD, Langhus BG, Patel C. Technical Summary of Oil & Gas Produced Water Treatment Technologies. ALL Consulting LLC; 2005.
18. Jhansi S, Mishra S. Wastewater Treatment and Reuse: Sustainability Options. Consilience. 2013; 10:1-15.
19. Gorozhankina GI, Pinchukova, LI. Sorbentyi dlya sbora nefti: sravnitelnyie harakteristiki i osobennosti primeneniya [Sorbents for the collection of oil: comparative characteristics and features of the application]. Truboprovodnyiy transport nefti. 2000; 4:12-7.
20. Ryabchikov VE. Sovremennyie metody i podgotovki vodyi dlya promyishlennogo i byitovogo ispolzovaniya [Modern methods of water treatment for industrial and domestic use]. Moscow: DeLiprint; 2004.
21. Roev GA, Yufin VA. Ochistka stochnyih vod i vtorichnoe ispolzovanie nefteproduktov [Wastewater treatment and recycling of petroleum products]. Moscow: Nedra; 1987.
22. Jesse K. Evolution of a wastewater system. ReNew: Technology for a Sustainable Future. 2004; 88:38-41.
23. Fayza AN, Hala SD, Hisham SA, El-Shafai SA. Chemical Industry Wastewater Treatment. Environmentalist. 2007; 27:275-86.
24. Mohr K, Moore R. Removing Oil from Water. The Military Engineer. 2014; 106(687):59-60. Available from: http://www.jstor.org/stable/26354243
25. Feklistov VN, Meliev BU, Antipev VN. Razrabotka tehnologii ochistki vodnoy poverhnosti ot neftyanyih zagryazneniy pennyimi sorbentami [Development of technology for cleaning the water surface from oil pollution with foam sorbents]. Truboprovodnyiy transport nefti. 1994; 9:5-7.
26. Reeves T. Petrochemicals. Water Environ Res. 1996; 68(4):546-7.
27. Hlestkin RN, Samoylov NA, Shemetov AV. Likvidatsiya razlivov nefti pri pomoschi sinteticheskih organicheskih sorbentov [Oil spill response using synthetic organic sorbents]. Neftyanoe hozyaystvo. 1999; 2:46-9.
28. Nabatkin AN, Hlebnikov VN. Primenenie sorbentov dlya likvidatsii neftyanyih razlivov [Application of sorbents for oil spill response]. Neftyanoe hozyaystvo. 2000; 11:61-7.
29. Yong C. New technology for wastewater treatment. Centria University of Applied Sciences; 2017.
Samoylov NA, Hlestkin RN, Shemetov AV, Shammazov AA. Sorbtsionnyiy metod likvidatsii avariynyih razlivov nefti i nefte produktov [Sorption method to eliminate emergency spills of oil and oil products]. Moscow: Himiya; 2001.

Primary Paper Section: D

Secondary Paper Section: DJ

F MEDICAL SCIENCES

FA	CARDIOVASCULAR DISEASES INCLUDING CARDIO-SURGERY
FB	ENDOCRINOLOGY, DIABETOLOGY, METABOLISM, NUTRITION
FC	PNEUMOLOGY
FD	ONCOLOGY AND HAEMATOLOGY
FE	OTHER FIELDS OF INTERNAL MEDICINE
FF	ENT (IE. EAR, NOSE, THROAT), OPHTHALMOLOGY, DENTISTRY
FG	PAEDIATRICS
FH	NEUROLOGY, NEURO-SURGERY, NUERO-SCIENCES
FI	TRAUMATOLOGY AND ORTHOPAEDICS
FJ	SURGERY INCLUDING TRANSPLANTOLOGY
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FM	HYGIENE
FN	EPIDEMIOLOGY, INFECTION DISEASES AND CLINICAL IMMUNOLOGY
FO	DERMATOLOGY AND VENEREOLOGY
FP	OTHER MEDICAL FIELDS
FQ	PUBLIC HEALTH SYSTEM, SOCIAL MEDICINE
FR	PHARMACOLOGY AND APOTHECARY CHEMISTRY
FS	MEDICAL FACILITIES, APPARATUS AND EQUIPMENT

TOTAL HIP ARTHROPLASTY WITH NEW FEMORAL COMPONENT AND MONITORING OF INTRAOSSEOUS PRESSURE

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Abstract: Aim. To study whether use of newly designed rasps and femoral stem change intraosseous pressure (IOP) in distal femur during femur machining and stem implantation. Methods. The authors measured distal femur IOP in 44 patients, 19 men and 25 women with a mean age of 49.7±7.3, at six time points during Kaz NIITO hip stem (K-implant Germany) implantation using RAUMEDIC® (Germany) IOP monitor. Results. IOP averaged 62.6 ± 14.8 mm Hg (95% CI 58.2-67.0) before surgery, 61.3± 6.5 mm Hg (95% CI 59.3-63.3) after femoral neck resection, 64.5±7.6 mm Hg (95% CI 62.1-66.9) while opening the medullary canal with box chisel, 56.3± 12.6 mm Hg (95% CI 52.3-60.3) during IM canal reaming, 76.2 ± 13.1 mm Hg (95% CI 72.2-80.2) during canal rasping, 69.3 ±14.1 mm Hg (95% CI 72.2-80.2) at femoral stem impaction. Conclusions. Implantation of newly designed femoral stem does not lead to serious intraosseous pressure change, and thereby, can potentially reduce risk of fat embolism during THR.

Keywords: Hip, Arthroplasty, Intraosseous Pressure, Reaming, Rasping, Osteotomy, Embolism, Femoral, Stem, Fat Embolism, Implantation, Arthritis.

1 Introduction

Currently, total hip arthroplasty (THA) is the most reliable method of surgical treatment that stops the pain syndrome and restores function for patients with hip joint diseases. (1)

In the US over the past 10 years the number of surgeries of primary THA increased by 50% and according to various estimates, it will increase by 174% over the next 20 years. (2,3) It was calculated that 100000 surgeries for revision hip arthroplasty will perform by 2030 in United States. The reasons for unsuccessful outcomes that lead to the need for revision surgery are infection of the implant, joint instability, components instability (loosening), periprosthetic fracture (3), and the most dangerous complication that can occur are thrombosis and fat embolism. (4) The main risk factor for thrombosis and embolism is intraosseous pressure which dramatically increases in the processing of the intramedullary canal with instruments and the setting prosthesis stem.

Since that time till the middle of 20th century it was investigated in several studies. (5-14) The first time IOP was mentioned in 1882 by Schultze EOP and measured by Behau B.J in 1912 (15). It was found that long bones nailing could be associated with serious increase of IOP. (16-19) This IOP growth is a risk factor of pulmonary vascular complications. (20-23) According to the literature, the rate of fat embolism syndrome in surgery thin tramedullary canal intervention is 0.25% - 1.25%. (23) Deep vein thrombosis of the lower limbs without specific prevention is detected in45-70% of cases. (24)

Total hip replacement (THR) is an effective procedure for patients with degenerative and posttraumatic hip joint pathology. It gives patients release from pain, improves quality of life, and restores limb function. (25-32) In several studies, it was shown that IOP in distal femur increases during IM canal opening (33), reaming (34,35), cementing and stem insertion. (36, 37)

Clinical and experimental studies have shown that the fat emboli could be found in pulmonary capillaries few seconds after fracture or manipulation in IM canal. Fat from bone marrow (or subcutaneous) directly enters blood circulatory system due to increased IOP. This is considered one of the key pathogenic factor for pulmonary complications development or so called implantation syndrome. (32,38,39)

In most of the studies, change of IOP during THR had been measured only at some certain steps of femoral stem implantation but not monitored during all the procedure. (33-37)

The purpose of this study was to measure IOP during different steps of newly designed fluted femoral stem implantation in order to find out if use of new fluted rasps and stem can help to keep IOP on level close to base line during THR.

2 Materials and Methods

The authors measured distal femur IOP in 44 patients during implantation of new femoral component (KazNIITO - Patent of RK №29059. publ.10.2014, Bul. №10). There were 19 men and 25 women. The average age of the patients at the time of the surgery was 49.7±7.3. Reasons for THR were: post-traumatic coxarthrosis in 11 patients, degenerative implantation in 12, dysplastic arthritis in 9, femoral head AVN in 10, subcapital fracture neck of femur in 1, pseudarthrosis of femoral neck in 1.

2.1 IOP testing

IOP testing and THR were performed under general anesthesia with patients in lateral decubitus position. The authors tested IOP using RAUMEDIC® (Germany) pressure monitor (Figure 1). For that, they placed intraosseous needle in distal femur, through the needle, introduced into the bone catheter - microchip with sensor. In the research was monitored IOP during all steps of femoral implantation. The authors provisionally divided their IOP monitoring into 6 steps according for main steps of stem implantation.

1. Base line (Before neck resection surgery);
2. Femoral neck osteotomy;
3. IM (intramedullary) canal opening;
4. Canal Reaming;
5. Rasping;
6. Stem impaction.

Figure 1. Device RAUMEDIC® (Germany)

The plan of clinical research was approved by Ethics Comity of the Review Board of Research Institute of Traumatology and Orthopedics of the Ministry of Health of the Republic of Kazakhstan, protocol No. 213 of 13 November 2008.

2.2 Implants and instruments features

The authors added a groove to the lateral side of rasps of even number and groove on the medial side of odd number rasps (Figure 2). The femoral stem design based on clinically proved design of "K-implant Modell Minden V. Echtermeyer" anatomical stem. It is proximal fixation stem of tapered shape with a longitudinal "ribs" and structured surface.

Figure 2. Design features of Rasp

(Innovation patent of RK №23344, publ. 15.12.2010, Bull. №12)

The constructive feature of the stem is decompression groove on the outer surface (Figure 3).

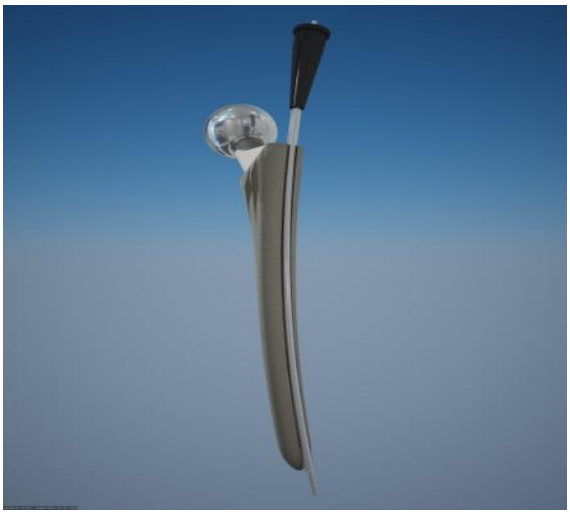


Figure 3. Design Features of the Femoral Component

On the basis of the obtained results, it was established that the sorption process intensively proceeds within 30–40 min

2.1 Statistical analysis

The results were exposed to statistical variation-processing and defined weighted arithmetic mean value (mean value), standard deviation (SD), confidence interval (95% CI).

3 Literature review

In the CIS countries the research of intraosseous pressure mainly studied the pathology of bones and joints. Intraosseous pressure response to the metal structures and prostheses wasn't run.

A number of foreign researchers examined the effects of intramedullary reaming of the medullary canal in the intraosseous pressure in animal experiments.

On the sheep model Duwelius (40) found the significant increase of intraosseous pressure in intramedullary fixation of femur with bone canal reaming, than without reaming. This histological analysis of lung tissue testified about a lot of fat embolism and dysfunction of the lungs during surgery.

Kröpflet et al. (41) got similar results on baboon model. During the intramedullary nail fixation of not reamed medullary canal the intraosseous pressure was 11 times less than the reamed canal. Embolization fat in osteosynthesis occurs during insertion of the pin, depending on the value of intraosseous pressure, but to a lesser extent in not reamed than the reamed femoral canal. However, the increase of intraosseous pressure has seen during insertion of different diameter pins. During insertion of 7 mm pin the intraosseous pressure was 76 +/- 25 mm Hg (10.1 +/- 3.3 kPa), in insertion of 9 mm pin the intraosseous pressure was - 879 +/- 44 mm Hg (117.2 +/- 5.9 kPa).

On isolated bovine bone and sheep model Smith P, Leditschke A, McMahon D, et al (42) also confirm that during the bone canal

reaming there is an increase of IOP, and histological data showed a significant higher number of fat embolism in the lung tissue of sheep.

Johnson et al. (43) studied the effect on the cadaver bone reamers of two systems Zimmer and AO for the reaction of intraosseous pressure during reaming the bone canal. They found that the IOP increases at all stages of reaming, but it has a particularly high value in the early stages of intake reamers with peak pressures ranging from 270 - 1500 mm Hg. Art. No significant differences were found in peak pressures produced by these two systems (P = 0.10) with peak pressures ranging from 270 - 1500 mm Hg. Art. No significant differences were found in peak pressures produced by these two systems (P = 0.10).

Peter et al. (44) studied the effects of 2 types of reamers on IOP during reaming the intraosseous canal in 9 patients. It is universal reamers AO / ASIF and Grey is a flexible system reamer (Howmedic). The maximum pressure was 450 mm Hg. Art. in the process of expansion with 9.0-and 9.5-mm reamers.

Mousaviet et al. (45) determined that the pressure changes during the expansion with different parameters and scanning projects. They studied the reaction of IOP using different diameter reamers (9,14,18 mm) silicon cylinder models, the rate was 15,30,50 mm per second, the number of revolutions was 150,250,500. Using a stepwise linear regression analysis, leading the speed was the most important parameter. Lowest pressure increase occurred at the lowest speed and driving the highest level at high speed and the speed of all. In their subsequent studies, the authors found that the change and improvement of intraosseous pressure depends not only on the diameter of the reamer, but from the manufacturers (JSC, Gray, Howmedica) minimum 80 mm Hg, a maximum of 2700. (46)

In Green (47) works, reported that the problem of IOP during intramedullary fixation was taken out for the first time by the founder of intramedullary fixation Gerhard Kuncher in 1940, and with the use of tools for reaming bone canal issue was still relevant. The first researchers who have proposed in the late 1960s, various systems to reduce IOP were Lorenzi, Olerud, Dankwardt-Lilliestrom. They proposed method of active bone aspirate the contents of the canal before reaming to create a negative pressure and subsequent irrigation fluid during reaming. K.M. Sturmer has proven the effectiveness of this technique in his research on sheep, made in the 1980s.

Endoprosthesis replacement is an effective treatment of diseases and injuries of the hip joint, which saves patients from the pain and lameness, improve quality of life, allows restore limb function and the ability to work. However, despite improvements in surgical technique, the treatment of pain there is a risk of complications. (54-60)

Hofmann et al (61) measured pressure after the opening of the canal, and it increased, and proposes to develop a technique of insertion to reduce.

Song et al. (62) in their studies found that during the cement prosthesis has been a significant increase of intraosseous pressure and the value ranges from 2385 mm Hg to 3710 mm Hg with the cement insertion.

Mueller et al. (63) provide evidence that the insertion of reamer is not only an increase of intraosseous pressure, but also the temperature rises inside the medullary canal. Studies of foreign scientists devoted mainly to the study of intraosseous pressure on the individual stages of arthroplasty. Although it can be assumed theoretically, that any interference in the medullary canal leads to the risk of intraoperative complications.

Beck et al. (64) studied the intraosseous pressure in the implantation of Mueller's endoprosthesis stem. IOP range varied from 590-2570 mm Hg. Art. (median = 1,293, SD = 627 mm Hg. Art.). During modified stem prosthesis the IOP - 59-574 mm Hg. Art. (median = 289, SD = 219 mm Hg. Art.). The differences were statistically significant (p = 0.0008).

Barden et al (65) conducted a randomized clinical trial using a standard endoprosthesis stem and a hollow stem with vertical and longitudinal. During installation, the standard prosthetic stem mean pressure was 82 mm Hg. Art. (minimum high, 12-259 mm Hg. Art.) and with a hollow stem - 27 mmHg (minimum high, 0-48 mm Hg. Art.). This difference was statistically significant (t-test, p = 0.00076). Opening the inside of the medullary canal the IOP averaged 35 mm Hg. Art. (Minimum maximum 4-72 mm Hg. Art.). Both groups were higher pressure at the opening of the canal and processing tools.

Significant increase in the value of intraosseous pressureis observed during hip arthroplasty especially in the implantation of the femoral componentand thus the risk of intraoperative complications increases. Thereby modern technology implants and implants to prevent excessive intraosseous pressure in the medullary cavity should be improved.

3 Results and Discussion

The main objective of the research is to determine the IOP during hip arthroplasty with new stem prosthesis. Results of research quantities of intraosseous pressure (IOP) are shown in Table I.

The average value of IOP in the distal femur, before surgery was 62.6 ± 14.8 (95% CI 58.2 -67.0) mmHg. Art. The lowest IOP observed in 1 (2.2%) patients and found 47 mm Hg. Art. High IOP was also in 1 (2.2%) patients and was 156 mm Hg. Art. In other cases, IOP in 17 (38.6%) patients ranged from 52 to 62 mm Hg, in 25 (57%) patients - from 64 to 67 mm Hg. Art.

After osteotomy of the femoral neck and head was 61.3 ± 6.5 (95% CI 59.3-63.3) mmHg. Art. Thus lowest IOP was 44 mm Hg, high - 101 mm Hg. Art. IOP from 46 to 58 mm Hg. Art. was present in 18 (40.9%) patients, from 60 to 73 mm Hg. Art. - 24 (54.5%) patients.

While opening the medullary canal with fenestrated tool was 64.5 ± 7.6 (95% CI 62.1-66.9) mm Hg. Art. Low IOP was 48 mm Hg. Art, the value of high IOP - 104 mm Hg. Art. IOP from 53 to 62 mm Hg. Art. occurred in 11 (25%) patients, from 63 to 69 - in 31 (70.4%) patients.

Analysis of the data obtained (Table 1) shows that with an increase in the concentration of oil from 100 to 1000 mg/l, the degree of water treatment with KM-1a is 98.21% and 68.21%. It has been established that a further increase in the oil content does not contribute to an increase in the degree of water treatment. For example, when the concentration of oil in water is 3000 mg/l, the degree of water treatment from oil is 43.03%. The obtained results made it possible to determine the optimal ratio of the initial components of the oil from the "Zhylankabak" field and composite materials.

Table 1. Value of Intraosseous Pressure

Stages of surgery	Number	Mean	SD	95% CI
Before surgery	44	62,6	14,8	58,2 – 67,0
After osteotomy	44	61,3	6,5	59,3 – 63,3
Prosection of canal	44	64,5	7,6	62,1 – 66,6
Intervention of rimmer	44	56,3	12,6	52,3 – 60,3
Intervention of rasp	44	76,2	13,1	72 ,2 – 80,2
Insertion of endoprosthesis Stem	44	69,3	14,1	65,1– 73,5

SD = standard deviation, 95% CI = confidence interval

The while introducing and processing with Rimmer – 56.3 ± 12.6 (95% CI 52.3-60.3) mm Hg. The value of the low IOP was 45 mm Hg. Art., IOP high - 122 mm Hg. Art. IOP from 46 to 61 mm Hg. Art. occurred in 13 (29.6%) patients, from 62 to 68 mm Hg. Art. - In 29 (65%) patients.

When using new rasp in medullary canal– 76.2 ± 13.1 (95% CI 72.2-80.2) mm Hg. This low IOP was 56 mm Hg. Art., IOP high - 152 mm Hg. Art. IOP of 57 to 74 mm Hg. Art was observed in 12 (27.2%) patients from 76 to 81 mm Hg. Article - 30 (68.2%) patients.

When fixing a new stem of prosthesis – 69.3 ± 14.1 (95% CI 72.2-80.2) mm Hg. Art. The value of the low IOP was 54 mm Hg. Art., IOP high - 155 mm Hg IOP of 55 to 65 mm Hg. Art had in 10 (22.7%) patients, 66 to 74 mm Hg. Art. - 32 (72.7%) patients.

High IOP was patient T., 33 years old (male) with aseptic osteonecrosis head of the left femur and chronic osteomyelitis in remission. Low IOP was observed in patient A., 60 years old (male) with aseptic necrosis of the head of the right femur.

The authors found no significant differences in value of IOP at the time of neck osteotomy and IM canal opening ($p > 0.05$), IOP decreased during canal reaming ($p<0.05$) and slightly increased during rasping and stem impaction (The difference was not significant ($p > 0.05$).

The authors have studied the anatomical and functional condition of the hip joint before and after surgery at term of 6, 12, 24, 36 months in 44 patients. The results were evaluated by Harris score. In the study group under the age of 20 years was 1 (2.3%) patients, 21 to 30 years - 5 (11.4%), from 31 to 40 years old - 7 (15.9%), from 41 to 50 years - 11 (25%), over 51 years - 20 (45.4%). There were 34 Asians (18male, 16 female) patients, 10 Europeans – 10 (3 male, 7 female).

From 44 patients there were 25 (56,8%) patients with comorbidities in remission-14 patients with cardiovascular system chronic diseases (coronary heart disease, hypertension, varicose veins), 2 patients with respiratory system diseases (chronic bronchitis, chronic obstructive pulmonary disease), 3 patients with chronic gastrointestinal disease (chronic cholecystitis, gastric ulcer), 3 patients with endocrine system disease (diabetes, chronic pancreatitis), 3 patients with urinary system diseases (chronic pyelonephritis, chronic prostatitis).

All patients had persistent pain, severe activity limitations (Table 2) in estimating the anatomical and functional condition of the hip joint. The average Harris score was 14. In joint function association the moderate and severe lameness was observed, patients used the additional support to walk, there were difficulties in climbing stairs, there were problems with using public transport and restrictions on the self-service. The average score was 18.7. So, the overall average score was 36.7 (95% CI 26-48).

Hip joint function assessment after 6 and 12 months indicates that there are significant positive developments in the anatomical and functional hip joint state (Figure 4). In this way the quality of patients' life improved. The decline and lack of constant pain improved in the patient's condition a lot. At home patients move around without additional support. Most of patients start using the public transport with no problems. There is an improvement of the anatomical and functional hip joint condition compared with the initial state before joint replacement surgery. In this way, the average Harris score was 91 after 6 months, 93 after 12 months. This was because of absence of pain, improving function and movement amplitude of hip joint.

Analysis of the data presented in Figure 5 shows that the degree of wastewater treatment from oil by the GKM preparation depends on the duration of the sorption process. For example, after 5 minutes of contact, the degree of water treatment from oil is 61.20%, and with a sorption duration of 10, 20, 30, 40 and 60 minutes, respectively, 73.0; 86.2; 93.6; 94.1 and 94.6%.

Table 2. Hip Joint Function by Harris Before Surgery

Patient no.	Pain	Function	Absense of deformity	Range of motion	Total score
1	10	20	4	3.7	37.7
2	20	13	4	1.3	38.3
3	10	20	4	3.7	37.7
4	10	20	4	3.7	37.7
5	10	28	4	3.7	45.7
6	10	19	4	4.2	37.2
7	0	2	4	3.9	19.9
8	10	24	4	4.6	42.6
9	10	29	4	4.6	47.6
10	10	15	4	3.3	32.3
11	10	29	3	3	46
12	10	13	4	4.3	31.3
13	10	22	4	4.4	40.4
14	10	17	4	1.6	32.6
15	10	25	4	4.9	43.9
16	10	16	4	3.1	33.1
17	10	17	4	2.5	33.5
18	10	17	4	2.5	33.5
19	10	17	4	4.6	35.6
20	10	7	4	3.3	24.3
21	10	24	3	2.5	39.5
22	20	25	4	4.8	53.8
23	20	29	4	4.8	57.8
24	10	5	4	4.3	23.3
25	10	15	4	0.1	29.1
26	0	5	4	0.1	9.1
27	10	26	4	4	44.9
28	10	24	4	2.1	40.1

29	10	14	4	3.5	31.5
30	10	27	4	3.8	44.8
31	10	28	4	4	46.0
32	10	25	4	4.2	43.2
33	10	28	4	1.9	43.9
34	44	13	4	0.1	61.1
35	10	8	4	3.4	25.4
36	10	28	4	5	47.0
37	10	2	4	3.4	19.4
38	10	16	4	3.9	33.9
39	10	14	4	4.9	32.9
40	10	9	4	1.9	24.9
41	10	22	4	3.1	39.1
42	10	13	4	3.2	30.2
43	10	25	4	4	43.0
44	10	29	4	1.6	44.6
	11.2 (10-13)	18.7(18-20)	3.9(3.8-4.0)	3.3(3.1-3.7)	36.7(26-40)

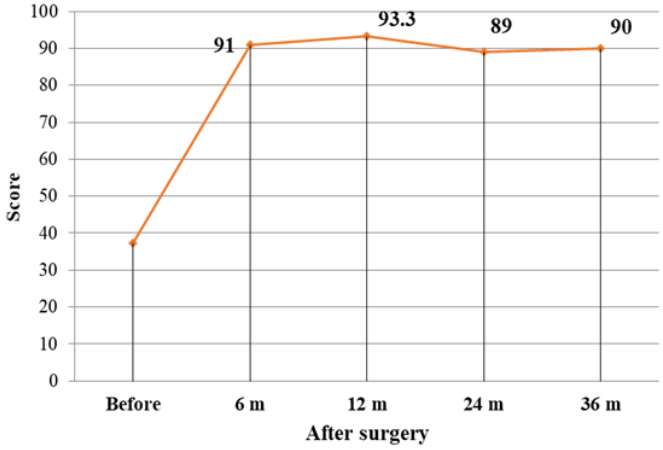
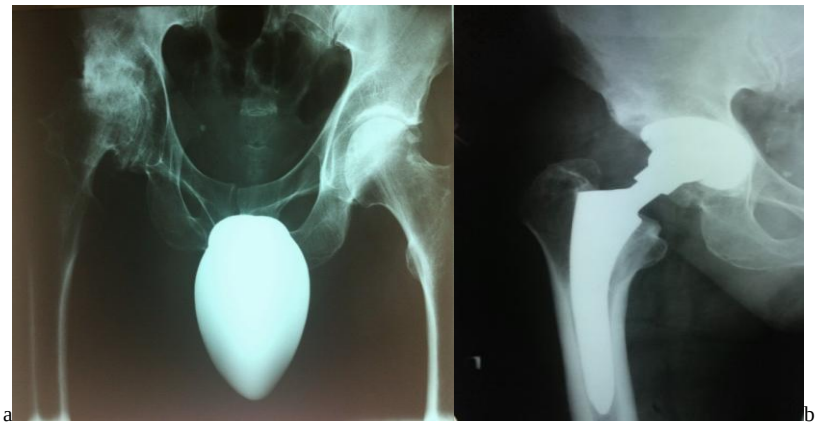


Figure 4. Average Score by Harris in Dynamics in Patients Before and After Arthroplasty Surgery

Long-term results after the new hip prosthesis components implantation were studied in 41 patients after 2 and 3 years.

The dynamics of the joint anatomical and functional condition does not deteriorate and remains at the same level. So, in the study group, after 2 years the mean Harris score was 89 ± 1.2 (95% CI 87-91), after 3 years 90 ± 1.1 (95% CI 88 - 92) points. However, it should be noted that in the dynamics anatomical and functional state of hip joint after 2 and 3 years after surgery deteriorated slightly, but remained stable. Compared with the immediate period. It should be noted that in the test group after 6 and 12 months the results were better (91 ± 1.1; 93 ± 1.3), after 2 years, and 3 (89 ± 1.2; 90 ± 1.1).

As a result, good results were seen in 85.9% of patients, satisfactory in 2 and 3 years - 11.7%, unsatisfactory - in 2.4%. Reasons for the unsatisfactory result were the instability of the acetabular implant component in 1 patient. The result of the new femoral component is shown in Figure 5.



a b

c d

Figure 5. Pre-operative radiographs of 49 – year-old men with coxarthrosis (a). Post-operative radiographs after total hip arthroplasty with new femoral component (b) and after 2 years result (c, d)

In this way, according to the literature above there is a significant increase of the intraosseous pressure and risk of peri-operative complications in hip joint arthroplasty in particular the implantation of the femoral component. During the femoral component Kaz. NIITO implantation, the value of intraosseous pressure decrease and thereby the risk of fat embolism reduces during surgery.

Analysis of the given data revealed that in total and in unicompartmental hip replacement with regard to fat intravasation, the greatest danger is the stages of the medullary canal of the femur processing, placing the femoral component of the endoprosthesis. It is necessary to perform method preventing a sharp rise in pressure in the treated cavity. The simplest of these are: placing the spongy substance cork premises of the spongy substance of removed femoral head below the tip of implemented endoprosthesisstems; placing the drainage tube to the distal cavity.

In terms of the massive fat droplets intravasation the most dangerous is period of time until the completion of the osteotomy implant prosthesis components. Severe blows to the osteotomy with no broken bones integrity can cause fat intake in the bone marrow veins. Opening of the medullary cavity of the femur causing its outflow to the outside, and the subsequent reaming exposes vascular lumen as bones and bone marrow, allowing access to their liquid fat. Each implementation of the rasp, the test prosthesis causes intake of fat tissue detritus, the air into the bloodstream.

For surgical measures preventing fat embolism operating equipment without severe impacts intact femur technic include, including the gradual opening of the medullary cavity, the removal of fatty degeneration of the bone marrow, draining its distal, as well as getting rid of coarse reintroduction of the drill, the femoral component of the endoprosthesis.

As can be seen many scholars from the evidence-based perspective medicine have seen that there is a danger of complications in hip replacement during the operation. Foreign researchers, on the basis of experimental and clinical studies, have identified key indicators of intraosseous pressure during femoral component implantation and the peak value of using different tools during joint replacement surgery.

To reduce the risk of complications in performing hip replacement, foreign scientists in conjunction with the manufacturer's studied the modernization of tools and offered a variety of aspiration-irrigation system scans, and systematic literature review has shown the effectiveness of these tools that can reduce peak intraosseous pressure.

The advantage and importance of the designs is the fact that authors have developed not only tools, but also the hip joint prosthesis. This makes it possible to minimize the intraosseous pressure in all phases of operation of the hip arthroplasty.

This replacement technology is new and promising direction compared to other implants, designed for hip replacement. The authors can see this technology in the future replacement, as this direction will improve the results of treatment and quality of patients' life.

4 Conclusion

According to the results of the clinical studies it is observed that implantation of new femoral prosthesis decreases the intraosseous pressure during implantation, and thereby reduces the risk of fatty embolism during surgery.

In scientific studies of many authors it was found that intraosseous pressure increases since the moment of opening the medullary canal. (33) Increase of intraosseous pressure while using the rimmer depends on its diameter and ranges from 45 to 2800 mm Hg. (34,35)

The studies have shown that while processing the medullary canal with rimmer the intraosseous pressure was56.3 ± 12.6 [95% CI 52.3-60.3] mm Hg. Art. when inserting new rasp – 76.2 ± 13.1 [95% CI 72.2-80.2] mm Hg. Art. While applying the cement and inserting the stem, the intraosseous pressure reaches 3710 mm Hg and holds for 8-10 minutes (36-39).

Beck et al. (64) in his prospective study of 8 patients defined intramedullary pressure in the distal femur during implantation of the femoral stem using Mueller's prosthesis. The range of the intraosseous pressure was 590-2,570 mm Hg (Mean value is 1293, SD = 627 mm Hg).

Barden et al. (65) developed a femoral endoprosthesis with vertical and long itudinal hole at the surface of an implant for reducing the intramedullary pressure and fat embolism during implantation. Randomized clinical research works have shown the intraosseous pressure ranged from27 to82 mm Hg. Art. when

using a femoral component with long itudinal grooves. These authors claim that the intraosseous pressure was lower while inserting the cored femoral component than while opening the canal and working with drills. When installing new stem, the intraosseous pressure was 69.3 ± 14.1 mm Hg. Art., and it was slightly higher than during osteotomy of femoral head and neck (61.3 ± 6.5 mm Hg. cent.), and opening the medullary canal with fenestrated tool (64.5 ± 7.6 mm Hg. cent.). There are no significant differences in the values of intraosseous pressure (p>0.05).

According to Mueller et al. (35), during the intervention of reamer not only the intraosseous pressure increases, but also the temperature in the medullary canal reaches 39.7 degrees C.

The studies have shown that the greatest value of IOP occurs when administering the rasp and fixing the stem, but there were no complications during and after surgery.

Therefore, Hofmann et al. (33) proposes to develop the technique on how to effectively fix the prosthesis to reduce the value of pressure. During the clinical study, intraosseous pressure after osteotomy of femoral head and neckshowed61.3 ± 6.5 (95% CI 59.3-63.3) mm Hg, while opening medullary canal with fenestrated tool- 64.5 ±7.6 (95% CI 62.1-66.9). mm Hg. Art. There was no significant difference in the value of the average values of intraosseous pressure in comparison with the intraosseous pressure before surgery(p>0.05).

Especially it is interesting to work on improving the design of the femoral component of hip endoprosthesis (64-65), which enables to reduce the IOP during implantation. Other authors propose to reduce the IOM to form the bone hole in the distal femur. (75,77)

Research and literature data of many authors suggest that all stages of joint replacement surgery have changes in intraosseous pressure, which reaches significant numbers, especially when inserting rasp and stem of prosthesis (33-39). However, while using new implant and rasp, there was no higher value of intraosseous pressure and complications in the study group (44 patients) at post-operative period.

And so, many researchers have noted that the implantation of the femoral component of the endoprosthesis is an increased intraosseous pressure during the opening of the channel (66), the processing of the medullary canal with reamer (155,165), the insertion of the cement and the implant stem. (67) Clinical and experimental studies have shown that fat emboli in the pulmonary capillaries appear after a few seconds after a fracture or manipulation in the medullary cavity. (68-70) The fat from the bone marrow (and subcutaneous tissue) falls directly into the systemic circulation due to increased pressure in the medullary cavity (intravasation tissue of bone marrow, fat and "debris". (71-73) It is considered the main pathogenic factor for the development of pulmonary complications and is called implantation syndrome. (74-76)

In order to reduce IOP, the authors (48-51) have proposed and investigated new aspiration-irrigation system scans (RSR, RIA), that have been tested on models of sheep, pigs, and in the clinical practice. During the study was an assessment of the following parameters: the pressure inside the medullary, hemodynamics, blood tests, lung histology and hip X-rays. At all stages of reaming IOP using the new scan (RSR) It was significantly lower compared with the AO reamer, as well as marked reduction in the number of intravenous blood fat, and Husebye et al. (52) reported that while reaming the bone channel using conventional scan IOP was 188 +/- 38 mmHg, and when using a new scanning (RIA) - 33 +/-8 mmHg.

Coxet al. (53) conducted a systematic review of the literature on the effectiveness of aspiration-irrigation system scans and the results of clinical trials. This study included a systematic review through Pubmed® and Google Scholar®, English language sources (nine non-clinical studies, seven clinical studies and seven case histories) using keywords: 'reamer' 'irrigator', 'suction'. Position is established with evidence that aspiration-irrigation system scans lead to lower IOP and simultaneously allows the sampling of bone material, reduce fat embolism (FE) and thermal necrosis (TN).

In the most research the reaction of intraosseous pressure in hip arthroplasty was studied only at certain stages of arthroplasty. The research of intraosseous pressure reaction wasn't performed since the start of surgery until completion of the femoral component endoprosthesis installation up to the present day.

In this way, the results comparison of clinical contact intraosseous pressure value shows that the hip joint endoprosthesis technology proposed by us with new femoral component has significant advantages compared to current prostheses. The intraosseous pressure during installation and during implantation of the femoral component does not increase substantially and thereby reduce the risk of fat emboli.

The advantages of this technology are shown in clinical studies conducted by us after 6, 12, 24, 36 months after surgery. Comparative analysis of the immediate and medium-term results with the data of several authors has shown a steady improvement in the dynamics of hip function.

Mironovet al. (87) obtained the results of primary total hip arthroplasty before surgery were 37.6 points by Harris score and after surgery 89.3, 92.2, 89.1 points in term of 12, 24, 36 months. In applying the new femoral component following results were obtained: preoperative Harris score was 36.7, after 12 months were 93 ± 1.3 points, after 24 months -89 ± 1.2 score, 36 months - 90 ± 1, 1 score. Similar results were also observed by other authors. (78-86) There were no significant differences in clinical outcomes (p> 0.05). However, it should be noted that there was no thromboembolic complications or fat embolism during surgery with the new femoral component.

In this way, short-term (6 and 12 months) and long-term (2 and 3 years) clinical outcomes after using new femoral component were not worse than those of other authors (88-90) and were presented by us on International combined meeting British Hip Society. (91)

Literature:

1. McLaughlin JR, Lee KR. Total hip arthroplasty with an uncemented tapered femoral component. J. Bone Joint Surg. Am. 2008; 90:1290-6.
2. Kurtz S, Mowat F, Ong K, et al. Prevalence of primary and revision total hip and knee- arthroplasty in the United States from 1990 through 2002. J. Bone Joint Surg. Am. 2005; 87(7): 1487-97.
3. Kurtz S, Ong K, Lau E, et al. Projections of primary and revision hip and knee- arthroplasty in the United States from 2005 through 2030. J. Bone Joint Surg. Am. 2007; 89(4):780-5.
4. Memtsoudis SG, Besculides MC, Liu S, Gonzalez Della Valle A. Risk factors for pulmonary embolism after hip and knee arthroplasty: a population-based study. International Orthopaedics. 2008; 33:1739-45.
5. Arnoldi CC, Linderholm H, Muoabichler H. Venous Engorgement and Intraosseous hypertension in osteoartritis of the Hip. J. Bone Jt. Surg. 1972; 54-B: 409-21.
6. AmoldiCC, Lemperg RK, Linderholm H. Intraosseous hypertension and pain in the Knee. J. Bone Jt. Surg.1975; 57-B: 360-65.
7. Bloomenthal ED, Olsen WH, Nickeles. Studies on the Bone Marrow Cavity on the Dog. Fat Embolism and Marrow Pressure. Surg. gynec. and Obset.1952; 94: 215-22.
8. Camp JF, Colwell CW Jr. Core decompression of the Femoral Head for Osteonecrosis. The J. of Bone Joint Surgeiy1986; 68 (9): 1313-19.
9. Cuthberston E, Siris EG, Gilfillan R. The effect ligation of the canine nutrient artery on intramedullian pressure. J. Bone Jt. Surg. 1964; 46-A: 781.
10. Hoffmann S, Engel A., Neuhold A. et al. Observations on the intramedullary blood flow and marrow pressure in bone. J. Bone Jt Surg.1993; 75B (2): 210-16.

11. Keck S.W., Kelly P.I. The effect of venous staasis on intraosseous pressure and longitudinal bone growth in the dog. J. Bone Jt. Surg. 1965; 47-A (3): 539-44.
12. Larsen R.M. Intramedullary pressures with particular reference to massive diaphyseal bone necrosis. Experimental observations. Ann. Surg.1938; 108 (I): 127-40.
13. Miles I.S. The use of intramedullary pressures in the early determination of asept. necrosis in the femoral head. In proceedings of the Orthopaedic Research society. J. Bone and Joint Surg.1955; 37-A: 622-23.
14. Walderrama G.F., Trueta I. The effect of muscle action on the intraosseous circulation. Pathol., Bacteriol.1965; 89(1):176-79.
15. Schultze E.O.P., Behau B.J. Abernegativen Druck in den langen Rohrenknochendes Hunden. Mench. med. wschr. 1912; 52:2849.
16. Arnoldi C.C., Linderholm H. Intraosseous Pressure in Patients with Fractures of Femoral Neck. Acta Chir. Scand. 1969; 135:407.
17. Bone LB, Johnson KD, Weigelt J, Scheinberg MD. Early versus delayed stabilization of femoral fractures. J Bone Joint Surg 1989; 71A:336-40.
18. Court-Brown CM, Christie J, Queen M. Closed intramedullary tibial nailing: Its use in closed and type 1 open fractures. J Bone Joint Surg 1990; 72B:605-11.
19. Kempf I, Grosse A, Beck G. Closed locked intramedullary nailing: Its application to communinuted fractures. J Bone Joint Surg 1985; 67A:709-20.
20. Levy D. The fat embolism syndrome. A review. Clin Orthop 1990; 261:281-296.
21. Pape HC, Auf "m" Kolk M, Paffrath T, et al. Primary intramedullary fixation in polytrauma patients with associated lung contusion: A cause posttraumatic ARDS? J Trauma. 1993; 35:540-45.
22. Wozasek GE, Neudeck F, Obertacke U, Redl H, Schlag G. Intramedullary pressure changes and fat intravasation during intramedullary nailing: An experimental study in sheep. J Trauma 1994; 36:202-7.
23. Gurd AR, Wilson RI. Fat embolism Syndrome in a Surgical Patient. J Am Board FamPract 2001; 14(4):310-3.
24. Pitto RP, Koessler M, Draener TK. The John Charnley Award. Prophylaxis of far and bone marrow embolism in cemented total hip arthroplasty. Clin. Orthop 1998; 10:23-4.
25. Leijtens B, Kremers van de Hei K, Jansen J, Koëter S. High complication rate after total knee and hip replacement due to perioperative bridging of anticoagulant therapy based on the 2012 ACCP guideline. Arch Orthop. Trauma Surg. 2014; 134:1335.
26. Li N, Liu M, Wang D, Xia L. Comparison between autologous blood transfusion drainage and no drainage/closed-suction drainage in primary total hip arthroplasty: a meta-analysis. Arch Orthop Trauma Surg. 2014; 134:1630.
27. Zhang J, Chen Z, Zheng J, Breusch SJ, Tian J. Risk factors for venous thromboembolism after total hip and total knee arthroplasty: a meta-analysis. Arch Orthop Trauma Surg. 2015; 135:759–72.
28. Bosque JJ, Coleman SI, Di Cesare P. Relationship between deep vein thrombosis and pulmonary embolism following THA and TK. Orthopedics. 2012; 35(228):234.
29. Baser O, Supina D, Sengupta N, Wang L, Kwong L. Impact of postoperative venous thromboembolism on medicare recipients undergoing total hip replacement or total knee replacement surgery. Am J Health Syst Pharm. 2010; 67:143.
30. Markovic-Denic L, Zivkovic K, Lesic A, Bumbasirevic V, Dubljanin-Raspopovic E, Bumbasirevic M. Risk factors and distribution of symptomatic venous thromboembolism in total hip and knee replacements: prospective study. Int Orthop. 2012; 36:129.
31. Pedersen AB, Mehnert F, Sorensen HT, Emmeluth C, Overgaard S, Johnsen SP. The risk of venous thromboembolism, myocardial infarction, stroke, major bleeding and death in patients undergoing total hip and knee replacement: a 15-year retrospective cohort study of routine clinical practice. Bone Joint J. 2014; 96(B):479.
32. Hagley SR, Lee FC, Blumbergs PO. Fat embolism syndrome due to total hip to arthroplasties. Med J Austr 1986; 145(1):443-44.
33. Hofman S, Hopf R, Mayer G, Schlag G, Salzer M. In vivo femoral intramedullary pressure during uncemented hip arthroplasty. Clin Orthop Relat Res. 1999 Mar; 360:136-46.
34. Mousavi M, David R, Ehteshami J, Pajenda G, Vecsei V. Pressure Changes During Reaming with Different Parameters and Reamer Designs. Clin Orthop Relat Res. 2000; 373:295-303.
35. Mueller CA, Rahn BA. Intramedullary pressure increase and increase in cortical during reaming of the femoral medullary cavity: the effect of draining the medullary contents before reaming. J Trauma 2003 Sep; 55(3):495-503.
36. Ereth MN, et al. Cemented versus noncemented total hip arthroplasty – embolism, hemodynamics and intrapulmonary shuting. Mayo ClinProc 1992; 67:1066-74.
37. Song Y, Goodman SB, Jaffe RA. An in vitro study of femoral intramedullary pressures during hip replacement using modern cement technigue. Clin Orthop Relat Res. 1994 May; 302:297-304.
38. Byrick RJ, Kay JC, Mullen JBM. Pulmonary marrow embolism: a dog model simulating dual component cemented arthroplasty. Can J Anaesth 1987; 336-42.
39. Christie J, Burnett R, Potts HR, Pell ACH. Echocardiography of transatrial embolism during cemented and uncemented hemiarthroplasty of the hip. J Bone Joint Surg [Br] 1994; 76-B: 409-12.
40. Duwelius PJ, Huckfeldt R, Mullins RJ, Shiota T, Woll TS, Lindsey KH, Wheeler D. The effects of femoral intramedullary reaming on pulmonary function in a sheep lung model. J Bone Joint Surg Am. 1997 Feb; 79(2):194-202.
41. Kröpfl A, Davies J, Berger U, Hertz H, Schlag G. Intramedullary pressure and bone marrow fat extravasation in reamed and unreamed femoral nailing. J Orthop Res. 1999 Mar; 17(2):261-8.
42. Smith PN1, Leditschke A, McMahon D, Sample RR, Perriman D, Prins A, Brьssel T, Li RW. Monitoring and controlling intramedullary pressure increase in long bone instrumentation: a study on sheep. J Orthop Res. 2008 Oct; 26(10):1327-33.
43. Johnson JA1, Berkshire A, Leighton RK, Gross M, Chess DG, Petrie D. Some basic biomechanical characteristics of medullary pressure generation during reaming of the femur. Injury. 1995 Sep; 26(7):451-4.
44. Peter RE1, Selz T, Koestli A. Influence of the reamer shape on intraosseus pressure during closed intramedullary nailing of the unbroken femur: a preliminary report. Injury. 1993; 24(3):48-55.
45. Mousavi M, Kolonja A, Schaden E, Gäbler C, Ehteshami JR, Vecsei V. Intracranial pressure-alterations during controlled intramedullary reaming of femoral fractures: an animal study. Injury. 2001 Nov; 32(9):679-82.
46. Mousavi M, David R, Ehteshami J, Pajenda G, Vecsei V. Pressure changes during reaming with different parameters and reamer designs. Clin Orthop Relat Res. 2000 Apr; 373:295-303.
47. Green J. History and development of suction-irrigation-reaming. Injury. 2010 Nov; 41(2):24-31.
48. Joist A1, Schult M, Frerichmann U, Frebel T, Spiegel HU, Koppe M, Joosten U. A new irrigation-suction boring system facilities low-pressure intramedullary boring of isolated swine femurs. Unfallchirurg. 2003 Oct; 106(10):874-80.
49. Joist A, Schult M, Ortmann C, Frerichmann U, Frebel T, Spiegel HU, Kröpfl A, Redl H. Rinsing-suction reamer attenuates intramedullary pressure increase and fat intravasation in a sheep model. J Trauma. 2004 Jul; 57(1):146-51.
50. Husebye EE, Lyberg T, Opdahl H, Laurvik H, Røise O. Cardiopulmonary response to reamed intramedullary nailing of the femur comparing traditional reaming with a one-step reamer-irrigator-aspirator reaming system: an experimental study in pigs. J Trauma. 2010 Oct; 69 (4):6-14.
51. Masquelet AC, Benko PE, Mathevon H, Hannouche D, Obert L. Harvest of cortico-cancellous intramedullary femoral bone graft using the Reamer-Irrigator-Aspirator (RIA). Orthop Traumatol Surg Res. 2012 Apr; 98(2):227-32.
52. Husebye EE, Lyberg T, Madsen JE, Eriksen M, Røise O. The influence of a one-step reamer-irrigator-aspirator technique on the intramedullary pressure in the pig femur Injury. 2006 Oct; 37(10):935-40.

53. Cox G, Jones E, McGonagle D, Giannoudis PV. Reamer-irrigator-aspirator indications and clinical results: a systematic review. Int Orthop. 2011 Jul; 35(7):951-6. DOI: 10.1007/s00264-010-1189-z.
54. Pitto RP, Koessler M, Draener TK. The John Charnley Award. Prophylaxis of far and bone marrow embolism in cemented total hip arthroplasty. Clin Orthop. 1998:23-24.
55. Wu PK, Chen CF, Chung LH, Liu CL, Chen WM. Population-based epidemiology of postoperative venous thromboembolism in Taiwanese patients receiving hip or knee arthroplasty without pharmacological thromboprophylaxis. Thromb Res. 2014; 133:719.
56. Friedman RJ, Hess S, Berkowitz SD, Homering M. Complication rates after hip or knee arthroplasty in morbidly obese patients. Clin Orthop Relat Res. 2013; 471:3358.
57. Adelani MA, Archer KR, Song Y, Holt GE. Immediate complications following hip and knee arthroplasty: does race matter? J Arthroplasty. 2013; 28:732.
58. Dua A, Neiva S, Sutherland A. Does previous varicose vein surgery alter deep vein thrombosis risk after lower limb arthroplasty? Orthop Surg. 2012; 4:222.
59. Lapidus, et al. Symptomatic venous thromboembolism and mortality in orthopaedic surgery – an observational study of 45 968 consecutive procedures. BMC Musculoskeletal Disorders. 2013; 14:177.
60. Najafzadeh, et al. Patients' perception about risks and benefits of antithrombotic treatment for the prevention of venous thromboembolism (VTE) after orthopedic surgery: a qualitative study. BMC Musculoskeletal Disorders. 2015; 16:319.
61. Hofman S, Hopf R, Mayer G, Schlag G, Salzer M. In vivo femoral intramedullary pressure during uncemented hip arthroplasty. Clin Orthop Relat Res. 1999 Mar; 360:136-46.
62. Song Y, Goodman SB, Jaffe RA. An in vitro study of femoral intramedullary pressures during hip replacement using modern cement technigue. Clin Orthop Relat Res. 1994 May; 302:297-304.
63. Mueller CA, Rahn BA. Intramedullary pressure increase and increase in cortical during reaming of the femoral medullary cavity: the effect of draining the medullary contents before reaming. J Trauma 2003 Sep; 55 (3): 495-503.
64. Beck A1, Strecker W, Gebhard F, Arand M, Krischak G, Kinzl L. Influence of prosthesis design on intramedullary pressure formation in femur shaft implants of cemented hip endoprostheses. Unfallchirurg. 2001 Dec; 104(12):1140-4.
65. Barden B1, Seel W, Lцer F, Konermann H. The cement free hollow hip prosthesis to reduce intramedullary pressure.Z Orthop Ihre Grenzgeb. 2004 May-Jun; 142(3):298-302.
66. Hagley SR, Lee FC, Blumbergs PO. Fat embolism syndrome due to total hip to arthroplasties. Med J Austr 1986; 145-1: 443-44.
67. Ereth MN, et al. Cemented versus noncemented total hip arthroplasty – embolism, hemodynamics and intrapulmonary shuting. Mayo Clin Proc 1992; 67:1066-74.
68. Levy D. The fat embolism syndrome. Clin Orthop 1990; 261:281-296.
69. Pape HC, Auf "m" Kolk M, Paffrath T, et al. Primary intramedullary fixation in polytrauma patients with associated lung contusion: A cause posttraumatic ARDS? J Trauma. 1993; 35:540-545.
70. Wozasek GE, Neudeck F, Obertacke U, Redl H, Schlag G. Intramedullary pressure changes and fat intravasation during intramedullary nailing: An experimental study in sheep. J Trauma 1994; 36:202-207.
71. Byrick RJ, Kay JC, Mullen JBM. Pulmonary marrow embolism: a dog model simulating dual component cemented arthroplasty. Can J Anaesth 1987; 336-42.
72. Christie J, Burnett R, Potts HR, Pell ACH. Echocardiography of transatrial embolism during cemented and uncemented hemiarthroplasty of the hip. J Bone Joint Surg [Br] 1994; 76-B:409-12.
73. Gurd AR, Wilson RI. Fat embolism Syndrome in a Surgical Patient. J Am Board FamPract. 2001; 14(4):310-3.
74. Porsch M, Schmidt J, Brimmers P, Menne A, Merkle W. Intrafemoral pressure measurement in different cement removal procedures during hip prosthesis replacement operations--experimental study with cadaver femora. Biomed Tech (Berl). 1998; 43(3):53-7.
75. Heim D. Experimental results of intra-osseous pressure in various surgical procedures of the long bones. Orthopade. 1995; 24(2):104-13.
76.Strecker W1, Franzreb M, Gerber J, Rosenheimer M, Kinzl L. Intraoperative recording of intramedullary pressures with a microprobe. Biomed Tech (Berl). 1993 Dec; 38(12):314-6.
77. Engester LB, Strand T, Raugstad TS, Huseb S, Langeland N. Effects of a distal venting hole in the femur during total hip replacement. Archives of orthopaedic and traumatic surgery 1984 Dec; 103(5): 328-31.
78. McMinn DJ, Snell KI, Daniel J, Treacy RB, Pynsent PB, Riley RD. Mortality and implant revision rates of hip arthroplasty in patients with osteoarthritis: registry based cohort study. BMJ. 2012; 344:3319.
79. Mardani-Kivi, Karimi-Mobarakeh M, Asadi K, Hashemi-Motlagh K, Saheb-Ekhtiari K. Evaluation of clinical outcomes of cementless total hip arthroplasty in patients under 30 years of age. Eur J OrthopSurgTraumatol. 2013; 23:785–790.
80. Fink Barnes L. A., Johnson S. H., Patrick D. A., Macaulay W. Metal-on-metal hip resurfacing compared with total hip arthroplasty: two to five year outcomes in men younger than sixty-five years. International Orthopaedics (SICOT). 2014; 38:2435–40.
81. Smith AJ, Wylde V, Berstock JR, Maclean AD, Blom AW. Surgical approach and patient-reported outcomes after total hip replacement. Hip International. 2012; 22(4):355-61.
82. Lampropoulou-Adamidou K, Macheras GA, Hartofilakidis G. Bilateral character of total hip replacement does not change the overall survival. Hip International. 2015; 2 (2):138-41.
83. Dabir S, RamanathSh, Shah H, Rudramurthy M, Patil SS. Surgical technigue and outcome of uncemented THR using HA coated stems in fused and deformed hips due to ankyiosing spondylitis. Hip International. 2015; 25(2):142-5.
84. Rometsch E, Bos PK, Koes BW. Survival of hip stems with a "modern", trochanter-sparing design – a systematic literature review.Hip International. 2012; 22(4):344-354.
85. Unver B, Kahraman T, Kalkan S, Yuksel E, Karatosun V, Gunal I. test-retest reliability of the stair test in patients with total hip arthroplasty patients: a prospective cohort study. Hip International. 2015; 25(2):160-163.
86. Klit J, Jacobsen S, Schmiegelow V, Sonne-Holm S, Troelsen A. Alternative outcome measres in young total hip arthroplasty patients: a prospective cohort study. Hip International. 2015; 25(2):152-159.
87.Prohorenko VM, Slobodsky AB, Mamedov FF, Dunaev FG, Voronin IV, Badak IS, Lezhnev AG. Comparative analysis of medium- and long-term results of primary total hip arthroplasty using cementless and cemented fixation. Traumatology and orthopedics bulletin named after NN Priorov. 2014; 3:21-26.
88. Mironov SP, Balberkin AV, Zagorodny NV, Karpov VN, Kolondaev FF, Shavryn DA, Snetkov DA. Early and mid-term results of primary total hip replacement using a "ILZA" endoprosthesis. Traumatology and orthopedics bulletin named after NN Priorov. 2015; 2:5-12.
89. Kavalersky GM, Murylev V Yu, Holodaev MYu, Elizarov PM. The experience of Wagner SL Revision Stem femoral component for revision hip replacement. Traumatology and Orthopedics Journal. 2014; 2:40-45.
90. Zagorodny NI, Nuzhdin VI, Buhtin KB, Kagramanov SV. The results of using the bone allografts plastics in revision hip arthroplasty. Traumatology and orthopedics bulletin after NN Priorov. 2014; 2:33-39.
91. Batpenov N, Baimagambetov Sh, Batpen A. Long-term out comes of hip arthroplasty with new Kaz. NIIT Oprosthesis. International combined meeting British Hip Society: Scientific programme. Milano; 2015: 47.

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HEMATOLOGICAL AND BIOCHEMICAL BLOOD COUNT OF SIMMENTAL CATTLE OF KAZAKHSTAN BREEDING WITH DIFFERENT GENOTYPE FOR CANDIDATE GENES FOR PROTEIN METABOLISM

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Abstract: The scientific article noted that with the development of molecular genetics, it became possible to identify the genes directly or indirectly associated with economically useful traits, which makes it possible to carry out the selection in view of genetic markers in addition to the existing methods of selecting animals. The animal's organism is a complex biological system and the realization of the genetic potential of the animal represents a variety of different realizations. In this connection, the aim of the research was to study hematological and biochemical indices of blood composition of Simmental cattle with different genotype at candidate genes for protein metabolism. According to the results of the studies, it was found that the highest content of erythrocytes, platelets, and hemoglobin for the kappa-casein gene (CSN3) was observed in animals in the BB genotype. The content of leukocytes was within the limits of physiological norms. According to the beta-lactoglobulin gene (bLGB), superiority in the studied parameters was observed in animals with the BB genotype, which also indicates the conjugation of symptoms and the increased flow of metabolic processes in the animals. According to the prolactin gene (PRL), a high erythrocyte content was observed in animals in the BB genotype, which was detected in 5 cows. A high value of leukocytes and platelets was detected in animals in the homozygous genotype AA. The highest hemoglobin value was obtained in animals with heterozygous genotype AB. For the effective introduction of selection work in dairy cattle breeding it is necessary to know the mechanisms of obtaining high milk productivity and, accordingly, their application in the practice of dairy cattle breeding. The conducted research made it possible to conclude that the studied hematological and biochemical blood counts are interrelated with the level of productivity and genotype of cows, and they can also be used as tests for the early prediction of milk productivity of cows.

Keywords: biology, selection, genotype, kappa-casein gene (CSN3), beta-lactoglobulin gene (bLGB), prolactin gene (PRL), biochemistry, physiology, hematology, correlation, productivity.

1 Introduction

The selection in dairy cattle breeding is one of the determinants of effective management of the industry. Traditional methods in breeding cannot ensure its sufficient effectiveness. At present, with the development of molecular genetics, it becomes possible to identify genes directly or indirectly associated with economically useful traits, which makes it possible to carry out the selection in addition to the existing methods of selecting animals taking into account genetic markers.

The advantage of DNA technology lies in the fact that it is possible to determine the genotype of an animal regardless of sex, age, physiological state of individuals at an early age, almost immediately after birth. This significantly speeds up the selection process, making it more predictable. The use of the method of genetic markers in breeding animals has a number of advantages over traditional methods of selection. (1)

The introduction of DNA technologies into livestock farming makes it possible to monitor and predict economically useful signs in animals, which is extremely important for determining the further use of each animal. (2)

The increase in the level of milk productivity is one of the main goals in breed selection of cattle that produce milk. (3)

An animal's organism is a complex biological system and the realization of the animal's genetic potential in productive qualities represents a variety of different realizations.

Allelic variants of milk protein genes are the most important markers of dairy productivity of cattle. In connection with the increased market demands for the quality of dairy products, in particular, the amount and composition of milk protein, as well as the cheese-making characteristics of milk, there is an urgent need to identify and use in breeding genetic markers directly or indirectly related to qualitative and quantitative signs of dairy productivity.

Different alleles of genes directly involved in the regulation of lactation can be considered as potential markers of milk productivity: beta-lactoglobulin (β-LGB), the growth hormone (GH) gene, the prolactin gene (PRL), and the casein (CSN) genes, the main milk proteins. (4)

The first group includes the genes of proteins that make up milk, such as casein, lactalbumin, and the second group includes genes whose products are involved in regulatory or metabolic processes. (5,6) There are known test systems, allowing to judge its genetically determined milk potential in the early stages of development of the animal. Such DNA diagnostics mainly take into account the polymorphism of individual genes, among which the kappa-casein (CSN3), beta-lactoglobulin (bLGB), prolactin (PRL) genes occupy a special place because of their high influence on lactation and associated metabolic processes.

In this regard, the purpose of our research was the study of the hematological and biochemical blood composition of Simmental breed cows with different genotype at candidate genes for protein metabolism.

2 Materials and Methods

The work on the allocation of genes was carried out in 2016 in a certified DNA technology laboratory "Biotechnology of Animals" on the basis of S. Toraighyrov Pavlodar State University. The laboratory was certified by the National Center for Expertise and Certification, the certificate No. 370. In order to establish target genes for dairy cattle, 123 heads of cows and 3-4 lactations were selected in Galitskoe LLP of Pavlodar region when their genetic potential was fully manifested.

To conduct DNA diagnostics in animals in the number of 123 heads, blood samples were taken. The blood was obtained from the jugular vein of animals, introduced into tubes with 100 mM EDTA to a final concentration of 10 mM.

The gene polymorphism was determined in each cow: kappa-casein (CSN3), β-lactoglobulin (bLGB), prolactin (PRL).

For all loci in the study of DNA polymorphism, a polymerase chain reaction method was used, followed by restriction analysis of product amplification (PCR-RFLP).

The reaction was carried out in the thermocycler "Terzik" of "DNA technology" company. The DNA was denatured at 94°C for 4 minutes, and then 35 amplification cycles were performed in the following mode: 94°C – 1 min., an annealing of the primers – 1 min, 72°C – 1 min. The final stage of the synthesis was carried out at 72°C during 4 minutes.

The electrophoretic analysis of DNA fragments after the restriction was carried out in 6% polyacrylamide gel and in 1% agarose gel. A standard set of M27 (SibEnzyme) was used as a marker of molecular weights.

To determine the biological status of animals with different genotype by polymorphic genes, hematological and biochemical blood values were studied in experimental animals.

The study of blood composition was carried out in the laboratory of the Department of Zootechnology, Genetics and Selection of S. Toraighyrov Pavlodar State University on the automatic hematological analyzer Mindray BC - 3200 and the biochemical analyzer Biochem SA.

The level of total immunoglobulins in the blood reflects the degree of antimicrobial protection of the animal's organism. The concentration of immunoglobulins in the blood is subject to

significant changes and depends on external factors and the physiological state of the animal organism. In addition, there is information that indicates that the immune system is also susceptible to genetic influence. (1) Therefore, the study of the level of common immunoglobulins in the blood of cows belonging to different lines is relevant. In connection with this, the task was to study the level of common immunoglobulins in lactating Simmental cows that belong to different genetic lines. Studies were carried out on lactating cows of Simmental cattle of German breeding belonging to four different lines: Romulus, Redad, Haxle, Honig. From each genetic group, 10 cows were allocated, which were analogous in age and had approximately the same milk productivity at a level between 10 and 11 thousand kilograms per lactation. Conditions for feeding and keeping lactating cows were the same. Blood samples from the experimental cows were collected from the tail vein before the morning feeding. In the blood samples, the total immunoglobulins were determined by the zinc sulfate method.

The concentration of total immunoglobulins during this lactation period was in the range between 12 and 14 mg/mL. Later in the course of lactation, the level of this indicator gradually increased. Between the level of milk productivity of cows and the concentration of common immunoglobulins, a negative correlation was established in all lines of cows, which was from g=-0.63 to g=-0.69. In cows belonging to the Romulus line, in the second half of the lactation the level of immunoglobulins was insignificantly higher in comparison with the compared groups.

Thus, a negative correlation is established between the level of milk productivity of cows of different genetic origin and the concentration of common immunoglobulins. Higher values of total immunoglobulins in the second half of the lactation were found in the cows of the Romulus line.

During the study period, rations of two types were tested: concentrates (coarse fodder - 35%, juicy feeds - 18%, concentrates - 15% and pasture grass - 32%) - control group (p = 15) and concentrate-free (45, 20, 0 and 35% respectively) - experimental group (p = 15). The basis of rations was hay meadow, straw and silage, which are the main food for feeding animals.

Table 1. Number of Blood Elements (M±m)

Age, months	Indicators		
	Hemoglobin, g/L	Erythrocytes $10^{12}l^{-1}$	Leukocytes $10^{9}l^{-1}$
Control group			
6	11,43±0,32	6,92±0,13	9,43±0,22
12	11,12±0,04	7,52±0,20	8,74±0,15
15	11,32±0,40	7,94±0,30	9,59±0,30
18	11,28±1,13	6,55±0,15	9,40±0,50
Experimental group			
6	11,44±0,33	6,91±0,12	8,91±0,6
12	11,48±0,34	7,08±0,16	8,73±0,15
15	11,00±0,21	8,34±0,18	9,52±0,14
18	10,84±0,20	7,09±0,20	10,59±0,50

The weight of the animals in the control group at the age of 18 months was 326.5 kg; in the experienced group - 323.9 kg. The animals of both groups grew and developed in the same way. There was no significant difference between the groups of experimental heifers. With the age of heifers, a gradual decrease in their average daily growth was observed, which confirms the well-known regularity.

During the scientific and economic experience on the Simmental cattle, the study of the blood composition was carried out: hemoglobin, erythrocytes, leukocytes, macro- and microelements, vitamins, amino acids, protein fractions.

Despite the relatively constant composition of blood, a number of its biochemical indicators undergo changes under the influence of external and internal factors. One of the main factors affecting the composition of blood is feeding. (2) It was found that with an increased level of feeding, the number and size of erythrocytes, the concentration of hemoglobin, the leukocyte formula is changing. The increase in these indicators is the result of an increase in general and especially protein feeding.

The study of the chemical composition of animals' blood serum is of great importance for the characterization of metabolism, especially when it is disturbed.

Table 1 shows the data on the number of blood elements during different periods of life of experimental heifers. Significant differences in these indicators, caused by a concentrate, concentrate-free diet between the experimental groups of heifers was not found. The difference between groups in the content of uniform elements is unreliable (P<0.95). At a physiologically normal state, the blood of animal hemoglobin contains 10 g/L with fluctuations from 9 to 11 g/L. The content of hemoglobin in the blood of heifers from 6 to 18 months did not change. The content of hemoglobin and erythrocytes, in the blood indicates a high level of metabolism occurring in the animal organism. The content of hemoglobin, erythrocytes and leukocytes in the blood of the experimental heifers was within the physiological form.

The data obtained by us agree with the results of studies of such scientists as H.F. Kushner (1938) (1), E.A. Petukhova (1983). (3)

In the animal organism, the importance of mineral substances is extremely great. This is explained by the role that minerals play in all metabolic processes. Heifers of experimental groups had insignificant (P<0.95) difference in the content of calcium and phosphorus in the blood. It should be noted that in the pasture period, an increase in the content of calcium and phosphorus in the blood serum (calcium in the range of 11,34-12,61 mg %, phosphorus varied 5.14-5.73 mg %).

The resistance of the animal organism to infectious diseases is associated with its physiological state, which is directly dependent on age, season, feeding conditions and content. (1)

The leading place in the metabolism is assigned to blood proteins and its fractions. Most of the proteins contained in the plasma consist of albumin and globulin. In our studies, the content of the total protein and its albumin fraction differed insignificantly, irrespective of the growth rate and the development of animals in the experimental groups. (3)

The characteristics of the blood serum of heifers in the experimental groups are given in Table 2.

Table 2. The Content of the Total Protein and Its Fractions in the Blood, (M±т)

Age, months	Total protein, g/L	Albumins, g/%	Globulins, g/L		
			a	ß	Y
Control group					
6	60,8±0,40	22,1±0,21	10,5±0,05	18,4±0,12	9,8±0,24
12	70,9±0,19	29,6±0,11	9,5±0,05	23,4±0,26	8,4±0,07
15	79,6±0,19	32,6±0,14	8,6±0,06	25,4±0,10	13,0±0,15
18	70,2±0,29	27,2±1,54	10,5±0,58	21,5±0,66	11,0±0,58
Experimental group					
6	61,8±0,12	21,0±0,23	13,0±0,22	14,5±0,20	13,3±0,07
12	69,6±0,32	32,1±0,21	10,5±0,05	18,4±0,12	8,6±0,08
15	74,9±0,25	28,5±0,26	10,0±0,14	20,9±0,142	15,5±0,24
18	74,0±0,29	31,5±1,36	12,0±0,63	10,0±0,47	9,5±0,74

The dynamics of the total protein and its fractions in the blood showed no significant differences between the groups. According to modern ideas, the proteins, fats, carbohydrates and salts received by the animal body from food, in order to join the metabolism and turn into body tissues, they must be subjected to deep chemical transformations with the obligatory participation of the substances that catalyze these transformations. These components are protein-enzymes, consisting of two components: a specific protein synthesized by the body and an active grouping (coenzyme), which is a derivative of the compounds of various vitamins that come with feed. If there are no individual vitamins in the feed or they are not enough, the activity of enzymes is reduced and a metabolic disorder and a decrease in productivity occur in animals.

Vitamin A is involved in oxidation reactions taking place in cells of epithelial tissues, promotes biosynthesis of cholesterol, accelerates the exchange of phosphorus compounds, and also stimulates the growth and development of animals. Normally, the content of vitamin A (carotene) in the ration should be from 40.0 to 150.0 μg/100 ml. In the winter stall period of feed, according to our research, partially lose the content of vitamins, and therefore an avitaminosis of animals is often observed in many farms. Our studies showed that the vitamin A content in the blood serum of animals was normal. The animals of the experimental group had a vitamin A content of 18.8 μg% less than in the control group. The difference between groups is not significant (P<0.95). Vitamin E (tocopherol) provides reproduction of animals, participates in the metabolism of muscle and nerve tissue. Vitamin E has the property of an antioxidant, it promotes the assimilation and preservation of vitamin A and carotene in the animal's body. There was a difference in the content of vitamin E, which was insignificant (by 0.32 μg%). Thus, the balanced feeding of experimental groups did not affect the content of vitamins A and E in the blood.

The study of the chemical composition of blood serum is of great importance for the characteristics of metabolism. When studying the effect of feeding different levels of mixed fodders on the digestibility of nutrients in the diet, we found that the types of rations tested had practically the same effect on their digestibility. So the digestibility in heifers of the control group was 64.13% for dry matter, 64.02% for experimental, 65.50% and 65.42% for organic matter, for raw protein - 66.66%, and 61.78%, for raw fat - 88.57% and 75.90%, for raw fiber 63.83% and 64.48%, for nitrogen-free extractives - 69.20% and 67.60% respectively.

The natural resistance of the organism in agricultural animals or the natural non-specific resistance of the organism is provided by the animal hair, the mucous membranes of the digestive tract, the respiratory tract, blood, lymph, and from the conditions of feeding and maintenance. Protective functions of the organism are provided by the phenomenon of phagocytosis, bactericidal and bacteriostatic activity of blood serum, the presence of natural antibodies, lysozyme, acid-alkaline, buffer systems and enzymes. The protective factors underlying the natural resistance are complex.

Table 3. Indicators of Natural Resistance in Experimental Heifers

Indicators	Control group	Experimental group
Leukocyte formula, 10^9 l^{-1}:		
Basophils	0,3	0,3
Eosinophils	7,5	7,2
Neutrophils	28,9	25,8
Lymphocytes	63,1	62,4
Monocytes	4,8	4,9
The intensity of phagocytosis:	1,98	1,96
The total absorption effect, thousand mm^3	17,0	16,7
Active neutrophils, %	5,8	5,5
Average absorptive capacity of cells	0,170	0,167
General hemolytic activity, %		

The degree of their expression is influenced by individuality, breed and animal species. (4) An assessment of natural resistance in heifers aged 16 months, in the number of 10 animals in each group, was made. At the same time, phagocytosis, hemolytic activity and neutrophil activity were determined.

From the data in Table 3, it can be seen that the number of eosinophils, neutrophils, lymphocytes, monocytes in the blood of the experimental animals were normal, due to the high level of feeding and the balanced ration for protein, fat, carbohydrates, vitamins, minerals. The difference between groups in terms of natural resistance is not reliable (P <0.95). The fluctuation of the total effect of active neutrophils absorption in the animals of the control group was observed in the range 9.5-23.6 109 l-1, and the experimental - 9.4-22.3 109 l-1, the total hemolytic activity in the control group averaged 0.170 %, the experimental - 0.167%.

The above data indicate that the blood composition of the experimental animals was within the physiological norm. There were no significant differences in blood composition and

dynamics of its basic elements in the age aspect between groups, depending on the level of mixed fodder in rations.

An analysis of the data on the blood count of the experimental animals of the Simmental cattle shows that there are no deviations from the norm of the course of the physiological processes in the body. The dynamics of the total protein and blood fractions did not distinguish between groups.

Indices of natural resistance of the organism of the experimental animals were within the limits of physiological norms and showed the stability of their organisms to various kinds of diseases.

The increase in protein and its fractions occurs up to 15 months and then goes down. The amount of albumin increases until the age of 15 months and then decreases. The same regularity is noted for fractions of globulins. An increase in the total to its fractions is observed in the pasture period.

3 Results and Discussion

The intensification of livestock farming involves achieving a high level of production, which should be based on modern achievements of science and innovate experience.

The productivity, as a result of the complex interaction of genotype with technological factors, depends in a certain way on the level of metabolic processes in the organism. Therefore, an important component in improving the efficiency of livestock breeding is the identification of the relationship between individual blood values and the productivity of animals.

Fundamental importance in this direction belongs to physiological research. A great deal of attention is devoted to the study of the physiology and biochemistry of blood, as well as to the identification of exchange bonds between the constituent parts of the blood and the level of animal productivity. In this regard, it seems promising to study the specific features of protein metabolism by candidate genes for protein metabolism in highly productive animals by hematologic blood indices.

Table 4. Hematologic Blood Values of Cows with Different Genotype by Candidate Genes for Protein Metabolism

Genes under study	Genotype	n	Hematologic blood values			
			Erythrocyte 10^{12}/l	Leukocyte 10^{9} /l	Platelet 10^{9} /l	Hemoglobin g/l
Kappa-Casein	AA	28	6,6±0,18	9,2±0,65	608,2±36,72	111,8±2,44
	AB	50	6,6±0,12	8,8±0,35	626,1±25,78	113,2±1,93
	BB	25	6,7±0,17	9,0±0,54	627,5±42,91	116,8±2,11
Beta-lactoglobulin	AA	14	6,7±0,48	8,4±0,88	557,7±62,33	106,3±8,18
	AB	57	6,5±0,13	8,8±0,40	598,1±25,76	112,4±1,72
	BB	44	6,8±0,11	9,2±0,38	638,5±27,88	113,9±1,88
Prolactin	AA	32	6,5±0,16	8,6±0,49	645,8±22,80	112,8±2,39
	AB	40	6,6±0,14	7,8±0,40	592,5±35,21	114,4±1,88
	BB	5	6,9±0,46	7,4±0,95	627,6±61,41	110,5±5,33

According to Table 4, we observe that the highest content of erythrocytes, platelets, and hemoglobin for the kappa-casein gene (CSN3) was observed in animals in the BB genotype. The studied index in animals of this genotype by the content of erythrocytes was higher by 0.1^{12}/l, of platelets by 19.3 and 1.4^{9}/l, of hemoglobin by 5 and 3.6 g/l than in peers of other genotypes. The content of leukocytes was within the limits of physiological norms. The studied indicator exceeded the similar index in animals with the genotype AB and BB by 0.4 and 0.2 ^{9}/l. The high content of erythrocyte and hemoglobin values in the blood of cows with a homozygous BB genotype indicates a high productivity and lactation intensity of cows of this group.

According to the beta-lactoglobulin gene (bLGB), the superiority in studied parameters was observed in animals with the BB genotype, which also indicates the conjugation of symptoms and the increased flow of metabolic processes in animals' organisms.

Another equally important gene is the prolactin gene, which is considered as one of the central candidate genes. For this gene, a high erythrocyte content was observed in animals in the BB genotype - 6.9 ^{12}/l, which was detected in 5 cows, their result exceeded that of other genotypes by 0.4 and 0.3 ^{12}/l. A high leukocyte and platelet count was detected in animals in the homozygous AA genotype and amounted to 8.6 ^{9}/l and 645.8 ^{9}/l. The highest hemoglobin value was obtained in animals with a heterozygous AB genotype, 114.4 g/l, which is 1.6 and 3.9 g/l more than in homozygous genotypes (AA and BB).

The blood that is in constant contact with all organs and tissues, under the influence of various factors on the organism (feeding, maintenance, physiological state, etc.) reflects all the processes occurring in it, changing itself both qualitatively and quantitatively. Biochemical indicators play an important role in protein, lipid and mineral metabolism of animals. So, aspartate and alanine amine transferases (ACT and ALT) take an active part in nitrogen metabolism, carrying out a connection between protein, carbohydrate, and fat metabolism.

In order to control metabolic processes and the state of animals under the conditions of Galitskoe LLP, a study was made of the state of their immuno-biochemical status. Table 5 contains data on the study of biochemical blood values, depending on the gene and the genotype of cows.

Table 5. Biochemical Blood Values of Cows with Different Genotype for Candidate Genes of Protein Metabolism

Genes under study	Genotype	n	Biochemical blood values				
			Cholesterol, g/l	Common protein, g/l	ALT, Unit/l	ACT, Unit/l	Glucose, mmol/L
Kappa-casein	AA	28	3,9±0,99	82,5±6,61	31,6±1,85	72,8±3,38	3,6±0,83
	AB	50	3,4±0,50	79,5±2,78	34,8±1,82	71,9±2,15	2,9±0,08
	BB	25	2,4±0,23	100,2±17,6	35,3±1,92	75,6±3,95	3,8±0,97

Beta-lactoglobulin	AA	14	2,6±0,19	75,9±7,52	32,1±3,13	64,6±5,31	2,9±0,23
	AB	57	3,8±0,67	81,7±5,74	35,0±1,16	73,1±1,83	3,6±0,58
	BB	44	2,6±0,15	88,0±8,65	37,8±2,20	73,6±3,10	2,8±0,11
Prolactin	AA	32	3,2±0,27	80,7±5,61	36,4±1,80	72,4±2,44	2,9±0,11
	AB	40	3,2±0,67	85,9±8,01	36,2±1,52	71,1±2,40	3,4±0,58
	BB	5	2,9±0,38	85,2±11,40	37,7±3,81	78,5±11,1	2,7±0,33

On the basis of experimental data, it was established that with an increase in the amount of sorbent KM-1a from 0.02 to 1.0 w.p. regardless of the process temperature, the degree of treatment of water from oil increases. For example, for 30 minutes of the process when the concentration of oil in water is 200 mg/l by using the KM-1a preparation in an amount of 0.02 w.p., the degree of water treatment is 27.42%, and by the amount of 1.0 w.p. - 98.03%.

The results of the research showed that a high cholesterol content in the blood was observed in cows by the kappa-casein gene (CSN3). In cows with homozygous genotype AA - 3.9 g/L, their result was higher by 0.5 and 1.5 g/l than in peers of other genotypes. According to the beta-lactoglobulin gene (bLGB), a high cholesterol concentration was found in cows with a heterozygous genotype AB and amounted to 3.8 g/L. According to the prolactin gene (PRL) in the studied genotypes, the cholesterol content was almost the same and was within the range of 2.9-3.2 g/l. Based on the results of conducted studies, it can be concluded that the concentration of cholesterol in the blood of lactating cows depends on the level of productivity and their genotypic affiliation to the loci studied by the DNA.

In the opinion of T.A. Guseva, blood proteins have a leading role in the organism. They are used in the synthesis of enzymes, many hormones; they are involved in the transportation of nutrients and minerals, and are also responsible for nonspecific reactions and immunological reactivity of the organism, depending on environmental conditions. (7)

Analyzing the data given in Table 5, it can be seen that the highest concentration of total protein was observed in all animals with homozygous genotype BB. In cows with the kappa-casein gene (CSN3), it was 100.2 l/g, for the beta-lactoglobulin gene (bLGB) it was 88.0 g/L and 85.9-85.2 g/L for genotypes of the prolactin gene (PRL). Thus, during the studies, we found that the highest concentration of total protein in the blood was observed in a more highly productive group of animals with the BB genotype.

The activity of the enzymes ACT and ALT is an indicator of protein metabolism in the organism, which is used to control animal health. Investigations of the activity level of aminotransferase performed by us in the blood of cows in the kappa-casein (CSN3), beta-lactoglobulin (bLGB) and prolactin (PRL) genes showed that high activity of ALT and ACT was detected in blood of animals with BB genotype, which indicates a high protein metabolism in cows of this genotype. The glucose content was within the physiological norm. Some decrease in the activity of ALT and ACT in cows with heterozygous genotypes is apparently due to the periodicity of the processes of transamination and self-renewal of proteins in the organism during the animal pregnancy period.

The blood is rather a labile and plastic substance capable of maintaining the balance of its main components despite changing environmental conditions, as well as changes in the organism at the physiological level. The intensity of metabolism has a direct relationship with the dairy productivity and genotype of animals. This is confirmed by the fact that the metabolism of substances in the blood in highly productive cows is somewhat faster than in low productivity animals. (8)

Table 6. Correlation Dependencies Between the Indices of Productivity and Blood Composition in Cows with Different Genotype for Protein Candidate Genes

Genes under study	Genotype	n	Total protein of blood, g/L	Protein in milk, %	r
Kappa-casein	AA	28	82,5±6,61	3,20±0,03	0,66
	AB	50	79,5±2,78	3,25±0,05	0,55
	BB	25	100,2±17,46	3,26±0,06	0,65
Beta-lactoglobulin	AA	14	75,9±7,52	3,24±0,03	0,84
	AB	57	81,7±5,74	3,20±0,05	0,90
	BB	44	88,0±8,65	3,26±0,03	0,99
Prolactin	AA	32	80,7±5,61	3,23±0,08	0,58
	AB	40	85,9±8,01	3,22±0,02	0,94
	BB	5	85,2±11,40	3,16±0,06	0,55

As shown by the presented data, for all the genes and genotypes studied between the total protein content in the blood and the protein in milk, a high positive correlation relationship was found between 0.55 and 0.99. In kappa-casein (CSN3) and beta-lactoglobulin (bLGB) genes, the highest correlation indicator was obtained in cows with BB genotype (0.65 and 0.99).

According to the data of T.A. Guseva, in the breeding process, the correlation between the selection criteria in the population is of great importance, since in the case of positive correlation, selection can be conducted according to one of the interrelated characteristics, while improving the parameters of the other. On the contrary, if the connection is negative, other methods should be chosen to improve the herd. (7)

The strength and orientation of the connection of traits in groups of experimental animals are presented in Table 7.

Table 7. Correlation Dependencies Between the Indices of Productivity and Blood Composition in Cows with Different Genotype for Candidate Genes of Protein Metabolism

Genes under study	Genotype	n	Yield, kg	Act. ALT	r	Act. ACT	r
Kappa-casein	AA	28	5356,7±219,65	31,6±1,85	0,75	72,8±3,38	0,49
	AB	50	5387,8±248,32	39,8±1,82	0,45	71,9±2,15	0,04
	BB	25	5517,1±256,17	35,3±1,92	0,41	75,6±3,95	0,01
Beta-lactoglobulin	AA	14	5571,2±461,71	32,1±3,13	0,40	64,6±5,31	0,05
	AB	57	5316,6±155,98	35,0±1,16	0,75	73,1±1,83	0,17
	BB	44	5357,2±213,89	37,8±2,20	0,43	73,6±3,10	0,90
Prolactin	AA	32	5741,1±282,60	36,4±1,80	0,96	72,4±2,44	0,20
	AB	40	5457,6±204,18	36,2±1,52	0,33	71,1±2,40	0,10
	BB	5	4743,6±597,36	37,7±3,81	0,53	78,5±11,31	0,71

The presented materials show that the closest positive relationship is found in cows between the indices of milk yield and the activity of the ALT enzyme. In the kappa-casein (CSN3) and prolactin (PRL) genes, a high positive correlation was calculated in cows with a homozygous AA genotype amounted to 0.75 and 0.96, for the beta-lactoglobulin (bLGB) gene in the AB genotype it was 0.75. In the remaining pairs of studied signs, a weak positive correlation of different severity degree was observed. The presented results of biochemical research testify to the presence of interrelation in the activity of reamination enzymes and biochemical blood values of cows with their milk productivity.

4 Conclusion

The effective conducting of selection work in dairy cattle breeding is impossible without the complex use of all achievements in the field of such sciences as genetics, physiology, and biochemistry. Therefore, it is necessary to know the mechanisms for obtaining high milk productivity and, accordingly, their application in the practice of dairy cattle breeding. The knowledge of such mechanisms in the early stages of animal development will allow predicting their future dairy productivity using DNA tests, which will allow to purposefully increase their dairy productivity. In this connection, it is necessary to study various mechanisms of DNA technology impact by studying the relationship between the biochemical blood values of lactating animals with the level of their milk production and to find the closest correlative relationships of these indicators with the dairy productivity value of cattle.

Thus, the conducted studies allow to conclude that the studied hematological and biochemical indicators of blood are interrelated with the genotype of cows, they can be used as tests for the early prediction of the dairy productivity of cows.

Literature:

1. Alekseeva NM, Borisova PP. The enzyme preparation influence on the milk productivity of the Simmental cows in the conditions of Yakutia. Bulletin of Krasnoyarsk State Agrarian. 2015; 10:197-201.
2. Belkov GI, Panin VA. Improvement of economically valuable traits of Holstein and Simmental first-calf heifers under the conditions of South Ural. Bulletin of Orenburg State Agrarian University. 2014; 5:143-6.
3. Bogatyreva IA, Smakuyev DR. The evaluation of growth, hematologic status and behavior of Simmental heifers of different breeding. Bulletin of Altai State Agrarian University. 2015; 7:102-7.
4. Borisova VV. Economic-biological peculiarities of different genotypes of Simmental cattle. Bulletin of Orenburg State Agrarian University. 2014; 5:135-7.
5. Fedorovych VV, Orikhivsky TV, et al. The characteristics of Simmental cattle by their economically useful traits in the conditions of Lviv region. The scientific bulletin of S.Z. Gzhytsky Veterinary and Biotech University of Lviv. 2016; 2(18):255-60.
6. Katmakov PS, Anisimova YeI. Milk and meat productivity of Simmental cows of different inter-breed types. Bulletin of Ulyanovsk State Agricultural Academy. 2014; 1:1-6.
7. Kharlamov AV, Nikonova YeA. Influence of genotype on weight growth of black-spotted and Simmental young bulls and their double and triple-cross hybrids. Bulletin of Orenburg State Agrarian University. 2015; 1:96-9.
8. Kibkalo LI, Zherebilov NI, et al. The influence of gene pool of the Aberdeen-Angus cattle on the growth, development, and dynamics of the living mass of Simmental cattle's bulls. Bulletin of Kursk State Agricultural Academy. 2014; 5:56-9.
9. Kodzokova ZL, Tkhashigugova MS, et al. Dynamics of live weight in young bulls of Simmental breed under different technology of rearing. The collection of scientific works of Stavropol Scientific Research Institute for Livestock and Fodder production. 2014; 7(3):1-3.
10. Konorev PV, Gromova TV. The relationship of milk performance and the main milk indices of Simmental cows obtained from domestic and imported stud bulls. Bulletin of Altai State Agrarian University. 2015; 7:112-5.
11. Konorev PV, Gromova TV. The evaluation results of stud bulls used in the selection of the Simmental cattle. 2014; 7(3):1-4.
12. Kosilov VI, Sivozhelezova NA, et al. Economic and biological peculiarities of the Kazakh White-Headed and Simmental cattle in South Ural. Bulletin of Orenburg State Agrarian University. 2016; 6:136-8.
13. Kosilov VI, Zhaimysheva SS, et al. Exterior peculiarities of young bulls of the Simmental breed and its crossbreeds with limousines of different generations. Bulletin of Orenburg State Agrarian University. 2016; 6.
14. Li SS, Bolotova YuA. The effectiveness of commercial crossing of Simmental and Hereford cattle in beef production. Bulletin of Altai State Agrarian University. 2014; 1:78-80.
15. Lukyanov VN, Prokhorov IP. Hormone status of Simmental breed bull-calves and their crosses with both Hereford and Charolais breeds. Bulletin of Timiryazev Agricultural Academy. 2015; 4:95-105.
16. Lyapina VO, Lyapin OA. The meat productivity of bulls-castrates of Kazakh white-headed. Kalmyk and Simmental cattle. Bulletin of Orenburg State Agrarian University. 2015; 2:133-5.
17. Mechenkov DA, Lebedeva NV, et al. The concentration of the total protein and cholesterol in the blood of lactating cows of Black-spotted and Simmental cattle. Bulletin of Kursk State Agricultural Academy. 2015; 2:1-2.
18. Medvedeva NS, Goncharenko GM, Podkorytov AT, Goryacheva TS. Method of selection Simmental cattle for protein milkiness using molecular-genetic markers. Gorno-Altaisk; 2013.
19. Mannen H. Effect of DNA polymorphisms related to fatty acid composition in adipose tissue of Holstein cattle. Anim Sci J. 2011.
20. Paska MZ, Koval GM, et al. Veterinary-Sanitary inspection of beef bulls received from Polissya meat and Simmental breeds. The scientific bulletin of S.Z. Gzhytsky National Veterinary and Biotech University of Lviv. 2015; 1-2(17):1-5.
21. Orikhovsky TV, Fedorovsky VV. The dependence of milk productivity of Simmental dairy cattle on their reproductive ability indicators. The scientific bulletin of S.Z. Gzhytsky

National Veterinary and Biotech University of Lviv. 2015; 3(17):263-268.
22. Semerikova AI, Mironova IV. Slaughter indices of Simmental steers fed the “Vetosporin Suspension” probiotic. Bulletin of Orenburg State Agrarian University. 2014; 1:108-10.
23. Shevkhuzhev AF, Smakuyev DR. Quality of muscle tissue of Simmental breed bulls of different interbreed types. The collection of scientific works of Stavropol Scientific Research Institute for Livestock and Fodder production. 2014; 7(3):1-6.
24. Smakuyev DR, Khubiyeva ZK, et al. Slaughter qualities and biochemical blood parameters of Simmental steers with different constitution types according to beef cattle breeding technology. Bulletin of Orenburg State Agrarian University. 2014; 4:111-5.
25. Stasenkova YuV. The overall level of antibodies in the blood of lactating Simmental cows of different genetic origin. Bulletin of agricultural development and social politics. 2016; 1:97-8.
26. Strekozov NI, Amerkhanov KhA, Pervov NG, et al. All-Russian Scientific Research Institute for Animal Husbandry of the Russian Academy of Agricultural Sciences. 2nd Ed. Moscow: Agronauchservis; 2013.
27. Tagirov KhKh, Iskhakov RS, et al. Beef performance of young black-spotted and Simmental cattle under the different care and management conditions. Bulletin of Orenburg State Agrarian University. 2015; 3:114-6.
28. Tuzov IN, Shcherbatov VI, et al. Genetic peculiarities of Simmental livestock dropped off into farms of the Krasnodar region. Polythematic Scientific Online E-Journal of Kuban State Agrarian University. 2015; 108:1-13.
29. Drozdov YeV, Nam IYa, Zayakin VV. Analysis of the polymorphism of the kappa-casein, β-lactoglobulin, prolactin, releasing factor and somatotropin genes in cows of different breeds in the Bryansk region. Scientific support for innovative development of cattle breeding. Zhodino, RUE "Scientific and Practical Center of the National Academy of Belarus for Animal Husbandry"; 2013:67-9.
30. Manga I, Riha J, Dvorak J. Comparison of influence markers CSN3 and CSN2 on milk performance traits in Czech spotted and Holstein cattle tested at first, fifth and higher lactation. Acta fytotechnica et zootechnica. 2006; 9:13-5.
31. Tikhonov PT, Senko AYa. Economic-biological peculiarities of Simmental cows of different genotypes in the South Ural. Bulletin of Orenburg State Agrarian University. 2014; 5:141-3.
32. Tsiaras AM, Bargouli GG, Banos G, et al. Effect of kappa-casein and betalactoglobulinloci on milk performance traits and reproductive performance of Holstein cows. J. Dairy Sci. 2005; 88(1):327-34.
33. Guseva TA. Adaptive qualities of black-and-white cattle of different ecogenesis in the conditions of the forest-steppe zone of the middle Volga region. Thesis for the degree of Candidate of Agricultural Sciences. Penza; 2016.
34. Rotmistrovskaya YeG. Functional reserves of the thyroid gland and a testosterone-synthesizing system in cows with different milk productivity and their calves. Thesis for the degree of Candidate of Biological Sciences. Kursk; 2014.
35. Velmatov AA, Gladilin VN, et al. Technological features of the udder of Simmental cows of different genotypes in the Republic of Mordovia. 2015; 1:1-5.
36. Ulimbashev MB, Kodzokova ZL. Hematologic indices of Simmental young cattle under different raising technologies. Bulletin of Altai State Agrarian University. 2015; 3:93-6.

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MICROBIOTA OF PURULENT NECROTIC LESIONS IN PATIENTS WITH DIABETIC FOOT SYNDROME

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Abstract: The Diabetic Foot Syndrome (DFS) is one of the most serious complications of the diabetes mellitus (DM). Infections play a minor role in the genesis of a diabetic foot lesion but assume considerable importance in existing injuries as a risk factor for progression to amputation. Optimal treatment of these diabetic foot infections requires recognizing which foot ulcers are infected and prescribing pathogen-appropriate antibiotic therapy. The main goal of this study was the identification of microbiota's structure of purulent-necrotic lesions in 34 patients with a severe form of DFS. The certain amount of affected area was taken as material for research. The microbial composition was identified by sequencing of DNA fragments of 16S rRNA gene including V3 and V4 variable sequences. As a result, the microbiota of purulent-necrotic lesions was characterized by poly-microbial association. The high degree of the anaerobe bacteria which are generally responsible for the development of intrahospital infectious diseases was observed.

Keywords: Diabetic Foot Syndrome, Diabetes mellitus, Microbiota, Purulent-necrotic lesions, Diabetic foot ulcer, Osteomyelitis, Bacteria, Comparative analysis of a microflora.

1 Introduction

According to the International Diabetic Federation (IDF) number of people affected by DFS in 2015 accounted for more than 415 million worldwide, by 2040 this number will increase up to 642 million. In Kazakhstan, 715500 people are affected by DFS (The diabetic Atlas of IDF, 2015) and more than 1 million people are glucose-intolerant. Amongst the diabetes mellitus diseases with possible late complications, DFS is on top of the list resulting in early disability and lethality. The frequency of DFS accounts from 4.6 to 25% (1-2): The secondary infection of DFS is the leading reason for amputation of legs. Every hour 55 patients undergo amputation due to DFS. (3-4) The purulent infection in patients is usually very heavy, and often it develops into septic character. (5-7) The main causative agent of a wound infection in DFS is S. aureus – 52%, in the second place in regards to occurrence are gram-negative microorganisms (18.4%). (8) However, use of traditional methods of cultivation does not allow to carry out full identification of the bacteria which are present at the lesion centers in DFS. Development and deployment of new molecular tools made a significant contribution to understanding the role of microbiota at DFS. Scientific progress in the sequencing of bacterial genomes, in combination with the development of new molecular approaches, allowed to obtain new information on a microflora in the center of a purulent infection, and also the development of a wound fever. (9-10)

Aim: to study a range of the microorganisms present at the centers of infection in purulent - necrotic lesions in diabetic foot syndrome by identifying the primary nucleotide sequence of DNA fragments of 16S rRNA gene including V3 and V4 variable sequences. For this purpose, Next Generation Sequencing machinery MiSeq (Illumina) was used and comparison of the received sequences of fragments of DNA with the database was made in order to identify origins of microorganism species present.

Infections remain a serious hazard for the diabetic patient. Good metabolic control is a major factor in limiting the development and spread of infections and, most importantly, the development of diabetic complications which predispose to infections. In some patient's recurrent infections can pose a problem, particularly if there is evidence of secondary immunodeficiency. In these patient's adjuvant therapies, including Biological Responses Modifiers (BRMS) should be considered. Several factors could predispose diabetic patients to infections. These factors include genetic susceptibility to infection; altered cellular and humoral immune defense mechanisms; local factors including poor blood supply and nerve damage, and alterations in metabolism associated with diabetes. In the context of a diabetic patient, all or some of these factors may operate. The purpose of this review is to assess the relative contribution of these potential mechanisms in leading to infection in patients with diabetes. (11)

The foot of patients with diabetes mellitus is affected by several processes which not only contribute to the development and progression of infection but on occasion alter the appearance of the foot in ways, which may obscure the clinical features of local infection. Neuropathy involving the motor fibers supplying muscles of the foot causes asymmetric muscle weakness, atrophy, and paresis which in turn result in foot deformities and maldistribution of weight (or pressure) on the foot surface. Dysfunction of the sensory fibers supplying the skin and deeper structural elements of the foot allows minor and major injury to these tissues to proceed without appreciation by the patient. As a result of neuropathy, the foot may be dramatically deformed, ulcerate in areas of unperceived trauma (mal perforans), and on occasion be warm and hyperemic in response to deep structural injury (acute Charcot's disease). This warmth and hyperemia may be misinterpreted as cellulitis and ulceration, whereas a major portal of entry for infection may be uninfected. In the patient with diabetes, peripheral neuropathy may develop in isolation or commonly in parallel with atherosclerotic peripheral vascular disease. The latter involves major inflow vessels to the lower extremity but commonly is associated with occlusive lesions of the tibial and peroneal arteries between the knee and ankle. The resulting arterial insufficiency can alter the appearance of the foot and obscure infection. Rubor may reflect vascular insufficiency rather than inflammation and conversely, pallor may mute the erythema of acute infection. Gangrene and necrosis may be primarily ischemic or may reflect accelerated ischemia in the setting of infection. In sum, the diagnosis of infection involving the foot in patients with diabetes requires a careful detailed examination of the lower extremity and its blood supply. (12)

Infection represents the presence of an inflammatory response and tissue injury due to the interaction of the host with multiplying bacteria. The disease spectrum is a consequence of the variability in these interactions. Diabetes, because of its effects on the vascular, neurological, and immune systems, can compromise the local and systemic response to infection, potentially masking the typical clinical features and hindering diagnosis. The early recognition of infection, particularly osteomyelitis, is paramount in the management of diabetic foot disease. Careful clinical appraisal remains the cornerstone of the assessment. Hematologic, biochemical, and radiological investigations are important aids in assessing the severity of the infection. Microbiological assessment, particularly in more severe infection, requires good-quality samples, combined with rapid transport in an appropriate medium and effective communication with the laboratory. A focused, systematic approach to the accurate diagnosis and treatment of infection, combined with careful monitoring, ensures the maintenance of optimal management. (13)

2 Materials and Methods

Diabetic foot ulcerations have been extensively reported as vascular complications of diabetes mellitus associated with a high degree of morbidity and mortality. Diabetic foot syndrome (DFS), as defined by the World Health Organization, is an "ulceration of the foot (distally from the ankle and including the ankle) associated with neuropathy and different grades of ischemia and infection". Pathogenic events able to cause diabetic foot ulcers are multi-factorial. Among the commonest causes of this pathogenic pathway, it's possible to consider peripheral neuropathy, foot deformity, abnormal foot pressures, abnormal joint mobility, trauma, peripheral artery disease. Several studies reported how diabetic patients show a higher mortality rate compared to patients without diabetes and in particular these studies under filled how cardiovascular mortality and morbidity is 2-4 times higher among patients affected by type 2 diabetes mellitus. This higher degree of cardiovascular morbidity has been explained as due to the observed higher prevalence of major cardiovascular risk factor, of asymptomatic findings of cardiovascular diseases, and of prevalence and incidence of cardiovascular and cerebrovascular events in diabetic patients with foot complications. In diabetes, a fundamental pathogenic pathway of most of the vascular complications has been reported as linked to a complex interplay of inflammatory, metabolic and procoagulant variables. These pathogenetic aspects have a direct interplay with an insulin resistance, subsequent obesity, diabetes, hypertension, prothrombotic state, and blood lipid disorder.

Foot infection in diabetic patients can accelerate dramatically with devastating consequences if appropriate treatment is not given promptly. The role of the health professional caring for these individuals is to identify and treat the infection as early as possible, along with preventing further episodes. However, diagnosing infection in an ulcerated diabetic foot is not always straightforward. In diabetics, the host inflammatory response to injury or infection may be reduced because of impaired leukocyte function, vascular disease, and neuropathy. Thus, the classical signs of dolor, rubor, calor, and tumor associated with infection may be absent. Further confusing the issue are the effects of diabetic peripheral neuropathy, which can mimic some of these findings. When clinical signs are misleading, we rely on laboratory tests to help us diagnose infection. However, blood tests whose results can suggest infection (i.e., elevations in leukocyte count and erythrocyte sedimentation rate) often yield falsely normal results. Also, in the presence of chronic wounds, microbiological results may be difficult to interpret. Herein we examine definitions related to infection and describe, from our clinical experience, how we diagnose infection in the ulcerated diabetic foot.

There are many definitions of infection. It is most frequently described as a disease caused by a microbial pathogen that occurs when the presence of replicating organisms is associated with tissue damage. The American College of Surgeons (14) defined infection as the product of the entrance, growth, metabolic activities, and resultant pathophysiological effects of microorganisms in the tissues of the patient. More specifically, White, Cooper, Kingsley, et al. (15) defined infection as the presence of multiplying bacteria in body tissues, resulting in spreading cellular injury due to competitive metabolism, toxins, intracellular replication, or antigen-antibody response (host reaction).

In some situations, such as when established pathogens are isolated from properly obtained specimens of normally sterile fluid or tissues, diagnosing infection is easy. The presence of microorganisms in a wound, however, does not in itself define a clinical infection. All wounds are exposed to skin commensals, and their microflora will represent the surrounding environment. These contaminating microbes can quickly become established within a wound, reaching a state of colonization. Colonization is defined as the presence of multiplying bacteria with no overt host immunologic reaction Ayton M. (16) Diabetic foot ulcers are commonly colonized with multiple species of organisms (17) that do not normally interfere with healing. Multiplication of bacteria within the wound can reach a stage of "critical colonization" (18), in which the host defenses are unable to maintain a balance, thus resulting in delayed healing. Infection results when the invading organisms overwhelm the host defenses, either by their sheer numbers or by impairing the host's immunity.

Infection confined to an ulcer bed can be described as a local infection. This is typically manifest as purulent secretions, often accompanied by inflammatory signs. Untreated, the local infection can progress to involve the surrounding and deeper tissues. Superficial soft tissue infection may be accompanied by painful spreading erythema, known as cellulitis. Superficial infections involve the skin but do not extend to the fascia, muscle, tendon, bone, or joint, as defined by the International Consensus on the Diabetic Foot. Deep infections are those with evidence of abscess, septic arthritis, osteomyelitis, or septic tenosynovitis. The International Consensus on the Diabetic Foot distinguishes bone infections as osteitis, infection of the cortical bone only, and osteomyelitis, in which the bone marrow is involved.

2.1 Mechanisms of Infection

Although microorganisms are responsible for the infection, there is debate as to the exact mechanisms by which they cause their adverse consequences and their effect on a non-healing chronic wound. Several factors are thought to be involved, including the bacterial burden, or load, within a wound. Many authors have reported healing to be delayed in a variety of wounds by an excessive bacterial burden, and the likelihood of infection rises as the bacterial burden increases. (19) Controversy persists over whether the mere presence of a high bacterial bioburden warrants antimicrobial therapy. (20) Some have proposed that a burden of >105 cfu of bacteria per gram of tissue is required to cause wound infection. (19) However, particularly virulent organisms, such as β-hemolytic streptococci, secrete toxins that allow rapid spread through the host's tissue planes and are capable of producing clinical infection at a lower burden.

As demonstrated by β-hemolytic streptococci, the virulence of the colonizing microorganism correlates with the likelihood of infection. The significance of other individual species of bacteria in a wound is not yet known. In uninfected diabetic foot ulcers, the microflora is likely to be polymicrobial. (17) Staphylococcus species are the most frequently isolated organisms, along with Streptococcus species, Pseudomonas aeruginosa, and various coliform bacteria. (21) When infection ensues, especially in patients who have not recently received antibiotics, aerobic gram-positive cocci are the dominant pathogens. (22) With careful sampling and culturing techniques, some anaerobic bacteria can also be recovered in 74%–95% of more severe diabetic foot infections. (23-24) A culture with polymicrobial flora from a diabetic foot ulcer does not reveal which microorganisms are pathogens. In fact, bacteria are thought to be synergistic and form biofilms on the surface of chronic wounds. This allows anaerobes to survive on wound surfaces and supports the growth of bacteria not normally considered pathogenic. (25)

The final factor potentially influencing the manifestation of clinical infection is the host response. In diabetic patients, hyperglycemia reduces the activity of neutrophils and macrophages, the cells responsible for the phagocytosis of bacteria and foreign material in the initial inflammatory phase of healing. (26) Ischemia, edema, and neuropathy reduce the capillary vasodilation response to injury, further impairing the host's response to infection. Thus, the interaction between the bacteria present within the wound and the host response determines whether a wound will progress from colonization to infection and how infection will manifest.

In diabetic foot disease, we should aim to diagnose infection at an early stage before it progresses toward deep infection and damage to underlying tissue. Obtaining a rapid and accurate diagnosis is, however, compounded by several factors. Because

the clinical signs of infection and microbiological analysis may be misleading, it is important to combine all information available and not rely on any single laboratory report. Sometimes subtle findings, such as failure of a wound to heal within the expected time frame, may suggest infection.

2.2 Microbiological Sampling

Traditional methods of sampling to determine the causative agents of a wound infection include rubbing the wound surface with a cotton swab, aspirating purulent secretions, and obtaining tissue by curettage or biopsy. Surface swabbing will collect skin contaminants, which may or may not be pathogenic. Furthermore, routine processing of swabs in clinical microbiology laboratories is rarely sufficient to isolate anaerobic or fastidious bacteria; this results both from the inadequate collection and/or transport method and variations in laboratory processing and incubation. The culture of aspirated fluid or pus is more likely to reveal the pathogenic organism, especially if taken from a deep pocket within the wound. The culture of debrided infected tissue is an excellent method for diagnosis in diabetic foot ulcers. Removing superficial debris before sampling will eliminate surface contaminants and provide more specific results. Tissue biopsy is generally regarded as the reference standard for diagnosing infection. Quantitative analysis of the deep tissue can identify heavily inoculated wounds (>105 cfu/g of tissue), but the clinical significance of this finding is unclear because it requires expertise in obtaining the sample and specialist laboratory processing. If osteomyelitis is suspected, a specimen of bone obtained at surgery or by percutaneous biopsy is the most useful sample for culture. Although culture and histological examination of a specimen is the most accurate method for diagnosing infection, it is not always easily obtainable. The technique used to obtain a microbiological sample is crucial. Although some methods are clearly superior, those selected sometimes depend on local clinical and laboratory expertise.

2.3 Hematologic and Biochemical Markers

Blood tests, such as WBC count, erythrocyte sedimentation rate, and C-reactive protein level, are commonly requested to aid diagnosis. However, they are neither sensitive nor specific and are unlikely to be elevated in local or superficial infection. Up to 50% of patients with a deep foot infection will not have leukocytosis; therefore, normal results do not preclude infection. Inflammatory blood markers are simple and relatively inexpensive to detect and may help guide the clinician in assessing treatment responses in severe infection when used in combination with other factors. The erythrocyte sedimentation rate is frequently used to monitor the response to treatment for osteomyelitis. C-reactive protein levels have been demonstrated to be elevated in diabetic foot ulceration, and other acute-phase proteins, such as ferritin, α_1-antitrypsin, and haptoglobulins, are currently under investigation. Blood glucose and hemoglobin A_{1c} levels may rise in infection.

2.4 Radiological Diagnosis of Osteomyelitis

Many imaging techniques have been used to confirm or refute the presence of bone infection. Plain radiographs are useful as an initial evaluation and can be used as comparisons for later assessments. Radiography can also detect gas in soft tissues, which may represent severe soft tissue infection by anaerobic organisms and possible abscess formation. Osteolytic bone changes or periosteal elevation are suggestive of osteomyelitis. However, these changes may not be present in the first few weeks of infection, and their absence does not exclude osteomyelitis. Follow-up radiography is usually done 2–6 weeks later, although there is no agreed best interval. If the diagnosis remains in doubt, further investigations may include an isotope bone scan or labeled WBC scan, infrared thermography, ultrasound, or MRI. Among these, MRI has been found to be more sensitive and far more specific than bone scans for the diagnosis of osteomyelitis in diabetic feet.

2.5 Clinical Diagnosis of Infection

The most important diagnostic tool for infection is bedside clinical evaluation. The patient should be asked about an increase in pain, odor, or exudate. Local infection of an ulcer can be difficult for inexperienced clinicians to recognize. Cutting and Harding described signs of infection in a granulating wound: delayed healing, friable tissue, offensive odor, secretion of pus, increase in lesion size, pain or discomfort, and prolonged exudate production. Although symptoms may be absent in the neuropathic foot, the clinical signs of abnormal granulation tissue, such as a change in color from bright red to dark red, brown, or gray and increased fragility and contact bleeding, should alert the clinician to the possibility of infection. Spreading superficial infection, usually represented by warmth, erythema, and edema may be less obvious in the diabetic foot. Systemic signs, such as pyrexia, chills, and lymphadenopathy, are usually absent. Even if the infection is present, it can be difficult to differentiate from acute neuro-osteoarthropathy (Charcot's foot). Radiological and clinical assessments, together with laboratory tests, should aid the differentiation of infectious from noninfectious bone lesions.

If a bone is visibly exposed within the wound or can be detected on gentle probing with a sterile instrument, osteomyelitis is likely. In a study of 75 patients with 76 ulcers, osteomyelitis was confirmed in 50 ulcers (66%). Thirty-three of these ulcers had bone detectable on probing, whereas 4 with underlying osteomyelitis did not, giving a sensitivity of 66%, a specificity of 85%, and a positive predictive value of 89%. Other deep structures exposed within the wound, such as tendon or joint capsule, also signify deep infection. Probing a wound can also detect foreign bodies and sinus tracts. It is essential that a wound is carefully probed with a narrow, blunt instrument able to convey to the user the presence of hard material within the wound. It is among the quickest and easiest procedures to do when evaluating a diabetic foot ulcer and among the most important. (13)

To accurately diagnose infection, a combination of clinical, laboratory and imaging investigations must be used. Various studies have defined the proper techniques for obtaining and the values of various tests. Determining which diagnostic procedures to order depends somewhat on local expertise and availability. Among the simplest and most important of tests is probing the debrided wound at the base of an ulcer; this should be done on every wound to evaluate its depth and exclude osteomyelitis. If in doubt, it is better to treat potential infection empirically while waiting for a definitive diagnosis than to delay treatment.

34 patients with DFS participated in the study; all of them were undergoing hospital treatment in the department of bone and purulent surgery No. 4,7,12, HEMS (Hospital of Emergency Medical Service) in Almaty.

All patients were informed on the main provisions of the research and signed informed consent to participate in the study. The study was approved to proceed by the local Ethics committee of the Center for Life Sciences of Nazarbayev University (Protocol No 14 of 30 June 2014).

The majority of patients with DFS were men (64.6±6.0%), a proportion of women was 35.4%. Type 2 diabetes was prevalent in 96.9% of the patients, whereas type 1 was observed in 3.1±6.0% of the patients. The average age of the patients was 63.8 years old, with duration of diabetes 14.6 years, and duration of DFS 2.0 months.

88.2% of patients were registered with angiopathy, 76.5% of infected people had polyneuropathy which allowed to allocate them in the group of major factors of risk of development of DFS. The retinopathy was registered in 35.3%, nephropathy 50.0%, encephalopathy – at 11.8%. The depth of distribution it is purulent - necrotic defeats it was estimated as 4-5 degree according to Wagner classification in 52.9% of patients.

Study material of a range of the microorganisms present at the centers of purulent - necrotic defeats in a diabetic foot syndrome, 10-20 mg of biomass was taken from the deep center of the affected area and placed in 1 ml of a solution of 50mmol EDTA in 1,5 ml to a micro centrifuge test tube.

DNA from the samples was extracted using bacterial Easy Pure Bacteria Genomic DNA Kit DNA (Transgenbiotech, China).

16S rRNA gene amplification for the sequencing library preparation:

All samples were used in PCR amplification for the 16S rRNA gene for further library preparation of sequencing. Each PCR reaction included: 7 µl of genomic DNA, 1,5 µl of 10pM pair of primers, 12.5 µl of KAPA HiFi Hot Start ReadyMix PCR Kit (Kapa Biosystems Ltd.) which included an appropriate concentration of buffer, MgCl2, dNTPs, and polymerase. A total volume of each reaction was 25µl. Amplification was done using IQ5 thermocycler (BioRad, USA) with the following regime: Initial denaturation at 94° C for 3 min; Cycling (30 cycles): denaturation at 94° C for 45 sec, annealing at 50° C for 1 min, elongation at 72° C for 1 min 30 sec, additional elongation at 72° C for 10 min, hold at 4° C.

The PCR products were cleaned up using magnetic beads AMPure XP Beads (Agencourt AMPure XP) according to the Illumina protocol for sequencing library preparation.

The research of the variety of microorganisms present in the center of purulent - necrotic defeats in diabetic foot syndrome was carried out by the analysis of variable sites of V3 and V4 of a gene 16S of ribosomal RNA. Variable sites 16S of rRNA were used for phylogenetic classification of the non-uniform microbial population according to the origin of species.

For obtaining DNA fragments of 16S rRNA a gene which includes V3 and V4 sites, highly specific primers covering the region were synthesized. These fragments of DNA were analyzed using MiSeq, which allowed to identify the primary nucleotide sequence of DNA. The primary sequence of DNA was compared with data from the database which allowed to identify types of studied microorganisms, and also their quantity in a percentage ratio present in the material. This allowed a comparison and ratio analysis of samples by the species difference in the studied population of microorganisms.

3 Results

The DFS microbiota contained 34 different types of species, 26,5% of which were aerobes and 73,5% were anaerobes. A high proportion was mixed-infections was containing both anaerobes and aerobes was present (81,5%), only 11,1% of samples were purely aerobes, and 7,4% - anaerobes (Fig.1).

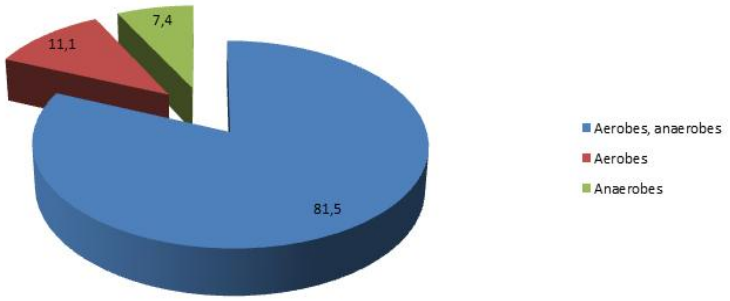

Figure 1. Specific Weight of Aerobes, Anaerobe Bacteria's and Mixed-infections

Aerobes were represented in the following 3 types of classes: Staphylococcus, Streptococcus, Pseudomonas, Campylobacter, Acinetobacter, Corynebacterium, Macrococcus, Achromobacter, Stenotrophomanas (Figure 2).

From aerobes representatives of Streptococcus spp appeared most often (44,4%), Pseudomonas spp. (37,0%), Achromobacter spp. (26,0%), Corynebacterium spp. (22,2%). As seen from the represented data, representatives of Staphylococcus were registered only in 14,8% and include the following species: S. aureus, S. intermedius, S. chromogenes, S. pseudolugdunensis, S. agnetis, S. lugdunensis.

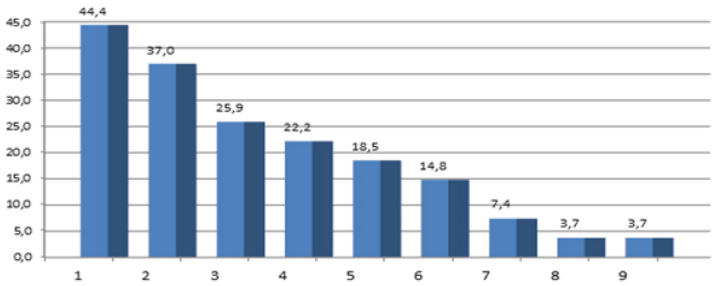

Figure 2. Aerobes. Distribution of Aerobes According to Genus: 1- Streptococcus; 2- Pseudomonas; 3- Achromobacter; 4- Corynebacterium; 5- Acinetobacter; 6- Staphylococcus; 7- Stenotrophomanas; 8- Campylobacter; 9- Macrococcus

Overall, bacteria representing 25 different genus groups were identified. Figure 3 shows the most frequently observed genus types of microorganisms, amongst which Anaerococcus spp., which belongs to the Clostridia family, accounted for 44.4% of frequency appearance, which was followed by Peptoniphilus spp. and Fusobacterium spp. representatives of Bulleidia spp., Enterobacter spp., Helcococcus spp. were identified in 14,8%. The most rarely occurring bacteria belong to the following types of the genus': Peptostreptococcus, Morganella, Citrobacter, Clostridium, Moryella, Negativicoccus, Tolumonas, Granulicatella, Oxalobacter.

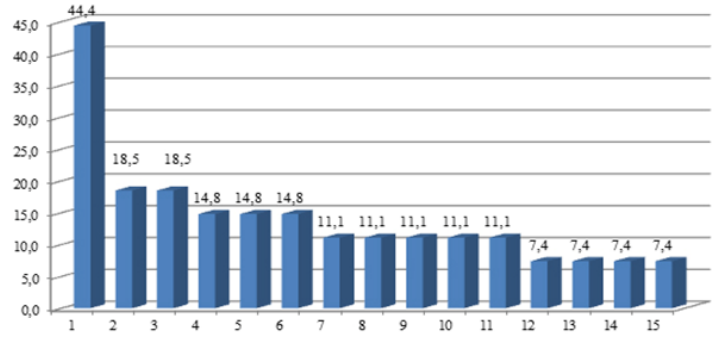

Figure 3. Anaerobes. Distribution of Anaerobes According to Genus: 1- anaerococcus; 2- Peptoniphilus; 3- Fusobacterium; 4- Bulleidia; 5- Enterobacter; 6- Helcococcus; 7- Finegoldia; 8- Escherichia; 9- Providencia; 10- Prevotella; 11- Porphyromonas; 12- Klebsiella; 13- Bacteroides; 14- Enterococcus; 15- Actinomyces

4 Discussion

T Our results indicate that mainly microflora of the infected sites with DFS is represented by a polymicrobial association of aerobes and anaerobes with the high degree of colonization 81.5%. As stated above, anaerobes belong to 25 types of the genus, which exceeds the number of aerobe microorganisms (Pseudomonas aeruginosa, Acinetobacter spp. etc.). Bacterial diversity in chronic wounds is represented by less than 8 specie origins in each type.

As seen in the given results of molecular-genetic results, the bacterial profile of purulent - necrotic defeats in DFS is characterized by the presence of anaerobic infectious organisms. The most frequently registered types of the Anaerococcus which was extraction from almost 44.4% of the patients. Three types were registered: A. vaginalis, A. lactolyticus, A. tetradius. This data is consequent with results which determined the dominating role of A. lactolyticus and A. vaginalis using 16S rRNA sequencing (27), in which these organisms are involved in biofilm formation in diabetes, the frequency of their appearance is 55%. Resistance to antibiotics of certain types of Anaerococcusspp is established. (28)

The polymicrobial etiology of microbiota at the centers of infection in DFS was characterized by the presence of representatives of a normal microflora: with an identical frequency we defined species of Peptoniphilus genus (18.5%), Fusobacterium genus (18.5%); 14.8% types of Bulleidia origin species, the Enterobacter genus, the Helcococcus genus. The Peptoniphilus genus is presented by 5 types of species: P. asaccharolyticus, R. gorbachii, P tyrrelliae, R. ivorii, R. methioninivorax. These types represent normal vaginal and intestinal microflora. (29-30) However, bacteria of these types were registered at a diabetic infection of the skin and soft tissues, an infection of bones and joints, surgical infections, a chorioamnionitis and infections of a blood-groove. (30) Usually, bacteria of this type are present as a part of polymicrobial associations, the sequence of which is difficult to be determined by routine cultural methods but can be revealed using the microbiome analysis using 16S rRNA sequencing and MALDI-TOF method of identification. (31) Fusobacterium spp. included F. gonidiaformans and F.naviforme. These types were identified in 5 patients, 4 of which were classified by 4-5 degree of infection on Wagner scale. There is evidence that elderly people with associated diseases have of F. nucleatum present, these people are at the stage of dialysis or with malignancies. (32-33)

Bulleidia genus included: Bulleidiaextructa and Bulleidiamoorei, identified in 4 samples from patients and classified at the degree of 4-5 according to Wagner scale. Presence of B. moorei in infections was described in the paradontitis patients, including those exhibiting dentoalveolar abscess. (34) This research (35) allowed revealing V. moorei at a wound fever as a part of the mixed microflora of aerobic and anaerobic bacteria.

In the studied samples Enterobacter nickellidurans, Enterobacter soli, Enterobacteraceae were also identified, which role in the development of intrahospital infections is undoubtable. Now enterobacterium causes up to 15% of all intrahospital infections, this is up to 0% of all bacteremia's. It is known that among intrahospital infections 5 to 10% of all cases contain pneumonia caused by enterobacterium.

Our comparative analysis of a microflora of ulcer and necrotic defeats in DFS depending on the extent of the defeated area allowed to identify the specific structure of the microflora. The frequency of staphilococci occurrence was 6,5%, unlike streptococci which in colonizing the defeated center 1,7 times more at 4-5 degree of classification on Wagner. There is a 4 times increase in presence of Fusobacteriumspp species. (13.0% in comparison to 3.2%), 3 times increase in Porphyromonas spp. (9.7% in comparison to 3.2%), double increase in Achromobacter spp. (13.0% in comparison to 6.5%), 1.2 times increase in Anaerococcus spp. (22.6% in comparison to 19.3% (fig. 4). According to this 4-5 degree of classification on Wagner scale, the number of representatives of normal flora decreases Corynebacterium (3.2% in comparison to 13.0%).

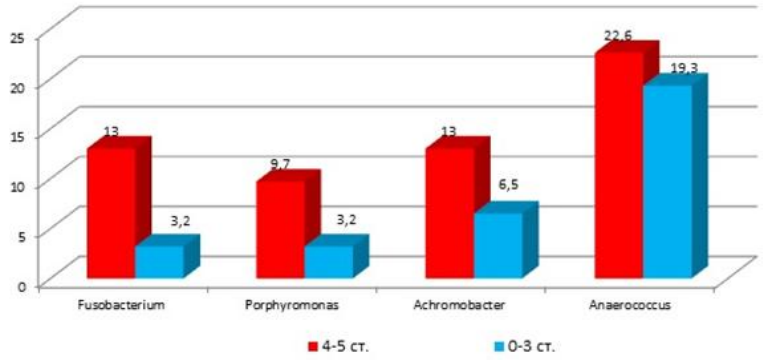

Figure 4. Frequency of Occurrence of Normal Microflora Representatives According to Wagner Scale of Classification

5 Conclusion

Therefore, the data obtained from our study using molecular and genetic methods of identification of microorganisms in DFS, allowed to generate a number of important conclusions:

- Development of purulent - necrotic complications are linked to long developing processes and irrespective of the degree of defeated are characterized by polymicrobial association, which supports the concept of "pathogroups";
- The consortium of genotypically different bacteria varies in accordance to origin of species depending on the degree of the infected area: at high degree on Wagner scale the frequency of the anaerobe bacteria increases which are generally responsible for development of intrahospital infectious diseases (Fusobacterium spp., Porphyromonas spp., Achromobacter spp., Anaerococcus spp.); the synergetic effect of "pathogroups" is provided with the functional equivalence at a co-aggregation of all terms of a microflora irrespective of pathogenicity degree;
- Correlation between the degree of violation of a microbiota and development of DFS attempts to find the solution in search of potential bacterial targets for medicines. These methods allow choosing the most adequate antibacterial therapy more effectively.

The molecular and genetic research of a microbiota in case of DFS has broad perspectives for the selection of genes as functional biomarkers for prevention or increase in risk in purulent-necrotic complications in case of DFS and to create methods of management of these mechanisms.

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Literature:

1. Bregovskii VB, Demina AG, Karpova IA. Prevention of diabetic foot syndrome in patients with diabetes mellitus. Directory outpatient physician. 2015; 4-5:30-3.
2. Budasheev VP, Grigorev EG, Lepekhova SA, Zhigaev GF. Microbial Landscape of wounds in diabetic patients. Bull ESSC SB RAMS. 2011; 4(80):16-21.
3. Gal IG, Kiparisov VB. Indicator assessing the quality of life of the patient with limb trauma and cost-effectiveness analysis in outpatient practice. Clinical Neurology. 2012; 4:7-10.
4. Dedov II. Diabetes: the development of technologies in the diagnosis, treatment and prevention of diabetes mellitus. Diabetes. 2010; 13:6-13.
5. Dibirov MD, Zavaliy IP, Chepkasova TV. Non-standard surgical infections in patients with pyo-necrotic complications of diabetic foot syndrome and the specifics of its antibacterial therapy. Vestnik Novgorod State University. 2015; 2(85):41-2.
6. Drobushevskaya AI. Meaning of gram-positive microflora in the development of skin and soft tissue infections and diabetes mellitus of the second type. Health and Education in the XXI century. 2013; 5:15.
7. Obolensky VN, Ermolova AA, Sychev DV, Semenisty AU. Local negative pressure method in the prevention and treatment of septic complications in traumatology and orthopedics. J of Traumatology and Orthopedics. 2013; 2:3-11.
8. Abdulrazak A, Bitar ZI, Al-Shamali AA. Bacteriological study of diabetic foot infections. J Diabetes Complications. 2005;19(3):138-41.
9. Koenig JE, Spor A, Scalfone N, et al. Succession of microbial consortia in the developing infant gut microbiome. Proc Natl Acad Sci USA. 2001; 108:4578-85
10. Woodmansey EJ, Murdo ME, Macfarlane GT. Comparison of compositions and metabolic activities of fecal microbiotas in young adults and in antibiotic-treated and non-antibiotic-treated elderly subjects. Appl Environ Microbiol. 2004;70: 6113-22.
11. Pozzili P, Leslie RD. Infections and diabetes: mechanisms and prospects for prevention; 1994.
12. Karchmer AW. Microbiology and Treatment of Diabetic Foot Infections. In: Veves A, Giurini JM, Logerfo FW, editors. The Diabetic Foot. Contemporary Diabetes. Humana Press; 2006.
13. Williams DT, Hilton JR, Harding KG. Diagnosing of foot infections in diabetes; 2004.
14. Committee on Control of Surgical Infections Committee on Pre- and Postoperative Care. American College of Surgeons. Manual on control of infection in surgical patients; 1976.
15. White RJ, Cooper R, Kingsley A. Diagnosing of foot infections in diabetes; 2004.
16. Ayton M. Wounds that won't heal; 1985.
17. Louie TJ, Barthlet JG, Tally FP, Gorbach SL. Aerobic and anaerobic bacteria in diabetic foot ulcers; 1976.
18. Kingsley A. A proactive approach to wound infection; 2001.
19. Robson MC, Mannari RJ, Smith PD, Payne WG. Maintenance of wound bacterial balance; 1999.
20. Dow G, Browne A, Sibbald RG. Infection in chronic wounds: controversies in diagnosis and treatment; 1999.
21. Bowler PG, Duerden BI, Armstrong DG. Wound microbiology and associated approaches to wound management; 2001.
22. Lipsky BA, Pecorara RE, Larson SA, Hanley ME, Ahroni JH. Outpatient management of uncomplicated lower-extremity infections in diabetes patients; 1990.
23. Johnson S, Lebahn F, Peterson LR, Gerding DN. Use of an anaerobic collection and transport swab device to recover anaerobic bacteria from infected foot ulcers in diabetics; 1995.
24. Gerding DN. Foot infections in diabetic patients: the role of anaerobes; 1995.
25. Bowler PG, Davies BJ. The microbiology of infected and non-infected leg ulcers; 1999.
26. Delamaire M, Maugendre D, Moreno M, Le Goff MC, Allanic H, Genetet B. Impaired leukocyte functions in diabetic patients; 1997.
27. Dowd SE, Wolcott RD, Sun Y. Polymicrobial nature of chronic diabetic foot ulcer biofilm infections determined using bacterial tag encoded FLX amplicon pyrosequencing (bTEFAP). PLoS One; 2008.
28. Goldstein EJC, Diane MC, Merriam CV. In vitro Activity of ceftobiprole against aerobic and anaerobic strains isolated from diabetic foot Infections. Antimicrobial agents and chemotherapy. 2006; 50(11):3959-62.
29. Clark N, Tal R, Sharma H. Microbiota and Pelvic Inflammatory Disease. Semin Reprod Med. 2014; 32(1):43-9.
30. Brown K, Church D, Lynch T. Bloodstream infections due to Peptoniphilus spp.: report of 15 cases. Clinical Microbiology and Infection. 2014; 20(11):857-60.
31. Ezak T, Kawamura Y, Li N. Proposal of the genera Anaerococcus gen. nov. Peptoniphilus gen. nov. and Gallicola gen. nov. for members of the genus Peptostreptococcus. Int J of Systematic and Evolutionary Microbiology. 2011; 51(4):1521-8.
32. Citron DM, Poxton IR, Baron EJ. Bacteroides, Porphyromonas, Prevotella, Fusobacterium, and Other Anaerobic Gram-Negative Rods. In: Murray PR, Baron EJ, Landry ML, Jorgensen JH, Pfaller MA, editors. Manual of Clinical Microbiology, ASM Press; 2007. p. 911-32.
33. Huggan PJ, Murdoch DR. Fusobacterial infections: Clinical spectrum and incidence of invasive disease. J of Infection. 2008; 57(4):283-9.
34. Detry GD, Pierard K, Vandoorslaer G. Septicemia due to Solobacterium Moorei in a patient with multiple myeloma. Anaerobe. 2006; 12:160-2.
35. Zheng G, Summanen PH, Talan D. Phenotypic and Molecular Characterization of Solobacterium Moorei Isolates from Patients with Wound Infection. J Clin Microbiol. 2010; 48(3):873-86.

Primary Paper Section: F

Secondary Paper Section: FB

G AGRICULTURE

GA	AGRICULTURAL ECONOMICS
GB	AGRICULTURAL MACHINES AND CONSTRUCTION
GC	PLANT GROWING, CROP ROTATION
GD	FERTILIZATION, IRRIGATION, SOIL TREATMENT
GE	PLANT CULTIVATION
GF	DISEASES, PESTS, WEEDS AND PLANT PROTECTION
GG	ZOOTECHNICS
GH	NUTRITION OF FARM ANIMALS
GI	FARM ANIMAL BREEDING AND FARM ANIMAL PEDIGREE
GJ	BDISEDAISES AND ANIMAL VERMIN, VETERINARY MEDICINE
GK	FORESTRY
GL	FISHERY
GM	FOOD INDUSTRY

INFLUENCE OF BIOFERTILIZERS ON SOWING QUALITIES OF SOYBEAN AND WHEAT SEEDS

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Abstract: Preparing the seed material, as well as choosing the right protectant, is an opportunity to prevent the disease from developing in the field and to get good healthy sprouts. In the laboratory conditions, the effect of growth stimulants and thiram protectant on the seed microbial flora and the sowing quality of soybean and wheat seeds was evaluated. As biofertilizers, sodium humophosphate and potassium humophosphate were selected as growth stimulants, thiram FS (suspension concentrates for seed treatment) was taken from the protectants, which has a wide spectrum of action against fungal and bacterial infections. They were tested separately and in combination with a protectant in recommended doses. Preliminary phyto-examination of seeds, conducted according to methodological instructions, showed their infection level with fungal and bacterial microbial flora. The purpose of our research was to use as biofertilizer growth promoters - sodium humophosphate and potassium humophosphate and assess their effect on the sowing qualities of soybean and wheat seeds.

Keywords: Soybean, wheat, infection, biofertilizer, protectant, effectiveness.

1 Introduction

The agricultural sector of Kazakhstan in recent years has faced a number of serious problems. To solve them, the Government of Kazakhstan has developed the Program for the Development of the Agro-Industrial Complex of the Republic for 2013-2020 "Agrobusiness 2020", the main goal of which is to increase the competitiveness of agricultural products.

The high quality of seeds is one of the main agronomic requirements, ensuring, under other optimal conditions, the production of high and stable crop yields.

Seeds are a source of conservation of many disease excitants, as they are rich in proteins, minerals and represent a good nutrient substrate for pathogenic fungi and bacteria livelihood.

Disease excitants that persist in the seed grains to significant crop losses and a decrease in grain quality due to:

- reducing the germinating ability of seeds (loose smut of wheat and barley);
- death or damage of the root system of sprouts (Fusarium and Helminthosporium root blights, Alternaria blight, bacterial blight), which leads to the deterioration of crops;
- contamination with mycotoxins (fusariosis);
- reducing the number of productive stems (dusty and hard cereal crops, Fusarium root rot and others).
- mycotoxins infection (Fusarium blight);
- decreasing of the number of productive stems (loose and kernel smut of cereal crops, Fusarium root blights, and others).

In addition, sprouts and primary roots have tender tegmen through which easily penetrate causal agents that persist in the soil. (1-3)

Among the leguminous crops, soybean is characterized by a high content of principal nutrients. Its seeds contain up to 50% protein and 20% oil, as well as minerals and vitamins, which allows it to be used for food, as well as for technical and fodder purposes. Its importance in increasing the fertility of the soil is also great. The arable layer of soil is enriched with organic nitrogen by means of nodule bacteria. In addition to that, soybean is a good precursor for many crops. The diversification of agriculture carried out in the country predetermines the increase in soybean production by means of the expansion of sowing areas, the increase of the yield of this valuable crop, the reduction of yield losses from pests, especially from fungal and bacterial diseases.

Getting high and stable soybean crops largely depend on the quality of the seed grains. In the practice of agricultural production, increasing attention is paid to the use of growth stimulants. The need for seed treatment with growth stimulants is now a scientifically grounded method. (4) Herewith, it is possible to achieve maximum germination ability and germinating energy, as well as the reduction of environmental factors and to improve the quality and quantity of obtained products. (5)

A very popular culture is wheat, from which flour is made, which, in turn, is the most popular product. Bread and various bakery products are produced from wheat flour. Such foodstuffs are purchased daily by millions of people. For farmers involved in the cultivation of cereals, it is important to have a quality and safe growth stimulant for wheat. A good growth stimulator for wheat will accelerate the process of plant development, and will also strengthen its health and resistance to various diseases. In addition, the growth stimulator significantly affects the quality and quantity of the crop. Therefore, many entrepreneurs engaged in agricultural activities acquire a highly effective and quality growth stimulator for crops. However, most of them are not able to effectively suppress the seminal infection. At the same time, seed disinfectants, in most cases, suppressing the seminal infection, do not have a positive effect on the germination ability, growth, and development of plants. The co-use is necessary for increasing their effectiveness. The combination of these two means of protection will allow developing an effective way of processing seeds. (6-8).

2 Materials and Methods

The objects of research are soybean and wheat seeds, biofertilizers. Research methods - the effect of soybean and wheat seed on sowing qualities of seeds and microbial flora was carried out under laboratory conditions. The sowing qualities of the seeds were determined in wet chambers placed in a thermostat at a temperature of 24°C. The germinating energy was taken into account on the 3rd day after the trial establishment was laid, the laboratory germination ability on the 7th day in terms of the number of sprouted seeds. The processing effect on bacterial and fungal infection of seeds was established on nutrient medium with potato dextrose agar (PDA). Herewith, the absence of microbial flora around the seeds was noted - (-), weak growth (+), medium (++), intensive (+++).

One of the most widely used for food, fodder and technical purposes is leguminous crop - soybean. The most important component of this culture is protein and fat. Soybean as a source of high-quality amino acid content of protein used for food purposes, as well as for valuable vegetable oil, which has food and technical applications, is in great demand. Soya, in comparison with other legumes, is not only richer in chemical composition, but also has the highest feed value, which has contributed to the development of the grain-growing direction of its cultivation and, in turn, made it possible to widely use it in fodder production as a culture providing more concentrated ingredients for formula feed industry.

One of the main reasons for the low yield of soybean and wheat is the lack of necessary nutrients for plants. Virtually any stress factor leads to a disturbance in plant nutrition - drought, low or high temperature and soil or air compactness, soil compactness and poor aeration. That is, even with a sufficient number of fertilizer elements in the soil, plants are not always able to use them fully. (9)

At present, close attention is paid to humic substances, which constitute a specific group of high-molecular compounds. This is due to the fact that they are economically the most profitable raw material for obtaining humic preparations. The latter contain

biologically highly active humic acids or their salts. They stimulate the growth processes of plants in the initial phase of development. But the intensity of manifestation of this action is different not only within families and genera but also between individual varieties and even hybrids of a variety of the same species. The most widely known drug is sodium humate or potassium humate.

The use of sodium humate for presowing seed treatment is an indissoluble part of measures to increase the yield of crops, in particular soybeans and wheat. Sodium humate increases the activity of many enzymes and enzymatic systems in the plant organism and improves the use of plant nutrients from soil and fertilizers. Great role of the drug in increasing the quantity and quality of the crop, in a favorable effect on the state of plants and the environment.

In 2012-2014, research was conducted on the territory of the scientific-experimental farm "Agrouniversitet" of the Kazakh National Agrarian University aimed at identifying ways to obtain high yields of soybean culture, using plant protection products and various biological products that can reduce the number of mineral fertilizers used. This is largely due to the fact that in modern agriculture, the fertility of soils should be considered not only in terms of plant nutrition but also with the preservation of the ecological functionality of the landscape. Anthropogenic load affects the fertility of lands, therefore, the problem of complex application of fertilizers with plant protection products and biological preparations of different directions of action, which ensure high crop productivity in crop rotation, is important for research, raising the state of soil fertility. (10-11)

The data of scientific institutions show that fertilizers are an effective and fast-acting factor that contributes to improving the quality of the crop. With the help of fertilizers, you can change the direction of metabolic processes in the desired direction, increase the accumulation of proteins, fats and other substances in plants, influence the chemical composition of plants, which determines the quality of the crop.

Therefore, it is important to know the conditions for the effective use of fertilizers, not only to increase the yield, but also to improve the quality of the produce.

The main substances that determine the nutritional and fodder value of soybean are proteins. Important in soybean seeds is fat. The chemical composition of soybean grain consists of protein 39%, starch 3%, fat 20%, fibre 5%, sugars 10% and ash 5.8%. Proteins in soybean seeds are on average 2-3 times more than in seeds of cereals.

This indicates that with equal yields from the same area, you can get 2-3 more proteins than when sowing cereals. The soy straw also contains many proteins. The study of the protein complex of soybean seeds showed that globulins predominate in it. They account for more than 60-70% of the total protein content. Proteins of soybean seeds were almost completely dissolved in water and in a 10% solution of sodium chloride. The easy solubility of proteins in water and solutions of neutral salts means easier digestibility for humans and animals, which distinguishes soya from the seeds of cereals. (12)

The biological value of proteins of soybean grain is very high, it is much higher than the biological value of other vegetable proteins. If we take the biological value of milk proteins for 100, the value of soy proteins approaches 100, other legumes to 75-85, rice to 83, wheat to 62. There is evidence that the proteins of milk and soybean are equipollent. In soy protein, there are all essential amino acids. Thus, soybean seeds are not only a product with a large number of proteins but also a concentrate of easily accessible amino acids for humans and animals.

The quality of seeds is the most important factor determining the size of the crop. The seed is the bearer of the biological and managemental signs of the future harvest. For sowing, it is necessary to use high-quality seeds of recognized and appreciable varieties. One of the main indicators affecting the quality of seeds is the level of technology for their cultivation. The higher are the arable farming, the agricultural background, the higher is the yield and the better is the quality of the seeds. (13)

The use of bio preparations in crop rotations promotes additional accumulation in the harvest of basic nutrients from fertilizers and an increase in the coefficient of their use by a factor of 1.5-2. The seed inoculation with microorganisms increases the accumulation of biological nitrogen in the crop by a factor of 2.3-6.5, reduces the tension of the balance of this element, and ensures an increase in the supply of stubble-root remains to the soil, due to screefing of which in the arable layer, accumulate up to 1.2 ... 1.4 t/ha of humus.

Grain quality is a combination of the biological, physicochemical, and technological properties of a grain, which determine its suitability and ability to satisfy certain needs in accordance with its purpose. The quality of wheat is a factor of intensification of agricultural production, therefore, the improvement of biochemical indicators of products is of key importance in the agriculture and crop production. (14)

Germination ability is the number of normally germinated seeds, denoted as a percentage of the sample, which was taken for analysis. Seeds that have a root not less than the length of the seed and a sprout not less than half the length of the seed (rye, wheat) refer to well sprouted. Among the germination ability, the distinction is made between laboratory (rationed by the standard) and field. (15)

Laboratory germination ability determines after germination of seeds for 7-8 days in a thermostat in specialized germinators that are filled with heat-treated sand, or Petrie dishes, the bottom of which is paved with moistened filter paper, at a temperature of 20 ... 22 °C.

Field germination is determined by the number of emerged sprouts, expressed as a percentage of the number of seeds sown. Since it is impossible to create the necessary conditions in the field, as in the laboratory, then the field germination is usually somewhat lower than the laboratory one. On average, the field germination is 60-70% for cereals, 35-70% for beets, 36-60% for perennial grasses.

The germination ability and energy of seed germination are important indicators of their sowing qualities. Seeds with high germination ability and good germination energy with proper agrotechnics always give vigorous and full-fledged shoots. Germination ability of seeds has a high production value: it determines their suitability for sowing, the seeding rate. (17)

The standard for certified and sowing qualities of seeds makes high requirements to the norms of germination ability. Seeds that do not fit the requirements of the standard are forbidden to use for sowing. When sowing seeds with low germination ability, the yield decreases; such seeds are inexpedient to use.

Germination energy is the germination rate, which is expressed in percent of seeds germinated (given roots, equal to half the length of the seed, and sproutings) in terms established by experimental germination. For field crops, it ranges from 3 to 15 days.

The germination energy is affected by a huge number of factors: heavy metal salts, growth stimulators, seed damage, etc. The most relevant factors are plant growth stimulators. Growth stimulants are substances that stimulate or inhibit the processes of growth and development in plants. They can be of both natural origin and artificially synthesized.

The mechanism of action of stimulants on a living organism can be varied. Stimulants can affect:

1. biosynthesis, translocation and accumulation of natural phytohormones in the plant;
2. the rate of oxidation-reduction reactions;
3. cell division, their extension, etc.

Herewith, any of the stimulants, as a rule, acts on a certain part of the metabolism and, accordingly, can be used in strictly defined cases.

Stimulants differ in the rate of manifestation and the duration of their action, which also depends on the size and culture of the plant, the amount of active ingredient and the time of its decomposition or inactivation. (18)

It should be noted that with an increase in the concentration of the stimulant and the time of its effect on the plant, the stimulating effect, as a rule, becomes oppressive (inhibitory). Therefore, the search for the most effective way of applying a certain stimulant in practice requires considerable time, effort and money from scientific institutions with further correcting in the conditions of agricultural production.

Organic waste of livestock complexes and processing industry are already fertilizers. However, the efficiency factor of such fertilizers is only 10-15% of the possible. When processing these wastes on a biogas plant, there is a significant improvement in their properties.

In supporting the ecological balance in soils, the most important role is played by the resource of humus, which is a nutrient medium for soil-forming microorganisms that stimulate the nutrition of plants and their growth processes. (19)

The basis of humus is the remains of organics of vegetable origin: the least decomposed fractions, the fractions that continue to decompose, the complex substances that formed as a result of hydrolysis and oxidation, and substances that are the result of the vital activity of microorganisms.

Humus includes humic acids, fulvic acids, and salts of these acids, as well as humins - stable compounds of humic acids, fulvic acids with ground materials. Humins have a significant specific surface area (600-1000 m2/g), a large adsorption capacity. When a small amount of humus is introduced into the soil (20), compared with other fertilizers, the composition, and structure of the microbial flora changes. This, in turn, leads to a change in the microbiological regime in soils, the intensification of the processes of the transformation of substances and energy. As a result, metabolic processes are accelerated, new cycles of microbial flora development are included, in particular, the activity of nitrogen-fixing bacteria is increased. As a result, the nutrient medium is enriched.

The soils in which humic fertilizers are contributed are characterized by the following characteristics:

- the mobility of ground phosphorus increases;
- the processes of nitro formation in the soil are activated, which in turn contributes to a significant increase in total and protein nitrogen, an increase in the release of carbon dioxide by the soil;
- accumulation of ammonical and amidic forms of nitrogen, phosphorus in plants are accelerated;
- the concentration of potassium and aluminum increases with a decrease in the amount of magnesium, i.e. humates exert a significant influence on the content and dynamics of ground cations.

In all important processes of soil formation and formation of soil fertility, humic substances actively participate, which are the result of the decomposition of organic substances. The main indicator of the humus state of soils is the content of organic matter, as it substantially improves the physical, chemical and biological properties of the soil promotes fertility. Also, organic substances have a low thermal conductivity and prevent the rapid release of heat from the soil into the atmosphere. (21)

Humus is 15-20 times more effective for any organic fertilizer. Specific microbial flora and enzymes that are contained in humus, a way to resume "dead soil", i.e. to ensure all its functions and give it the properties of high fertility. These valuable properties of humus retain for 3-4 years.

Annually, simultaneously with the crop, a large amount of organic material is taken out, the number of living microorganisms decreases, and as a result, the activity of humification is reduced. To maintain the necessary level of humus in soils, organic fertilizers (pus, poultry litter, peat) are most often introduced, but the content of humic substances in such organics is very small. Therefore, for a minimum provision of soil with the necessary amount of humus, it is necessary to use more effective fertilizers. (22)

When using humus, a significant increase in the quantity and quality of the crop is achieved. For example, according to different sources (23), winter wheat gives an increase of 15-20%, sugar beet up to 20%, corn 20-30%, potatoes - up to 30%. Thus, the positive effect of humus on soil fertility and yield can be represented in the form of a complex of interrelated processes:

- the physical, mechanical and physical properties of the soil improve;
- the processes of soil exchange are intensified: the adsorption of soil nutrients by fertilizers with the improvement of the nutrient regime of plant development and the increase of biological activity. As a result - yield enhancement.

Along with the stated signs, humus also has other properties, such as high moisture capacity, moisture resistance, the mechanical strength of granules, absence of weed seeds, the presence of a large number and wider range of useful microorganisms, enzymes, antibiotics, growth-promoting hormone for plants. Humus also has more standard qualities: flowability, controlled humidity, the processability of use, the predictability of action on crop yields, harmlessness to the soil, good interaction with these or other mineral and chemical fertilizers. In combination with meliorative and structuring properties of soil, such organic fertilizer, produced by natural technology in industrial production, exceeds the competitiveness of any other artificial mineral fertilizers. (24)

Liquid biofertilizers can also be used for non-root dressing (spraying) of plants. Spraying effectively acts against some harmful insects that parasitize on fruit-berry plants.

2.1 Advantages of Biofertilizers Over Other Organic Fertilizers

Biofertilizers are many times better than other organic fertilizers (pus, poultry litter, peat). Here are some of them:

- Lack of seeds of weeds. In the pus of pigs, cattle, and peat, there is usually a large number of weed seeds. In 1 ton of fresh pus, there are up to 10 thousand seeds of different weeds, which, after passing through the stomach of animals, do not lose the ability to germinate. This leads to a loss of harvest from 5-7 centners of cereal crops per hectare.
- The absence of pathogenic microbial flora. Organic fertilizers often spread many plant pathogens. For example, pus can contain more than 100 diseases that are dangerous to animals and humans: anthrax, tuberculosis, brucellosis, paratyphoid fever, paratuberculosis, foot and mouth disease, salmonellosis, ascariasis, and intestinal infections are just some of them. Pork pus has a total microbial contamination from 4.1 to 3.610-9, sporous anaerobes from 10-2 to 10-4, coli titer ranges from 10-5 to 10-7. Biofertilizers, thanks to a special processing technology in a biogas plant, are completely disinfected from pathogenic microbial flora.
- The presence of active microbial flora, which contributes to the intensive growth of plants. Organic waste that is used as a fertilizer does not have or contains a small amount of microbial flora. The pus contains 109 colonies/gr n different microbial flora, including undesirable. Biofertilizers contain 1012 - 1014 colonies/gr n microbial flora, while undesirable microbial flora is completely absent.
- Lack of adaptation period. Pus and other organics require long-term preparation (6-12 months) before soil application. Useful substances that are contained in them are partially lost, and the rest take effect in the soil only for 2-4 years

after its application. Due to their shape, biofertilizers begin to work effective immediately upon application. (25)

- Resistance to the removal of nutrients from the soil. For a season about 80% of organic fertilizers are washed out of the soil, therefore it is necessary to add them annually in large quantities. During this time, only up to 15% of biofertilizers are washed out of the soil. Thus, biofertilizers' applications in a small amount to your fields will work for 3-5 years longer than conventional fertilizers.
- Maximum preservation and accumulation of nitrogen. An insufficient amount of nitrogen in the soil leads to a decrease in the yield of many agricultural crops. At the same time, the effective growth of plants is hindered, their resistance to various diseases is weakened. Prolonged nitrogen starvation leads to the hydrolysis of proteins and the destruction of chlorophyll. With long-term storage (composting) of organic waste, up to 50% of nitrogen is lost. In biofertilizers, due to the anaerobic fermentation of organic waste in a biogas unit, the amount of total nitrogen N will be fully preserved, in addition, the content of soluble nitrogen Nh4-n increases by 10 - 15%.
- Ecological impact on the soil. Organic fertilizers in non-processed form cause more damage to the soil, polluting it and groundwater. Whereas biofertilizers are absolutely pure ecological fertilizers.

2.2 Advantages of Biofertilizers in Comparison with Mineral Fertilizers

Mineral fertilizers have a negative impact on human health and soil. Mineral fertilizers in the form of granules or solutions are absorbed only by 35-50%, the rest is lied over in the form of nitrates in products and soils. In turn, grown foods have a bad effect on the human body. Nitrates promote the development of cancerous tumors in the gastrointestinal tract. Long-term intake of nitrates in small doses leads to an increase in the thyroid gland. Nitrates contribute to increase cholesterol and reduce protein in the blood of humans and animals. (26)

Biofertilizers due to their biological properties are digested by plants almost 100%, while the content of nitrates in products is minimal.

3 Results and Discussion

Preparation of crops seeds for sowing should begin with the obligatory carrying out of a phytopathological examination of seeds, which includes microbiological analysis of the composition of fungal and bacterial phytopathogens. The purpose of our research was to use as biofertilizer growth stimulators - sodium humophosphate and potassium humanosphere, to evaluate their effect on the sowing qualities of soybean and wheat seeds.

Table 1. Effect of a Combination of Biofertilizers with a Protectant Thiram FS on Sowing Qualities and Microbial Flora of Soybean Seeds (Laboratory Experiment, 2018)

Characteristics	2007	2008	2015	2020	2030
Sector's share in global GDP, %	3,2	2,9	4	5,3	7,4
Share of world experts in global exports, %	10,9	7,7	13	15	20
Sector value of world exports, bln/year	1483	1242,4	1460,5	1682	2500
Sector output in the world, bln/year	2134	2044	3500	4200	6800
Consumption, %	6,1	-4,2	growth rate of over 4,4% per year		
Consumption, %	6	2	growth rate of over 3,6% per year		

As a result of preliminary phyto-examination of soybean and wheat seeds, conducted according to the guidelines (20), a high level of their infection with saprophytic and pathogenic microbial flora was established. In this regard, biofertilizers were tested separately and in combination with a protectant, which has a broad spectrum of action against fungal and bacterial infections (23). All drugs were used in recommended doses. In control, the seeds were treated with water.

As can be seen from the results presented in Table 1, the treatment of soybean seeds with biofertilizers increased the energy of seed germination but did not restrain the growth rate of fungal and bacterial microbial flora.

1 2 3

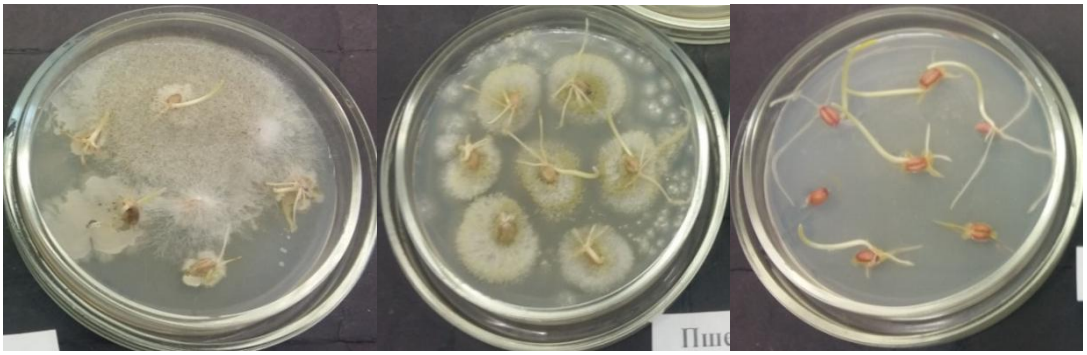

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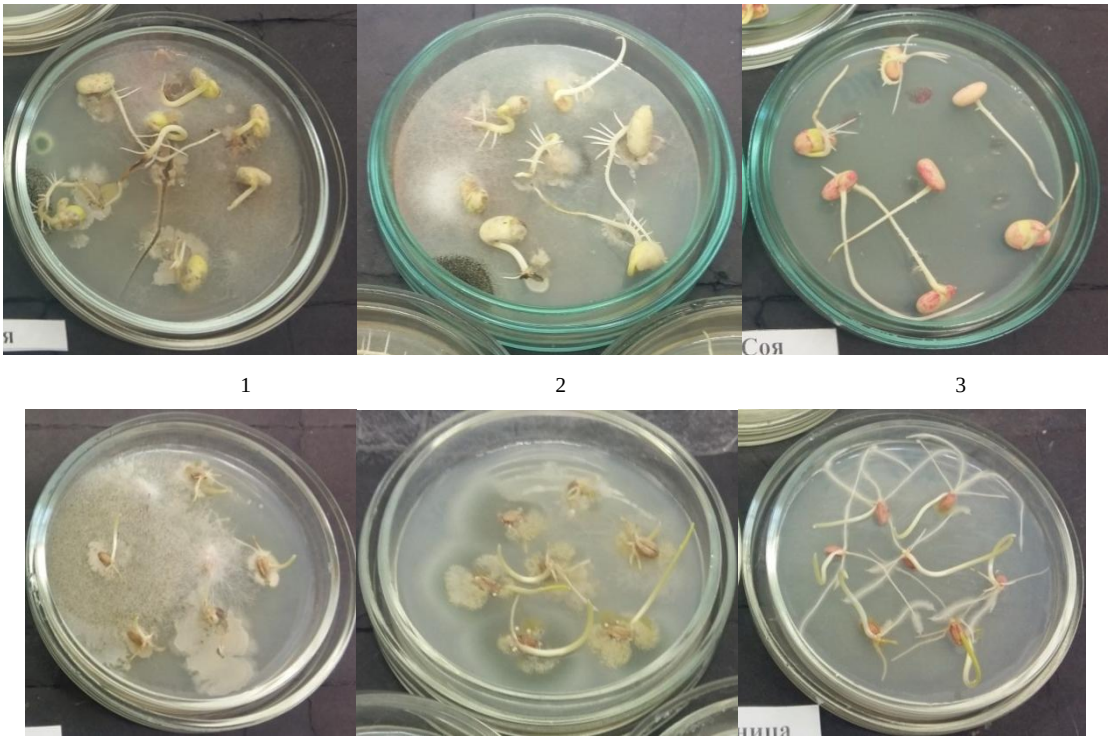
Figure 1. The Growth of the Microbial Flora of Soybean and Wheat Seeds After Treatment (Growing Medium) With 1 - Water, 2 – Sodium Humophosphate, 3 – Sodium Humophosphate + Thiram Protectant



1 2 3

1 2 3

Figure 2. The Growth of the Microbial Flora of Soybean and Wheat Seeds After Treatment (Growing Medium) With 1 - Water, 2 – Sodium Humophosphate, 3 – Sodium Humophosphate + Thiram Protectant

Figure 3. Dependence of the Degree of Water Treatment on the Concentration of Oil (m (GKM) - 1,0 m.p., t - 30 min, T - 20°C)

By a combination of biofertilizers with a protectant, suppression of the seminal infection and a significant increase in germination energy, stimulation of plant growth and root system are noted (Figures 1-4).

Table 2. Effect of a Combination of Biofertilizers with a Protectant Thiram FS on Sowing Qualities and Microbial Flora of Wheat Seeds (Laboratory Experiment, 2018)

Variants	Sowing qualities of seeds, %		The intensity of microbial flora growth	
	germinating energy, %	laboratory germination ability, %	fungal	bacterial
Control	64,5	93,5	+++	+++
Sodium humophosphate	74,2	96,2	++	++
Potassium humanosphere	71,0	95,5	++	+
Thiram + Sodium humophosphate	88,5	97,0	-	-
Thiram + Potassium humanosphere	84,5	96,5	-	-

According to the results of Table 2, it is evident that when processing wheat seeds with biofertilizers, the seed germination energy rises, and the growth rate of fungal and bacterial microbial flora is not restrained.

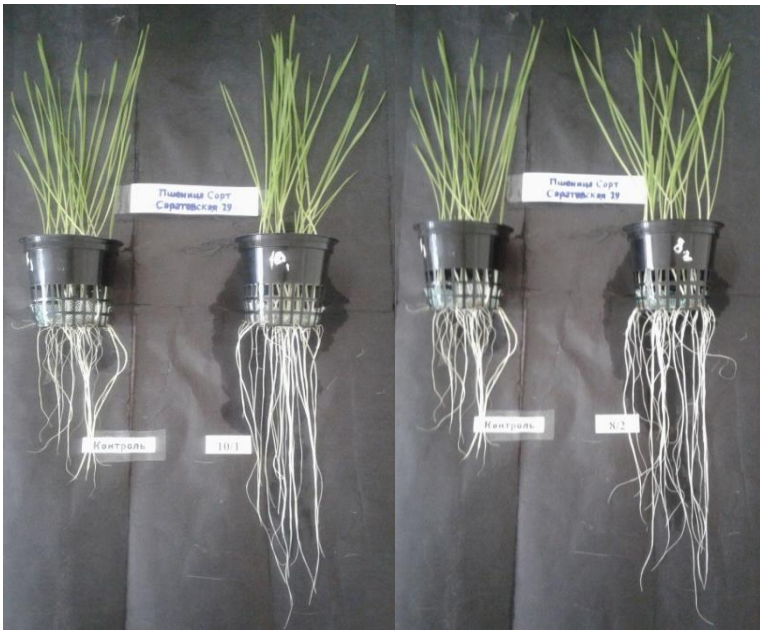


Figure 4. Intensive Growth of Plants and Root System After Treatment on the Left with Potassium Humanosphere, on the Right – in Combination with a Protectant

When counting on a nutrient medium after the intensity of growth of fungal and bacterial microbial flora after seed treatment separately by biofertilizers and in combination with a protectant, it was noted that in the variants of experiments when combined with a protectant there are none or fewer weak sprouts in comparison with the variants where biofertilizers are separate.

4 Conclusion

Thus, the treatment of soybean and wheat seeds with biofertilizers, sodium humophosphate, and potassium humophosphate in combination with a protectant significantly improve their sowing qualities, suppress mushroom and bacterial infections and promote the more intensive growth of plants and the root system.

Climatic conditions and water regime, which, in turn, depends on the physical properties of the soil, significantly affect the efficiency of biofertilizer application. With a lack of moisture, the effectiveness of fertilizers is reduced. In areas of insufficient moisture, it is important to foresee the depth of fertilizer application and it is not always advisable to feed agricultural plants. In conditions of sufficient moisture or during irrigation, biofertilizers should be added in larger quantities and effective methods of application should be selected to prevent nutrient leaching into the lower layers of the soil.

When developing a biofertilizer system, it must be borne in mind that the effect of fertilizers largely depends on the level of agrotechnics. Relatively small rates of fertilizers with high agricultural technology can have a significant effect, and increased rates with low agricultural technology often do not give a predictable result. High agrotechnics is a required condition for the effective use of biofertilizers and, conversely, the lack of nutrients limits the use of the created conditions.

Studies on the effectiveness of bio-fertilizers showed a positive effect on the growth and development of soybeans and wheat, contributing to a significant increase in the yield of these crops. Consequently, it can be expected that, based on the results of long-term studies, in the future bio-fertilizers will become an alternative to mineral sources.

On the basis of the data of the studies of each batch of seeds, the specialists of the Institute select the most highly effective drugs against the disease excitants, as well as the norms and specific features of the drug administration.

Literature:

1. Lebedintseva AM, Tyuterov LS. Strategiya i taktika ispolzovaniya zaschitno-stimuliruyuschih sostavov dlya obrabotki semyan s.-h. kultur [Strategy and tactics for the use of protective-stimulating compositions for treating seeds of groups]. Agrohimiya. 1994; 10:76-80.
2. Begunov II, Bachinskiy SD, Chuhov IV. Protravlivanie semyankompozitsionnyimismesyami [Seed dressing with composite mixtures]. Zaschita ikarantinrasteniy. 2003; 3:32-3.
3. Li M, Gu J, Gao H, Qin, Q-J. J of Northwest Agric and Forestry Univ. 2007; 35(9):67-72.
4. Gan Y, Stulen I. Physiological changes in soybean (Glycine max) Wuyin 9 in response to N and P nutrition. Ann Appl Biol. 2002; 140(3):319-29.
5. Agaev GM, Monakov SB, Subhankulov AA. Effektivnost protraviteley v smesi s regulyatorami rosta [The effectiveness of disinfectants in a mixture with growth regulators]. Zaschita i karantin rasteniy. 2009; 12:22-3.
6. Belyea RL, Rausch RL, Tumbleson ME. Composition of corn and distillers' dried grains with solubles from dry grind ethanol processing. Bioresource Technol. 2004; 94:293–98.
7. Cunha S, Filho W. Avanços tecnológicos na obtenção de etanol a partir de sorgo sacarino [Technological Advances in Obtaining Ethanol from Sorghum]. Tecno-Lógic. 2010; 14:69–75.
8. Petrenko VV. Vliyanie sistem zemledeliya na tehnologicheskie svoystva zerna imukipshenitsyiozimoy v protsessehraneniya [Influence of systems of agriculture on technological properties of grain and wheat flour winter during storage]. Dostizheniya naukiitehniki APK. 2012; 12:30-32.
9. Borodyichev VV. Mineralnoe pitanie soi [Soybean Mineral Nutrition]. Agrohimicheskiy vestnik. 2005; 5:20-21.
10. Onischenko LM. Udobrenie posevov soi [Fertilizing soybean crops]. Agrohimicheskiy vestnik. 2006:6.
11. Temperly RJ, Borges R. Tillage and Crop Rotation Impact on Soybean Grain Yield and Composition. Agron J. 2006; 98(4):999-1004.
12. Santos HP, Fontaneli RS, Pires J, Lampert EA, Vargas AM, Verdi CA. Grain yield and agronomic traits in soybean according to crop rotation systems. Bragantia, Campinas. 2014; 73(3):263-73.
13. Davari M, Sharma SN, Mirzakhani M. The effect of combinations of organic materials and biofertilizers on productivity, grain quality, nutrient uptake and economics in organic farming of wheat. J of Org Systems. 2012; 7(2):26-35.

14. Pedersen P, Lauer JG. Corn and soybean response to rotation sequence, raw spacing, and tillage system. Agron J. 2003; 95:965-71.
15. Abdul-Baki AA, Anderson JD. Vigor Determination in Soybean Seed by Multiple Criteria. Crop Sci. 1973; 13(6):630-633.
16. Berger-Doyle J, Zhang B, Smith SF, Chen P. Planting Date, Irrigation, and Row Spacing Effects on Agronomic Traits of Food-grade Soybean. Adv Crop SciTech. 2014; 2:149.
17. Subhash RR, Triveni S, Damodara KC. Biofertilizers for Sustainable Production in Oil Seed Crops. Scholars J of Agric and Veterinary Sci. 2016; 3(6):435-41.
18. Matsue Y, Uchikawa O, Sato H, Tanaka K. The productivity of the Soybean Seeds Stored for Various Periods. Plant Production Science. 2005; 8(4):393-6.
19. Mahanta D, Rai RK, Mishra SD, Raja A, Purakayastha TJ, Varghese E. Influence of phosphorus and biofertilizers on soybean and wheat root growth and properties. Field Crops Res. 2014; 166:1-9.
20. Naumova NA. Analiz semyan na bakterialnuyu i gribnuyu infektsiyu [Analysis of seeds for bacterial and fungal infection]. Leningrad; 1970.
21. Zarei I, Sohrabi Y, Heidari GR, Jalilian A, Mohammadi K. Effects of biofertilizers on grain yield and protein content of two soybeans (Glycine max L.) cultivars. Afr J of Bio. 2012; 11(27):7028-37.
22. Subhash RR, Triveni S, Damodara KC. Biofertilizers for Sustainable Production in Oil Seed Crops. Scholars J of Agric and Veterinary Sci. 2016; 3(6):435-41.
23. Sagitov AO, Dzhaymurzina AA, Umiralieva ZhZ, Kopzhasarov BK. Zaschitno-stimuliruyuschiy sostav dlya obrabotki semyanovoschnyih kultur ot gribnoy i bakterialnoy infektsii [Protective-stimulating composition for the treatment of vegetable seeds from fungal and bacterial infections]. Proceedings from Anapa - 2014: Perspektivyi ispolzovaniya novyih form udobreniy, sredstv zaschityi i regulyatorov rosta rasteniy v agrotehnologiyah selskohozyaystvennyih kultur [Prospects for the use of new forms of fertilizers, protective agents and plant growth regulators in agro technologies of agricultural crops]. GNU Vserossiyskiy NII agrohimii imeni D.N. Pryanishnikova. 2014:251-252.
24. Mekki BB, Ahmed AG. Growth, Yield and Seed Quality of Soybean (Glycine max L.) As Affected by Organic, Biofertilizer and Yeast Application. Res J of Agric and Bio Sci. 2005; 1(4):320-4.
25. Badaruddin M, Reynolds MP, Ageeb OAA. Wheat Management in Warm Environments: International Symposium on Nitrogen Fixation with Frequency, and Mulching. Agron J. 1999; 91:975-83.
26. Manal AA, El-Guibali AH, Shaban KhA, Mhosen MIA. J Soil Sci and Agric Eng, Mansoura Univ. 2014; 5(12):1647-66.

Primary Paper Section: G

Secondary Paper Section: GC, GD, GE

INFLUENCE OF NITROGEN PHOSPHORIC FERTILIZERS ON THE USE OF ELEMENTS OF NUTRITION BY BEANS OF CHICKPEAS FROM THE SOIL AND FERTILIZERS UNDER THE CONDITIONS OF KAZAKHSTAN

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Abstract: The work sets out results of an investigation conducted in 2003-2007 on the dark chestnut light-clay soils of Northern Kazakhstan, on the study of the influence of soil nutrition and mineral fertilizers on chemical composition and removal of elements of nutrition by beans of chickpeas from soil and fertilizer. The results showed that when cultivating chickpeas for non-steam predecessors, the latter incurs a deficit of nitrogen and phosphorus in the soil, which doesn't contribute to the formation of a high yield without application of nitrogen-phosphate fertilizers. Fertilizer stimulates intensive development of vegetative mass and root system, which is especially important for arid years with high moisture deficit in the soil. Drilled fertilizers essentially change the chemical composition of chickpeas. Nitrogen fertilizers increase the nitrogen content in the grain and, accordingly, the protein content by 4-6%. Phosphate fertilizers increase the content of phosphorus and fat in grains of chickpeas, but they can reduce the content of nitrogen and protein, and the higher dose of introduced nitrogen, the greater collection of protein. Applications of nitrogen-phosphate fertilizers increased removal of elements of nutrition from the soil by a factor of 1.5-2.0, which was determined not only by the chemical composition but also by the yield height. There is the largest amount of nitrogen and phosphorus removal and less amount of potassium because of grains of chickpeas. There is a number of nitrogen and potassium, and less amount of phosphorus with large fluctuations from year to year because of straw and roots. The nitrogen content varied in grain by a factor of 1.5, in the straw by a factor of 3.6, in phosphorus, respectively, by a factor of 2.8-7.9. Removal of elements of 1 c of total production varies within wide limits (2.5-4). According to the averaged data, the removal was: nitrogen in a factor of 5.2 (from 3.8 to 8.4); phosphorus in a factor of 1.4 (0.8-1.9); potassium in a factor of 2.41 (1.1-4.6). In general, assessing the quality status of chickpeas, it should be noted that chickpea is an important high protein culture that allows to solve protein problem both in the food industry and feed one successfully. In view of the combination of the factors, chickpeas may be considered a worthy culture for diversification of grain production in the North of Kazakhstan.

Keywords: Chickpeas, nitrogen fertilizers, phosphoric fertilizers, dark chestnut soils, productivity, chemical composition, removal of elements of nutrition.

1 Introduction

Different cultures, due to their biological characteristics, present unequal requirements to the conditions of mineral nutrition, have different abilities to absorb elements from soil and fertilizers. On the other hand, availability of elements of nutrition, as well as the effectiveness of utilized fertilizers, duration of their action depends on climatic conditions, soil and fertilizer properties in many respects. Chemical composition, productivity, and quality of cultivation are formed under the combined effect of these factors.

Chickpea is one of the perspective grain legume crops for Northern Kazakhstan, a valuable food and feed crop, rich in proteins and vitamins (A, B, B1, B2, C, PP, D). (1) Proteins of pulse plants are high-grade and high-quality. (2-3) Investigations of Behnoush Rasaei (4) found that proteins of chickpeas consist of such essential amino acids as tryptophan, lysine, arginine, and others, which are not less than in peas, lentils, and beans.

Protein content in seeds of chickpeas varies from 13 to 30%, fat content – 4.1-7.2; free-nitrogenous extractive agents – 47-60; starch – 48-61; crude fiber – 2.4-12.2; ash – 2.3-5.0; calcium – 0.255; phosphorus – 0.561%. (5-14)

Chickpeas create a predominant share of proteins as a result of assimilation of atmospheric nitrogen. Roots of chickpeas penetrate deeply into the soil (15), improve nitrogen balance of the soil, increase the productivity of the crop rotation. (16-17) All pulse plants are good precursors for winter and spring crops. (18)

G.V. Bodnar (8) and I.A. Abugaliev (10) note in their investigations that chickpeas play a significant role in increasing the soil fertility due to the remarkable property of synthesizing and accumulating a large amount of protein and other nitrogenous matters using a cheap source of the air nitrogen. Nodule bacteria live on the roots of these crops. They fix the air nitrogen from 50 to 300 kg/ha and enrich the soil by it. (19)

Changing conditions of plant nutrition, it's possible to increase the yield, to enhance plant growth, to accelerate or retard the rate of their development, to change the relation between generative and vegetative organs, chemical composition and quality of the obtained products, to make plants more resistant to unfavorable external conditions. (20)

In order to obtain a high yield of adequate quality, plant growth factors have to be represented in certain harmonious combinations that are most appropriate to the needs of plants in the corresponding periods of their growth and development. Insufficient or untimely inflow into plants of at least one of the nutrient elements leads to disruption of all metabolic processes between plants and the environment and, consequently, to a decrease in the yield and the quality.

Different plants react to the lack of individual nutrient elements not equally. Some plants are very sensitive to it, they have characteristic external changes during the initial period of the growth.

The chemical composition of plants is determined by the content of nutrient elements in the soil, depends on the amount, the form of fertilizers and the methods of their application, moisture and temperature of the soil. (21) Change in the absolute content of individual chemical elements in individual organs is determined by their specific function and processes of biosynthesis, physiological state, and age of individual tissues, organs, and plants as a whole. (22)

J.B. Bussengo (23), one of the first French scientists in the scientific history, put forward a position of the relevance of needs of the plant for nutrients. He pointed out that in order to check the opinion of the scientists, it's necessary to ask the opinion of the plant.

As of from 1868 to 1900, the questions of determining the need for fertilizers on the chemical composition of mature plants, grains and roots of cereal crops (barley, oats, wheat) were covered in the works of Gelrigel (1868), Heinrich (1882), Gassner (1887), Dikova (1887) and other researchers. (24) They showed that plants grown in field and vegetation experiments contain different amounts of nitrogen, phosphorus, and potassium depending on type and doses of fertilizers. These and other researchers came to the conclusion that soil analysis is less suitable for elucidating the need for fertilizers than plant analysis.

V.V. Tserling (25) considers that the chemical composition of agricultural crops is a fairly stable quantity, and deviations from it are primarily associated with a change of the conditions of mineral nutrition. According to the conclusion of Sh.I. Litvak (26), the optimal levels of content of elements of mineral nutrition in plants vary only slightly depending on the variety, culture, and region of its cultivation, and they are their physiological characteristics, and established variation of definitive exponents of nutrient content in plants indicates a number of unaccounted factors that affect on reliability and reproducibility of the analytical data.

In the process of their growth and development, plants consume a different amount of nutrient elements, depending on the specific chemical composition of the crop and variety, relation of biomasses of the main and secondary production, soil and climatic conditions, content of mineral substances in the soil, agricultural technology, harvesting phase, etc. (27)

Z.I. Zhurbitskiy and B.M. Lavrichenko (28) noted that plants of the same species expend the same amount of each element on the

formation of the yield unit in the same soil-climatic conditions. But at the same time, R.T. Wildflush and A.N. Minich (29) note that removal of nutrients by cultivation during the cool vegetation period is much less than during the warm period. S.N. Yurkin (30) reports that removal of nitrogen and potassium per yield unit rises sharply under the arid conditions, and removal of phosphorus decreases.

According to the data of N.S. Korogodov (31), annual pulse plants remove 140-160 kg of nitrogen, 15-28 kg of phosphorus and 80-100 kg of potassium from a hectare. The nature of nutrient enrichment during the vegetation period varies considerably. Thus, according to the data of M.P. Petukhov (32), to the beginning of flowering, when 30% of the crop mass accumulates, 40% of the total amount of nitrogen removed by the crop, 30% of phosphorus and 60% of potassium enter the plant.

V.V. Tserling (1963), N.K. Boldyrev (1970), Yu.I. Yermohin (1983) and others note that fertilizers are the main factor affecting absolute and relative removal of nutrients. Plants acquire only a part of the active forms of nutrients from both the soil and mineral fertilizers. According to the data of L.M. Derzhavin (35), in the field conditions, plants use 30-40% nitrogen from mineral fertilizers, 20-30% is fixed in the soil, 15-20% is lost in gaseous form as a result of the processes of denitrification, ammonification, and nitrification, 5-15% is eluted from the root layer. It is known that the use of nitrogen by agricultural crops depends on the regime of their nutrition by phosphorus and potassium. (36) When solution interacts with the soil, a chemical equilibrium is created. Plants shift this equilibrium by absorbing ions from solution by the root system, stimulating the appearance of new quantities in solution.

As changes in the ratio of nutrient elements of plants are caused by the development of plants and the growth of individual organs during the vegetation period, these processes may be controlled in a great measure, regulating absorption of nutrients by fertilizer application, and establishment of fertilizer doses to a large extent depends on the amount and composition of nutrients removed from the soil by the agricultural crops.

The presented data of investigation of Kazakhstan investigators (37-46), don't disclose an attitude to conditions of mineral nutrition and fertilizers fully, as well as methods of diagnostics of needs of chickpeas in nutrient elements under the conditions of Northern Kazakhstan haven't been studied practically, exactly this thing was the aim of our investigations.

A solution of these issues at this stage is topical, it will allow chickpeas to take a worthy place in the diversification of grain production in Kazakhstan.

In this regard, we studied not only the issues of responsiveness of chickpeas for fertilizers within 6 years but also the features of their use depending on the conditions of cultivation.

2 Materials and Methods

Study Site: The investigations on dark chestnut carbonate light-clay soils of the Akmola region located in the dry steppe zone of Northern Kazakhstan were conducted from 2003 to 2008. The amount of precipitations and the temperature regime of the year of investigations is given in Table 1.

The experiment design: The soil is a dark chestnut carbonate. The mechanical composition is the light-clay soil. The thickness of the humus horizon (An + B1) is 42-44 cm, the humus content in the arable layer (0-20 cm) is 2.89-3.28%, pH is 7.8-8.0, the sum of the absorbed bases is 21.0-22.0 meq/100 g soil, nitrogen - nitrate content is 9.1-12.0 mg/kg soil (in the layer 0-40 cm – 5.8-10.6); phosphorus is 7.6-24 mg/kg, potassium is 42.0-52.0 mg/100 g of soil.

Application of treatment: In order to study the conditions of mineral nutrition of chickpeas and control of dynamics of nutrient elements before sowing, according to the basic variants with non-contiguous repetitions, soil samples were taken of 5 points at a plot to a depth of 40 cm, every 20 cm to determine the main factors of fertility: humus, pH, Ca2 +, Mg2 +, N-NO3, P2O5, K2O and moisture.

The moisture content of the soil was determined by the weight method (GOST 28168-89), ammonia nitrogen – with Nessler's reagent (GOST 26489-85),nitrate nitrogen – on the ionomer "EV-74" and by the disulphophenol method according to Grandval-Liazhu (GOST 26951-86), labile phosphorus and potassium from one extract according to Machigin (GOST 26205-91),humus according to Tyurin-Kononovoy (GOST 26213-91), absorbed by Ca2+, Mg2+ – by trilonometric method (GOST 26487-85), pH of aqueous extract ionometrically (GOST 26483- 85). All of them were determined in the selected samples.

Soil samples were selected every 20 cm to a depth of 1 min order to control dynamics of moisture and nutrient elements–before sowing, during the branching phase, the flowering phase and after harvesting of chickpeas. During the main phases of development and harvesting time, plant samples (20 plants for each) were selected from 10 points to determine the accumulation of dry matter in plants, taking into account the yield formula.

The fiber according to the method of Kurshner and Ganek (GOST 13496.2-84), fat – on defatted residue (GOST 13496.15-85) and ash content of seeds (GOST 13496.16-75) were determined in the laboratory of the RSE "SPC of grain farming named after Baraev" of the Ministry of Agriculture of the Republic of Kazakhstan.

Chickpeas were seeded by the second cultivation in rotation of crops, therefore it moved in the fields annually. The investigations that were conducted in previous years found that the main factors determining the formation of crop capacity are moisture availability, the content of mineral nitrogen, phosphorus and their ratio, under the conditions of Northern Kazakhstan. Potassium doesn't limit the yield. (47-48)

Ammonium nitrate (rate of application is 34.6%) was used as nitrogen fertilizers, ammophos (46% P2O5, 11-12% N) – of phosphorus fertilizers. Ammophos was drilled in autumn superficially with the subsequent dumping labouring to a depth of 18-20 cm for the purpose of equal placement of fertilizers. Nitrogen fertilizers were drilled in spring under pre-sowing cultivation. The end of the moisture (BIG-3) and the secondary tillage were carried out by a cultivator (OP-8) to a depth of 6-7 cm in spring. The sowing was carried out by seeding-machinesSZS-2.1. The "Jubilee" variety was sown at the rate of 0.7 million of fertile seeds per hectare. Experiments were laid in fourfold repetition. The total area of the plot is 112.5 m2. Agrotechnics are generally accepted for the zone.

3 Results and Discussion

Meteorological conditions during the years of the investigations were developing in different ways, but they were quite typical for Northern Kazakhstan. All the years were dry, especially 2004, 2006 and 2008 with precipitation of 191, 203 and 213 mm for the agricultural year.2003, 2005 and 2007 were characterized by somewhat better moisture (252, 269, 248 mm, respectively), Table 1.

Table 1. Characteristics of Meteorological Conditions During the Vegetation Period (According to the Data of the Weather Point "Phoenix").

Months	Precipitation, mm						
	Long-time average annual	2003	2004	2005	2006	2007	2008
V	38.1	42.4	22.5	43.4	13.2	35.2	24.0

VI	46.2	19.6	21.9	21.4	21.7	17.5	10.0
VII	47.1	54.8	20.7	61.2	27.4	15.7	19.7
VIII	49.7	58.5	59.9	11.3	3.0	7.1	22.0
V-VIII	181.1	175.3	125.0	137.3	65.3	75.5	75.7
Agricultural year	302.0	252.1	191.6	269.5	203.1	248.5	212.9
	Average daily air temperature, ^{0}C						
V	15.7	12.3	16.5	14.7	13.8	14.2	16.0
VI	19.3	16.5	20.2	20.3	23.8	19.5	21.0
VII	20.2	18.1	21.5	20.9	22.8	23.1	25.3
VIII	19.3	21.5	18.2	18.2	20.9	19.8	19.0
V-VIII	18.6	17.1	19.1	18.5	20.3	19.2	20.3

They also differed on the temperature regime of the vegetation period: 2003 was the coldest 17,10C with the long-time average annual temperature of 18.60C. Especially May was cold – 12.30C. 2004, 2005 were within normal limits.

In 2006, May was cold (-1.90 C), June and July were hot with a temperature rise up to 4.5-2.60 C and dry – precipitation was 2 times less than long-time average annual ones (49 instead of 93 mm).

In 2007 and 2008, July was very hot and dry – 3-50C higher at 30-40% of precipitation. In addition, in 2008, May and June were dry (24 and 10 mm, respectively).

Apparently, the years of investigations differed significantly on the hydrothermal regime, which reflected on the state of the soil, growth, and development of plants.

The moisture supply of chickpeas depended not only on the conditions of the vegetation period but also on the spring reserves of productive moisture accumulated due to autumn and winter precipitation.

As for reserves of productive moisture before sowing of chickpeas, the most favorable conditions were formed in 2007 –

172 mm in a metrical profile of the soil. 2006 was the most unfavorable – 81 mm.

As Table 2 shows, a deficit of both nitrogen and phosphorus was noted in the soil in all the years. Fertilizers increased the content of nitrogen and phosphorus by a factor of 2.0-2.5. It provided a great variety of conditions of nutrition of chickpeas, which made it possible to identify features and patterns of the effect of fertilizers on its productivity, chemical composition and utilization of nutrient elements better.

Table 2. Effect of Fertilizers on the Content of Nutrient Elements in the Soil, mg/kg

Applied	Years of investigations					
	2003	2004	2005	2006	2007	2008
	The content of nitrogen of nitrates (N-NO3) in the layer of 0-40 cm					
O	9.7	8.8	5.8	12.8	8.5	7.2
N30	15.3	13.1	7.6	18.1	12.9	9.7
N60	17.2	16.7	11.8	21.2	17.6	11.4
N90	19.2	20.5	15.5	23.3	19.6	14.7
	The content of labile phosphorus (P_2O_5) in the layer of 0-20 cm					
O	24.0	9.6	13.0	14.4	17.8	18.4
P60	32.8	14.2	16.6	19.1	23.7	23.9
P90	35.6	17.2	19.6	21.2	27.5	28.1
P120	38.0	21.6	22.0	27.2	29.3	29.5
P150	41.6	26.0	29.6	30.6	34.7	36.2
P210	46.0	30.8	36.6	37.4	39.2	40.2

In the first phases of development, chickpeas consumed more nitrogen than phosphorus at a low air temperature. Its content fluctuated from 4.0 to 2.8% over the years on the non-fertilized ground, and it fluctuated up to 5.47% on the fertilized ground.

Application of nitrogen-phosphorus fertilizers has also significantly affected on the accumulation of dry matter and chemical composition of plants. So, phosphate fertilizers provided a growth of dry basis in 1.4-1.7 times before the flowering phase, and nitrogen fertilizers provided it in 1.2-1.7 times.

Growth processes outstripped the flow of nitrogen from the soil, in light of this, there was nitrogen concentration dilution in plants, Table 3(there are data on relatively contrasting years in the table due to the limitation of the volume). Nitrogen fertilizers have contributed to the accumulation of nitrogen in plants, which is very important, as the quality of the product – protein content – depends on its content.

Table 3. Influence of Conditions of Cultivation and Fertilizers on Chemical Composition of the Vegetative Mass of Chickpeas (% on Dry Basis)

Applied	2003				2005				2008			
	Branching phase		Flowering phase		Branching phase		Flowering phase		Branching phase		Flowering phase	
	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5	N	P_2O_5
O	4.04	0.07	3.31	0.10	3.40	0.77	2.67	0.26	2.82	0.48	2.44	0.53
P60	4.20	0.12	3.69	0.14	3.47	0.91	2.72	0.29	3.00	0.52	2.62	0.56
P90	4.30	0.17	3.90	0.19	3.58	0.95	2.94	0.34	3.10	0.55	2.70	0.59
P120	4.13	0.15	3.95	0.15	3.70	0.97	2.97	0.40	3.08	0.56	2.72	0.61
P150	4.10	0.15	3.79	0.14	3.57	0.85	2.89	0.34	3.06	0.59	2.70	0.63
P210	4.10	0.15	3.79	0.14	3.51	0.84	2.86	0.33	3.08	0.65	2.66	0.68
N30	4.18	0.16	3.53	0.16	3.60	0.82	2.97	0.26	3.14	0.44	2.70	0.44
N60	4.45	0.16	4.13	0.18	3.88	0.82	3.03	0.27	3.42	0.40	3.06	0.44

N90	5.14	0.18	4.86	0.19	3.95	0.84	3.24	0.26	3.60	0.38	3.46	0.41
P90 N30	5.00	0.19	4.43	0.17	3.60	0.84	3.44	0.33	3.22	0.52	2.76	0.54

The lowest concentration of phosphorus in plants was noted under the conditions of cold 2005. Phosphate fertilizers increased not only the content of phosphorus in plants, but they also intensified the flow of nitrogen when applying moderately dosed. Increased doses (P150-210) inhibited the absorbing capacity of the root, which is more likely due to the concentration of the soil solution.

Application of nitrogen fertilizers significantly increased nitrogen concentration, both in vegetative mass and grain, reducing the negative effect of increased doses of phosphorus, Table 4.

The fairly high content of nitrogen is in the straw of the harvest from 1% to 1.8% is characteristic for chickpeas. Variation of

nitrogen in grain was within 25%, and in straw, it was by a factor of 1.5-3. The content of potassium was marked by greater stability.

Table 4. The Content of N, P2O5, K2O in Grain and Straws of Chickpeas, %

Applied	2003			2004			2005			2006			2007			2008		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
	The content ofN, P_2O_5, K_2O in grain, %																	
O	3.14	1.32	0.90	3.14	1.02	0.85	3.86	0.72	0.80	3.34	0.58	0.60	3.34	0.87	0.85	3.46	0.52	0.60
P60	3.28	1.38	0.90	3.23	1.10	0.90	3.90	0.84	0.80	3.47	0.65	0.60	3.42	0.93	0.85	3.50	0.61	0.65
P90	3.15	1.38	0.90	3.16	1.15	0.85	4.00	0.98	0.80	3.47	0.68	0.60	3.43	0.98	0.85	3.54	0.63	0.65
P120	3.15	1.48	0.90	3.15	1.18	0.85	3.96	0.91	0.80	3.47	0.73	0.60	3.45	1.02	0.85	3.56	0.69	0.65
P150	wasn't determined			3.15	1.19	0.85	3.93	0.90	0.80	3.46	0.73	0.60	3.47	1.06	0.86	3.54	0,71	0.65
P210	wasn't determined			3.14	1.20	0.85	3.90	0.89	0.80	3.45	0.70	0.60	3.47	1.10	0.85	3.44	0.81	0.65
N30	3.95	1.32	0.90	3.87	1.04	0.80	4.12	0.78	0.80	3.51	0.62	0.60	3.48	1.02	0.85	3.70	0.49	0.62
N60	4.09	1.31	0.90	3.96	1.03	0.80	4.38	0.82	0.80	3.58	0.64	0.60	3.54	0.98	0.80	3.78	0.46	0.62
N90	4.11	1.31	0.90	4.04	1.03	0.80	4.57	0.86	0.80	3.62	0.65	0.60	3.61	0.92	0.80	4.00	0.46	0.62
P60 N60	3.64	1.34	0.90	3.60	1.06	0.80	4.42	0.98	0.80	3.58	0.68	0.60	3.49	0.97	0.80	4.34	0.58	0.65
P90 N60	4.01	1.42	0.85	3.87	1.02	0.80	4.15	0.96	0.80	3.58	0.67	0.60	3.52	0.95	0.80	4.20	0.82	0.65
P120N60	3.80	1.38	0.90	3.68	1.09	0.80	4.18	0.99	0.80	3.62	0.67	0.60	3.49	1.00	0.82	4.48	0.61	0.65
	The content of N, P_2O_5, K_2O in straw, %																	
O	0.3	0.12	1.5	1.28	0.50	1.2	1.15	0.16	1.0	0.77	0.08	0.60	0.85	0.42	0.24	1.02	0.15	0.72
P60	0.6	0.13	1.5	1.57	0.56	1.1	1.24	0.26	1.0	0.80	0.10	0.60	0.87	0.45	0.26	1.08	0.16	0.72
P90	0.8	0.24	1.8	1.44	0.59	1.2	1.38	0.28	1.0	0.80	0.10	0.60	0.88	0.49	0.34	1.10	0.16	0.72
P120	0.6	0.21	1.5	1.40	0.63	1.1	1.26	0.33	1.0	0.83	0.14	0.60	0.88	0.52	0.24	1.11	0.18	0.72
P150	0.6	0.22	1.6	1.39	0.64	1.1	1.25	0.32	1.0	0.82	0.13	0.60	0.87	0.56	0.30	1.14	0.22	0.75
P210	0.5	0.24	1.6	1.37	0.65	1.2	1.20	0.30	1.0	0.82	0.13	0.60	0.87	0.59	0.28	1.17	0.24	0.75
N30	0.4	0.15	1.6	1.64	0.50	1.2	1.36	0.22	1.0	0.83	0.09	0.60	0.90	0.45	0.24	1.17	0.16	0.75
N60	0.7	0.16	1.6	1.74	0.44	1.2	1.46	0.23	1.0	0.94	0.10	0.60	1.09	0.45	0.26	1.24	0.16	0.72
N90	1.1	0.13	1.5	1.92	0.44	1.1	1.68	0.26	1.0	1.00	0.10	0.60	1.10	0.44	0.27	1.28	0.16	0.75
P60 N60	0.9	0.12	1.6	1.80	0.54	1.2	1.34	0.27	1.0	1.00	0.12	0.60	1.00	0.45	0.26	1.27	0.16	0.72
P90 N60	0.8	0.15	1.8	1.60	0.52	1.2	1.48	0.26	1.0	0.95	0.14	0.60	0.97	0.43	0.30	1.22	0.19	0.72
P120N60	0.9	0.12	1.6	1.70	0.52	1.2	1.37	0.32	1.0	1.00	0.11	0.60	1.00	0.46	0.26	1.27	0.19	0.72

The high content of nitrogen in straw increases feed value of the secondary production.

Economical removal and expenses of elements per 1 cent of aggregate productions are a mirror reflection of the influence of the climatic factor and fertilizers on the utilization of nutrient elements, Table 5. Chickpeas apply the most nitrogen and phosphorus, less potassium by grain. And it applies more nitrogen and potassium and significantly less phosphorus by straw.

Fertilizers increased the removal of nutrient elements from the soil by a factor of 1.5-2.0, which was determined by the height of the harvest to a greater extent.

The economic removal of nutrient elements by the chickpea grain fluctuated on average depending on the degree of fertilization: from 26.4 kg/ha of nitrogen on the non-fertilized background to 126.7 kg/ha (N60 in 2007) on fertilized options, respectively 6.7-11.4 kg of phosphorus on the control to 44.1 kg on the fertilized backgrounds. Removal of potassium accordingly amounted 12.2-44.9 kg/ha. During the relatively good years on moisturization, nitrogen fertilizers intensified the absorption and removal of phosphorus by the harvest.

Comparing the economic removal with the amount of the drilled fertilizers, it should be noted that the balance of nitrogen and potassium is negative without the application of fertilizers. But, if potassium in the soil is sufficient and it does not limit the harvest, the negative balance on nitrogen leads to a steady decline in soil fertility, as humus is the main source of nitrogen in the soil. When applying nitrogen fertilizers, the zero balance is added at doses N60-90.

When applying 90 kg of active material, the balance on phosphorus is positive with an intensity of 80%.

The removal of nutrient elements of 1% of the aggregate production is also an important indicator. The removal of nitrogen per 1 cent fluctuated from 3.7 kg on the control to 7.4 kg on the fertilized backgrounds or more than by a factor of 2. The removal of nitrogen of 1 cent of chickpeas was 5.22 kg on average.

The removal of phosphorus is3.0-4.0 times less that the removal of nitrogen, and it fluctuated from 0.81 to 1.92 kg, on average by 1.4%, the removal of potassium is 2.1-4.6 kg, on average by 3.36%.

If you know the removal of the elements of 1 cent of the harvest, you can focus only on alienation of the elements by the harvest and the level of decline in soil fertility. Indicators of the removal of 1 cent don't reflect the degree of availability and assimilation of these elements from the soil and fertilizers, and therefore they can't be regarded as the norm of fertilizers per 1 cent of the harvest.

The coefficients of utilization of nutrient elements from the soil fluctuated from year to year on the natural background of nitrogen from 56 to 144% (2008), and they fluctuated up to 162% with the application of phosphorus fertilizers due to the high yield, Table 5.

Table 5. The Economic Removal of Nutrient Elements and the Costs of N, P2O5, K2O per 1 Cent of the Aggregate Production

Applied	2003			2004			2005			2006			2007			2008		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
	The economic removal, kg/ha																	
O	26.4	11.0	28.3	29.6	10.2	14.4	48.1	8.4	17.3	42.0	6.7	12.2	87.9	28.2	22.6	49.7	7.5	14.7
P60	36.1	12.1	29.6	33.2	11.5	14.9	56.0	12.0	20.2	52.9	9.3	14.8	107.3	35.9	27.4	60.5	10.2	18.1
P90	41.1	18.0	44.9	35.2	13.6	16.8	71.0	16.6	23.8	61.0	11.1	17.2	110.6	39.3	30.2	72.4	12.3	21.3
P120	41.6	16.9	35.7	35.8	14.6	16.4	63.7	15.1	22.0	64.6	13.0	18.0	119.2	44.1	29.5	73.7	13.7	21.7
N30	39.3	13.4	35.0	39.1	11.0	14.6	72.9	13.2	23.9	52.9	8.7	14.6	114.9	40.2	28.0	59.9	8.00	16.8
N60	43.2	12.3	31.2	39.7	10.6	14.8	87.0	15.6	26.8	61.0	10.0	16.2	126.7	40.7	28.5	61.2	7.60	16.4
N90	49.3	12.3	30.1	46.0	11.7	15.3	102.5	16.8	29.5	71.1	11.5	18.4	114.2	34.1	25.5	64.4	7.60	16.8
P60 N60	44.2	12.7	34.1	40.1	11.9	15.3	86.9	18.9	27.2	73.0	12.8	19.2	108.5	35.7	25.4	78.0	10.3	19.0
P90 N60	54.1	16.5	43.5	42.8	12.0	16.1	64.2	13.8	20.5	67.2	12.0	17.8	108.9	34.7	26.2	89,4	16.6	22.6
P120 N60	58.6	16.8	43.9	44.4	12.5	17.0	57.5	14.1	18.7	68.9	11.7	17.8	110.2	37.6	26.2	83.9	11.7	20.0
	The costs of N, P_2O_5, K_2O per 1 cent of the aggregate production																	
O	3.77	1.57	4.04	4.55	1.57	2.12	5.01	0.88	1.80	5.06	0.81	1.47	4.19	1.29	1.09	4.48	0.68	1.32
P60	4.94	1.66	4.05	4.76	1.72	2.15	5.14	1.10	1.85	5.29	0.93	1.48	4.29	1.38	1.11	4.58	0.77	1.37
P90	4.32	1.88	4.68	4.74	1.79	2.21	5.38	1.26	1.80	5.26	0.96	1.48	4.22	1.44	1.17	4.64	0.79	1.37
P120	4.72	1.92	4.06	4.59	1.87	2.10	5.22	1.24	1.80	5.30	1.06	1.48	4.33	1.54	1.09	4.66	0.87	1.37
N30	4.79	1.63	4.27	5.67	1.59	2.12	5.48	0.99	1.80	5.34	0.88	1.47	4.38	1.47	1.09	4.87	0.65	1.37
N60	5.76	1.64	4.16	5.67	1.51	2.01	5.84	1.05	1.80	5.60	0.92	1.49	4.62	1.43	1.06	5.02	0.62	1.34
N90	6.32	1,58	3.86	5.75	1.46	2.00	6.25	1.05	1.80	7.40	1.20	1.42	4.71	1.36	1.07	5.28	0.62	1.38

P60 N60	5.54	1.59	4.26	5.57	1.65	2.12	5.75	1.80	1.80	5.21	0.91	1.37	4.49	1.42	1.06	5.61	0.74	1.37
P90 N60	5.69	1.74	4.58	5.63	1.58	2.12	5.63	1.80	1.80	5.74	0.98	1.48	4.49	1.38	1.10	5.42	1.01	1.37
P120N60	5.77	1.63	4.26	5.55	1.56	2.12	4.36	1.42	1.80	5.75	1.00	1.48	4.49	1.46	1.08	5.76	0.77	1.43
P120N90	6.29	1.67	4.26	5.09	1.69	2.12	4.26	1.40	1.80	5.54	0.85	1.35	4.53	1.47	1.07	5.75	0.80	1.37
Average	5.28	1.67	4.23	5.23	1.64	2.11	5.41	1.26	1.80	5.89	0.99	1.45	4.43	1,45	1.10	5.10	0.76	1.37

The high coefficient of utilization of nitrogen in 2008is stipulated by the spring application of nitrogen fertilizers and peculiarity if spring of this year. Under the conditions of long cold spring, the nitrification process was delayed in the soil, and a significant amount of non-nitrified ammonium nitrogen was detected. Subsequently, ammonium nitrified and thereby contributed to the accumulation of nitrogen of nitrates and formation of the higher yield.

The coefficient of utilization of nutrient elementsP2O5varied from 17.0 to 66.0%, with an average value of 41.3%, or by a factor of 3.8.

The coefficient of utilization of fertilizers averaged 57% depending on doses and conditions of years, and it averaged

from 1.8% on P60 in 2003 to 19.4% on P120 in 2008 or by a factor of 10.8. The coefficient of utilization of phosphorous fertilizers was determined mainly by the efficiency (addition) of phosphorus fertilizers.

Table 6. The Coefficients of Utilization of Nutrient Elements and Fertilizers from the Soil by Chickpeas

Options	Years of investigations					
	2003	2004	2005	2006	2007	2008
The coefficient of utilization of nutrient elements N						
O	56.6	70.1	102	68.4	95.0	143.8
P60	66.0	66.5	117	86.2	112.9	146.6
P90	85.6	70.5	140	87.6	111.0	162.2
P120	76.1	69.1	132	85.2	112.0	153.5
The coefficient of utilization of nutrient elements P_2O_5						
O	19.1	56.0	28.7	21.5	66.0	17.0
N30	23.7	48.7	49.1	23.4	62.7	17.8
N60	20.7	42.1	58.0	27.4	56.9	15.7
N90	18.3	41.3	58.3	33.2	47.8	15.4
The coefficient of utilization of fertilizers N						
N30	43.0	31.7	82.7	36.3	90.0	128.6
N60	28.0	16.8	64.8	31.7	64.7	111.8
N90	25.4	18.2	60.4	32.3	29.2	91.3
The coefficient of utilization of fertilizers P_2O_5						
P60	1.8	2.2	6.0	4.3	12.8	17.6
P90	7.8	3.8	9.1	4.9	12.3	18.2
P120	4.9	3.7	5.6	5.2	13.2	19.4

The coefficient of utilization of nitrogen fertilizers fluctuated from 31.7 to 128.6%, or by a factor of 4.1 with an average value of 82.7; on N60 from 16.8 to 111.8%, or by a factor of 6.6; on N90 from 18.2 to 91.3, or by a factor of 5.0. The total variation of the coefficient of utilization of nitrogen fertilizers was about 8 volumes.

According to the maximum parameters, calculation of doses by the balance method for chickpea crop of 20 centners showed–a deficit P2O5 of 20.9 kg of the active material; a deficit P2O5 of 322 kg of the active material was obtained at the average rate of 116 kg/ha when using the minimum values. While the harvest of 20 centners was obtained on the control (without application of fertilizers), in experiments with a content of 17.8 mg of P2O5 kg in the soil (2007).

With such variation of the indicators, application of the balance method for determination of fertilizer doses for the conditions of Northern Kazakhstan is considered to be impossible, Table 7.

Table 7. Doses of Phosphoric Fertilizers Using Different Criteria in the Balance Calculation (at 20 Centners of the Chickpea Crop, with the Content of P2O5of 17.8 mg/kg in the Soil).

Indicators	Criteria		
	minimum	maximum	average
Removal of 1 centner of the harvest, kg			
nitrogen	3.8	8.4	5.2
phosphorus	0.8	1.9	1.4
The coefficient of utilization of nutrient elements, %			
N	56.6	102	78.4
P	19.1	66	38.3
The coefficient of utilization of fertilizers, %			
N	18.2	96.3	45.4

P	1.8	13.2	6.5
The dose of P_2O_5, kg / ha	20.9	322	116
On the removal of P_2O_5, kg /ha	16	38	28

All these things point to the need to search for more sophisticated methods of diagnostics of the conditions of mineral nutrition and the need for fertilizers that exclude the need for using such dynamic and uncontrolled indicators as the removal of elements of 1 centner of production, coefficients of utilization of nutrient elements and fertilizers used in balanced calculations.

4 Conclusion

The investigations on the dark chestnut soils in the dry steppe zone of Northern Kazakhstan on the effect of soil conditions and fertilizers on chemical composition and removal of nutrient elements of chickpeas were conducted from 2003 to 2007. They showed that chemical composition of chickpeas, intake, and accumulation of nutrient elements, removal of nutrient elements and fertilizers are varied within a broad range, and are determined by the joint effect of such factors as soil fertility – the content and ratio of nutrient elements in the soil, the hydrothermal conditions of the year, a type, a form and an amount of drilled fertilizers. The uncertainty of these indicators excludes the possibility of using them to determine the requirements (doses) of cultivations in fertilizers.

Assessing the quality status of chickpeas totally, it should be noted that chickpea is an important high protein culture that allows to successfully solve the protein problem both in food and feed industry. Significant content raises the dignity of this culture.

Taking into account the combination of factors, it may be considered that chickpea is a worthy culture for diversification of grain production in Northern Kazakhstan.

Literature:

1. Baloch Ms, Zubair M. The Journal of Animal and Plant Sciences. 2010; 20(3):208-210.
2. Chernogolovin VP. Grain legume crops and legume grasses in Kazakhstan. Almaty: Kainar; 1960.
3. Ali A, Ali Z, Iqbal J, Ahmad Nadeen M, Akhtar N, Akram HM, Sattar A, Agric J. Res. 2010; 48(3):335-343.
4. Rasaei B, Ghobadi M-E, Ghobadi M, Nadjaphy A, Rasaei A. The study effects of some biological agents on Chickpea (Cicer arietinum L.) under semi-dry conditions in Kermanshah. European Journal of Experimental Biology. 2012; 2(4):1113-1118
5. Maisuryan AA, et al. Plant growing. Kolos; 1965.
6. Abbst J. American Chem. Soc. 1966.
7. Chernogolovin VP. Grain legume crops in Kazakhstan. Kainar; 1974.
8. Bondar GV, Lavrinenko GT. Grain legume crops. Kolos. 1977.
9. Klimenko VG. Proteins of chickpea seeds. In: Proteins of seeds of leguminous plants. Kishinev; 1978:193-246.
10. Abugaliyev IA. Reference-book on seed-growing of field crops. Kainar; 1981.
11. Vavilov PP, Posypanov GS. Leguminous crops and problem of vegetable protein. Rosselkhozizdat; 1983.
12. Kosinskiy VS, Nyklyayev VS. Fundamentals of agriculture and plant growing; 1990.
13. Summerfield RJ, Vlrmani SM, Roberts EH, Ellis RH. Adaptation of chickpea to agro climatic constraints. Chickpea in the nineties: proceed in gs of the Second International Work shop on Chickpea Improvement; 1989 Dec 4-8; ICRISAT Center. Patancheru: International Crops Research Institute for the Semi-Arid Tropics. 1990:61-72.
14. Stolyarov OV, Kalashnikova SV. Study of the quality of various types of food chickpeas grown under the conditions of the Central Black Earth Region. Grain economy. 2003; 5:22.
15. Corby R. Seeds of Leguminosae. Advances in legumes systemics. In: Polhill RM, Raven PH, editors. Kew, UK: Royal Botanic Gardens; 1981:913-915.
16. Tavasolee AR, Aliasgharzad N, Salehijouzani GhR, Mardi M, Asgharzadeh A. African Journal of Biotechnology. 2011; 10(39)7585-7591.
17. Mortimer PE, Perez-Fernandez MA, Valentine AJ. Soil Biol, Biochem. 2008; 40:1019-1027.
18. M.S. Sarir; MI Durrani; AIshaqMian, Journal of Agricultural and Biological Science. 2006; 1(1):29-31.
19. Fedotov VS. Expansion of pea production. Messenger of agricultural science. 1961; 8:25-27.
20. Peterburgskiy AV. Agrochemistry and physiology of plant nutrition. Kolos. 1981:55.
21. Turkova NS. Physiology of agricultural plants. Edition of Moscow University; 1970.
22. Nikitishen VI. Agrochemical basis of effective application of fertilizers in intensive farming. Science. 1984:214.
23. Bussengo ZhB. Selected works on plant physiology and agrochemistry. Selkhozhiz; 1936.
24. Butkevich VV. Variability of protein content and protein productivity of wheat under the influence of agrotechnical and natural factors Plant nutrition and application of fertilizers. 1959; 33:142-175.
25. Tserling VV. The plant tells about the soil. Publishing House of the USSR Academy of Sciences; 1963.
26. Litvak ShI. System approach to agrochemical research. Moscow: Agro-industrial book edition; 1990.
27. Sabinin DA. Mineral nutrition of plants. Sel'khozhiz; 1940.
28. Zhurbitsky ZI, Lavrichenko VM. Determination of the plants' need for nutrition by the method of plant diagnostics. Agrochemistry. 1977; 9:127-133.
29. Wildflush RT, Minich AN. Peculiarities of nutrition and oat crop in the case of scattered and ribbon application of fertilizer. Collection of scientific works Bel. SKA. Gorki. 1974; 74:21-36.
30. Yurkin SN. Improvement of the effectiveness of fertilizers in intensive farming. Rosselkhozizdat; 1979.
31. Korogodova NS, Shchultseva GP. Leguminous crops. In: Mineral fertilizers. Translation from German. Kolos; 1975:190-196.
32. Petukhov MP, Prokoshev VN. Leguminous crops. Inthebook: Application of fertilizers in the Cis-Ural region. Perm book edition; 1964:300-305.
33. Boldyrev NK. Analysis of leaves as a method for determination of the needs of plants in fertilizers: leaf diagnostics. Omsk State Agrarian University named after P.A. Stolypin; 1970.
34 Yermokhin YuI. Soil diagnostics of the supply of plants with microelements and macroelements on the black earth of Siberia. Omsk State Agrarian University named after PA Stolypin; 1983.
35. Derzhavin LM, Litvak ShI. Modern methods for determination of the doses of mineral fertilizers. VNIHTEI Agroprom; 1988.
36. Korenkov DA, Semyonov YuI, Taran MG. Fertilizer nitrogen balance in the system "soil-plant". Chemicalization of the agriculture. 1990; 8:57-58.
37. Balashev AI. Cultivation of leguminous crops for feedon the thin-humous carbonate black earth of the virgin land of Kazakhstan: the author's abstract of candidate's agricultural sciences. Almaty; 1961.
38. Amirov NK. Why is the harvest of chickpeas low? Agriculture. 1972; 11:26.
39. Korbut Ye. Chickpeas in the arid zone. Agriculture. 1974; 5:8-9.
40. Gafarova K. Feed chickpeas. Agriculture of Kazakhstan. 1975; 9: 29.
41. Buyakin VI. The dry period isn't a problem for chickpeas. Agriculture. 1990; 10:62.
42. Balashov VV. Choose chickpeas. Steppes. 1991; 4:16-17.
43. Zavyalova IA. Recommendation for cultivation of chickpeas in the bogharic agriculture of the Southeast of Kazakhstan. Oblast Territorial Inspection of the State Inspection Committee in the Agricultural Sector of the Ministry of Agriculture of the Republic of Kazakhstan; 1996: 13.

44. Serikpayev NA. Peculiarities of formation of the yield of leguminous crops depending on accumulation of biological nitrogen at the moment of inoculation of seeds against the background of mineral fertilizers, with natural moistening, watering, after effect on the harvest and quality of spring wheat in the dry steppe zone of Northern Kazakhstan [dissertation]. [Astana]; 1998.
45. Vinokurov VA. Technology of cultivation of chickpeas in Northern Kazakhstan. Kokshetau; 1999.
46. Sagalbekov UM, Kostikov IF, Alenov ZhN. Less-common perspective cultures of Northern Kazakhstan. Kokshetau; 2003.
47. Chernenok VG. Diagnostic approaches and construction of optimized systems of fertilizers of grain crops on the dark chestnut soils of Northern Kazakhstan. The All-Union Meeting of the Inter-College Coordinating Council for agrochemistry. Almaty; 1990:227-234.
48. Chernenok VG. Nitrogen regime of soils of Northern Kazakhstan and application of nitrogen fertilizers. Akmola; 1997.

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MODIFICATION CHANGES OF ANATOMICAL STRUCTURES OF VEGETATIVE ORGANS OF RICE GRADES

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Abstract: This article deals with modification changes in the anatomical structure of vegetative organs of rice cultivars. Increasing doses of mineral, especially nitrogenous fertilizers, have a significant effect on modification changes in the anatomical structures of the stem and leaf sheaths of rice. With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The area of large conducting beams also increases. This, apparently, facilitates the movement of more assimilates in the phloem, as well as nutrients in the xylem, which has a significant effect on the formation of a high yield of rice grain.

Keywords: Rice, Grades, Anatomical standing of the stem, Leaf sheath, Nitrogen fertilizers, Modification changes.

1 Introduction

Thanks to the great success of the Green Revolution, since the late 1960s, global production of cereals has doubled, which has created high-yielding varieties with shorter and more durable stems of rice and wheat by modifying plant architecture. (1)

Rice is a monocotyledonous plant. Most monocots sheet system should determine the basic features of the anatomical structure of the stems to a much greater extent than in gymnosperms and dicotyledonous, partly due to the absence of secondary growth. For typical characteristic expressed monocot stems particle beam structure, abundance beams, in most sheet representing traces curvature of the beams during their passage through the interstices, complete (or almost complete) absence in the stem cambial often lack distinct boundaries between primary cortex and the axial cylinder. From the base of each leaf, monocotyledons include a significant number of closed conductive bundles of the collateral structure. (2)

Rice is one of the dominant cereal crops, it feeds more than half the world's population. In most developing countries, demand for rice will increase dramatically with population growth. To cope with this task, it is necessary to develop new elite varieties of rice, which can produce a much higher yield of grain. (1) Understanding the mechanisms that control the plant architecture of rice will promote the cultivation of rice varieties with higher yield potential.

Rice is an annual grass with round, hollow and articulated stems. The course of rice development is roughly divided into two stages: the vegetative stage and the reproductive stage. (3) The vegetative stage is usually longer and consists of the re-formation of a number of leaves and branched shrubs as lateral organs. A small lengthening of the internode in rice occurs during the vegetative stage. (4)

In the genetic improvement of rice, several genetic attributes have been selected to increase crop yields, yield stability, and large-scale adaptability. (1, 5) The yield of rice plants consists of three main components: the number of panicles per unit area, the number of spikelets per panicle and the weight of the core. (6) These components contribute to the release of grain to varying degrees, and their contribution varies depending on the genotype, environmental conditions and cultivation practices. (7) Nevertheless, plant architecture can be the most important factor affecting the yield of grain in rice. The architecture of the rice plant is mainly determined by the figure of the tiller, the height of the plant, the shape and arrangement of the leaves, and the architecture of the panicle.

The content of the genotype is not so much a consequence of its properties as a material bearer of hereditary information, but rather a consequence of the properties of the phenotype to which it is addressed. Therefore, at different stages of ontogenesis and in the implementation of various morphogenetic processes, the phenotype derives from a fundamentally identical genotype (only duplicated, multiplied by virtue of the principle of equally hereditary cell division. The definiteness of the content of the genotype depends not so much on the stability of its elements - genes, as on the stability (certainty of properties) of the historically formed, i.e. previously informed, the phenotype of the adaptive norm at all stages of ontogeny. (8)

Rice is one of the most important basic food crops in the world and is consumed by people like ethereal brown rice or polished white rice. Rice as a cereal crop has a monocotyledonous form with a sequenced genome, has also for functional genomics and studies of domestication and evolution of the genome. (1, 6, 9) The grain of rice has a complex structure, derived from a flower with caryopsis which is enclosed in a lemma and palea. (10-11) Caryopsis consists of three genetically distinct components. All these tissues in mature caryopsis, with the exception of the embryo and aleurone, are dead. (12-13) In transfer cells, the aleurone layer (14) and accumulated products, the development of caryopsis in different species of cereals has some common characteristics (15). Several morphological studies were carried out with rice embryos and endosperms. (14, 16-17) Also less studied was the pericarp of rice. (10-11) The pericarp of rice has three vascular bundles, a large one located on the dorsal side, and two small ones on the lateral side. (12) The spinal vascular bundle plays an important role in providing water, minerals and photosynthesis assimilates the developing caryopsis (12) CIN2/GIF1 cell wall inversion, expressed in the dorsal vascular bundle, can function to hydrolyze the sucrose delivered by phloem to fructose and glucose, since the mutation of this gene has led to a defective filling of the rice grain. (18-19) The cover in the ovary consists of a two-layered outer cut and a two-layered inner cover. (12) The outer cover degenerates within 2 days after pollination (DAP), while the degeneration of the inner cover varies depending on the rice varieties. (12) It is known that the degeneration of the nuclear projection, which is located next to the dorsal vascular bundle, is critically important for filling the grains. (20)

2 Materials and Methods

Entry into the XX century. was marked in biology by the rapid development of genetics. The beginning of the XX century. it is considered to be the beginning of experimental genetics, which brought a lot of new empirical data on heredity and variability. According to Naidysh V.M. (21), to such kind of data it is possible to carry:discovery of the discrete nature of heredity; ,substantiation of the concept of gene and chromosomes as carriers of genes; representation of the linear arrangement of genes; evidence of the existence of mutations and the possibility of causing them artificially; establishment of the principle of purity of gametes, laws of domination, splitting and concatenation of characteristics; the development of methods for hybrid logic analysis, pure lines and in-putsch, crossing-over (disruption of gene adhesion as a result of exchange of sites between chromosomes), etc. It is important that all these and other discoveries have been experimentally confirmed and rigorously substantiated.

Modern biology is a complex, a system of sciences. There are sciences that study the general laws of life: genetics - the science of variability and heredity, ecology - the science of the interrelationships of organisms among themselves and the environment, evolutionary teaching - the science of the laws of

the historical development of living matter, paleontology explores extinct organisms. (22-23)

Now, let's take a closer look at the features of the structure of plants. The body of highly organized plants consists of the organs of stems, leaves and roots, and their modifications. The stem grows and forms in close connection with the leaves and represents an escape along with them. The anatomical structure of a typical stem determines its main functions. The main functions of a typical stem are a new growth of organs, determination of position in space, support and transport of substances along the ascending and descending routes. In the stem, a system of conducting tissues is developed, which binds together all the organs of the plant. The system of mechanical tissues ensures the stem of the supporting function. The stem, like the entire shoot as a whole, is an open system of growth, i.e., it grows for a long time and participates in the formation of new organs. The stalk is characterized by a complex system of meristems apical (apical), lateral and intercalary. At the point of shoot growth with the correct periodicity, leaf primaries arise and, which leads to early isolation of the nodes, and the development of internodes is delayed. Often, the growth of internodes and the development of permanent tissues in them continue for a long time due to the work of those residual (intercalary) meristems that persist at the bases of several younger internodes. A good example of such an intercalary (gusset) growth may be cereal stalk whose apical meristem very early consumed in the formation of inflorescence and rapid escape stretch (earing) due to precisely intercalary growth.

The stalk of plants is characterized by a variety of structure and functions. It is possible to single out the general features of the structure characterizing the stem: long growth in length with the aid of the apical meristem in the cone of growth; the presence of leaves that are formed exogenously and in a certain order in the form of tubercles on the cone of growth; branching by exogenous laying in the axils of the leaves; radial (actinomorphic) structure and at least three planes of symmetry.

Not all stems have all of the above-listed characteristics. For example, horizontal and inclined stems often have deviations from actinomorphic. In some types of stems (for example, in flower axes) apical meristem early and quickly stops activity, differentiating into permanent tissues. Phylloclade differs from typical stem organs not only by the early differentiation of the apical meristem into permanent tissues but also by two planes of symmetry.

The differentiation of the tissues of the cone of growth begins below the level of primordia. Sign of the beginning of the formation of permanent tissues is a strong vacuolization of cells. Among them are areas of residual meristem in the form of a ring or strands. The cells of the residual meristem divide longitudinally, forming a column of cells, each of which extends parallel to the axis of the shoot, forming procambial. The differentiation of procambial, starting below the level of primordia, should be actopetalin the leaf. In the axial part of the stalk of dicotyledonous and coniferous plants, acrobatic development of cambium is observed, in dicotyledonous bicipital. (24) Formation of primary conducting tissues from procambial cells begins with the formation of phloem elements. After a while, the cells of the primary xylem begin to differentiate. The primary growth of the stem includes thickening and elongation of the axis of the cone of growth directly under the primordia. The primary growth in length is due to the anticlinal division of cells and their extension. The extension of cells in length can occur uniformly along the length of the entire rudimentary interstitial site, in the actopetal direction or intercalary. The primary growth in thickness is due to the periclinal division of the cells of the primary cortex and the central cylinder. Monocotyledons in apex have a meristem of primary thickening. Depending on its activity, leaf rudiments may have different positions relative to the apex. With the development of stems of grassy and in the first year of life of woody plants, the primary anatomical structure of the stem is formed. In the stem of the primary structure, one can distinguish: 1) a cover cloth; 2) the primary cortex; 3) a central (or axial) cylinder, also called a stele. (2)

Studied objects of rice variety Marzhan, Aral 202, Aru. The rates of seeding of rice seeds: Marzhan - 5, 6, 7 million germinated seeds; Aral 202 - 5, 6, 7 million germinated seeds; Aru - 5, 6, 7 million germinated seeds. Methods of inducement mineral fertilizers: 1) N0P0 - control (without fertilizer); 2) N60P90 kg/ha a.i. (inserted before sowing) + additional fertilizer N30 kg/ha (introduced in the phase of 6-7 leaves, i.e. 3-stage organogenesis); 3) N60P90 kg/ha (inserted before sowing) + additional fertilizer N60 kg/ha (in the phase of 6-7 leaves); 4) N60P90 kg/ha (inserted before sowing) + additional fertilizer + N90 kg/ha (in the phase of 6-7 leaves); 5) N60P90 kg/ha (inserted before sowing) + additional fertilizer N120 kg/ha (in the phase of 6-7 leaves); 6) N60P120 (inserted before sowing) + additional fertilizer N90 kg/ha (in the phase of 6-7 leaves); 7) N60P120 (inserted before sowing) + additional fertilizer N120 (in the phase of 6-7 leaves).

The plot area is 100 m2, the repetition of the experiment is three-fold. The soils of the area are old-irrigated, hydromorphic, the type of salinity is chloride-sulfate, the degree of salinity is strong. Shoots of rice varieties were obtained on flooded checks, field germination of seeds - 39-42%. To study the anatomical structures of samples of varieties of rice are taken in the phase of sweeping.

Changes in the agro-ecological conditions of the Aral Sea area have a significant impact on the morph physiological features of the growth and development of crops, including rice. With such altered environmental conditions, the introduction of mineral, especially nitrogen fertilizers, has a significant impact on the formation of high rice grain yields. (25) With their correct application, rice yields increase by 60-80%, sometimes 1.3-2.5 times. Thus, for crops of narrow-leaved varieties Kuban 3, Aru and large-leaved varieties of Marzhan, Aral 202, Togusken 1, the "first effect" of yield increase (45-55 c/ha) is observed when N120P90-120 kg/ha a.i. of fertilizers. With such a dose on agrocenosis of rice cultivars, neighboring plants do not shade each other, unfavorable cenotic interactions are not observed, the net productivity of photosynthesis does not decrease. (26) The "second effect" of increasing yields (70-78 c/ha) on crops of rice varieties is observed with the application of N180P120 kg/ha a.i. fertilizers. At this dose in agrocenosis rice gradually intensified cenotic adverse mutual influence, but the net photosynthetic productivity is at a high level, and as a result, formed the highest grain yield. This conclusion is consistent with the research of other scientists. So, according to scientists from Russia (Krasnodar Territory) and Uzbekistan on the criterion of "the highest grain yield" an optimal level of nitrogen fertilizers - N178 kg/ha a.i. with following increasing doses of fertilizers (N240P180 kg/ha a.i.) in rice significantly agrocenosis (PL, thousand m2/ha), photosynthetic potential (FP, mln.m2 day/ha), total biomass (U bio., c/ha), but the yield of grain is decreasing (U, c/ha) , the net productivity of photosynthesis (F n.pr., g/m2 day) and the economic efficiency of photosynthesis (K e.ef., %) also decrease.

When forming the grain yield are significantly affected by the length, width, area of the upper 2-5 leaves, internode length, and diameter of the main stem and lateral shoots. The formation of the above-mentioned plant organs of rice is significantly affected by the dose and methods of introducing mineral, especially nitrogen fertilizers. In this regard, the anatomical structure of the upper interstices of the stem, leaf sheath, depending on the dose and the methods of introducing mineral fertilizers and nitrogen fertilizing have been studied.

Figure 1. General View of Small-scale and Large-scale Plantings of Rice Cultivar

3 Results and Discussion

3.1 Anatomical Structure of Stems

The following cells are located on the transverse section of the stems (Figure 1, Table 1): epidermis (1), small, green assimilating parenchyma (2), colorless primary parenchyma (3). The structure of the wall of a single-layered epidermal cell (1) is reticular, shallow, the walls thickened and saturated with silicon, covered with a thin cuticle. In cells of the epidermis, there are no stomata, there are one or two hairs. The shape of the hair is round, convex, or slightly elongated. (27)

Small, slightly elongated, densely located parenchymal (2) cells are located below the epidermis, between the cells there are narrow lumens. Further, to the bottom of small parenchymal (2) cells are located large, the main assimilating parenchymal (3) cells, their shape is roundish, there are several elongated forms. The walls of these cells are thin, there are intercellular spaces.

In the stems, there are two rows of vascular-fibrous conducting bundles. The number of beams in a straw is from 20 to 40. (28) Sclerenchyma coating of conductive beams merges with sclerenchyma elements of the ring. The "outer", small vascular fibrous conduction beams (4) are located at a "large distance" from each other, and in the parenchyma located closer to the center, large, "inner" vascular fibrous bundles (5) are formed that form almost " the right circle ". All conducting bundles are closed, collateral. In the center of the stem is a cavity (6), formed as a result of the death of parenchyma cells (Figure 2).

Figure 2. Preparation of Sections of the Stem and Sheath of the Rice Leaf and Consideration

In the non-spreading Anao variety, internal, large conductive bundles are somewhat elongated, ovate, and in Uzros 7-13, whose average lodging ability, conduction beams are diamond-shaped, roundish. Arp - shaly variety in lodge vascular bundles elongate rounded, compressed from two sides. The internal conducting beams of varieties Marzhan, Aral 202, Togusken 1, Aru are similar in shape to conducting beams of the average littered variety UzROS 7-13. Consequently, the investigated Kazakh varieties in terms of their property are medium-liable under the microscope.

The composition of the conducting beams includes elements of phloem (8) and xylem (9). Xylem is represented by 3-4, among them 1-3 large-lobes, constituting a short radial chain. The phloem (8) has the form of a grid, the cells of which correspond to the cross section of the sieve tubes and consist of small, "satellite" cells. Protophloem altered, located along the edges of the bundles.

The mechanical tissues surrounding the "outer" conductive bundles are densely located with each other, there are no intercellular spaces. The shell of these cells is sclerated, a bit thick. These cells are docked with sclerenchyma, surrounding the stem cells and gives the stem a certain degree of strength. Sclerenchyma cells surrounding the inner large conducting beams 2-3 row, tightly arranged. On the outside of these cells are small, parenchymal cells, in which the shell is thin (Figure 2a, 3).

With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The area of large conduction beams also increases

(Table 1). This, apparently, facilitates the movement of more assimilates in the phloem, as well as nutrients in the xylem, which has a significant effect on the formation of a high yield of rice grain. (29)

The quantitative parameters of the anatomical structure of the stem in the sectional view also change (Table 1). Thus, the number of large conductive beams and their area, as well as the number of small, outer beams in Aral 202 are significantly higher than those of Marzhan (standard). This is one of the indicators of the superiority of the newly regionalized Aral 202 (Table 1). With the application of an average dose (N60P120 + N60 kg/ha a.i.), the number of large, inner and small (external) conducting beams increased in the studied sorbents. The number of sclerenchyma coatings of these conducting beams increases.

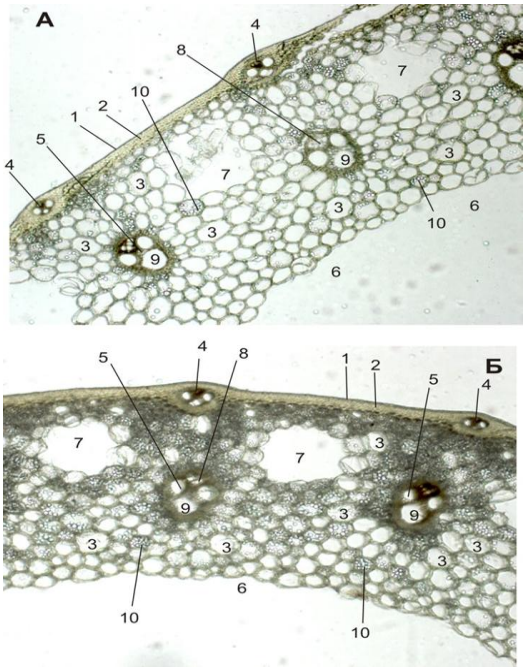

Figure 2a. Anatomical Structure of the Stalks of Rice Aral 202 (on Top of the 1st Internode, a and below the 2nd Internode, B); Variant-seeding 5 Million Germinated Seeds; Without Fertilizer (Control)

Table 1. Quantitative Indices of the Anatomical Structure of the Stem of Rice Cultivars Depending on Increasing Doses of Fertilizers

Varieties of rice	Seeding of 5 million germinated seeds			Seeding of 7 million germinated seeds		
	N0P0, without fertilizer (control)	N60P90+ +N60, average dose	N60P120+ +N120, high dose	N0P0, without fertilizer (control)	N60P90+ +N60, average dose	N60P120+ +N120, high dose
Internal, large conductive bundles, pcs.						
Marzhan standard	8,7±0,33	10,3±0,32	16,7±0,71	10,2±0,33	13,0±0,55	17,1±0,63
Aral 202	12,3±0,31	16,0±0,40	20,0±0,60	12,3±0,30	16,0±0,70	19,0±0,40
Aru	9,7±0,33	13,6±0,37	18,7±0,70	10,8±0,41	14,1±0,63	18,2±0,51
External, small conductive bundles, pcs.						
Marzhan standard	12,7±0,87	14,3±0,86	20,0±0,57	15,8±0,52	17,3±0,61	21,8±0,77
Aral 202	15,3±0,80	20,0±0,70	28,0±0,60	17,3±0,41	20,3±0,50	26,7±0,61
Aru	15,7±0,87	18,7±0,86	21,7±0,56	16,2±0,65	18,5±0,66	21,2±0,54
Area of internal, large conducting beams, mkm^2						
Marzhan standard	115,7±0,6	116,7±0,3	138,7±0,7	117,3±0,4	121,4±0,5	139,2±0,6
Aral 202	129,3±0,3	133,7±0,6	138,0±0,6	127,3±0,2	135,4±0,8	143,3±0,4
Aru	118,7±0,6	122,7±0,3	132,0±0,7	118,2±0,5	123,5±0,6	136,5±0,6

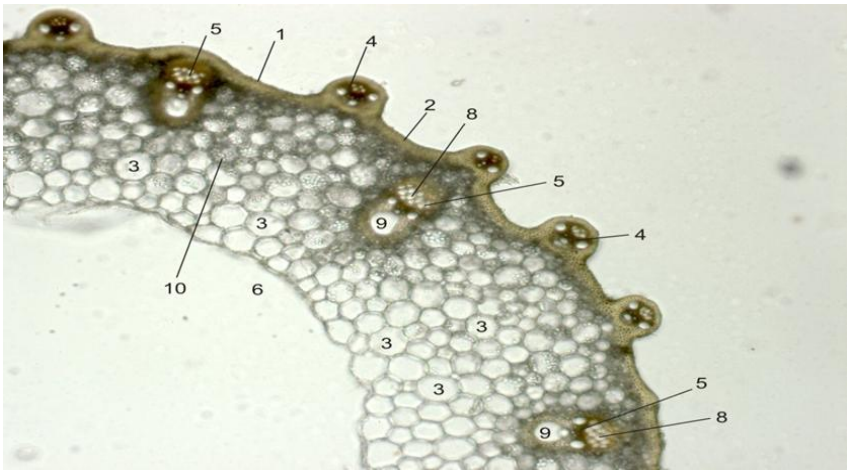

Figure 3. Anatomical Structure of the Stem of Aral 202. Option-seeding 7 Million Seeds, Applying an Optimally High Dose (N60p120 + N120 Kg/ha a.i.)
Notation: same as in Figure 2.

This to a certain extent contributes to the increase in strength of the stem and the studied varieties at a moderate dose do not fall. But, at an optimally high dose (N60P120 + N120 kg/ha a.i.), the height of the stem of the studied varieties increased. In addition, due to the destruction of the internal large parenchymal cells of the stem, the inner cavity of its stem (6) widened somewhat. This reduced the strength of the stem and increased the lodging ability of the studied varieties (Figure 3).

In the variant without fertilizers (control) in the internodes of the stem, the number of internal conducting beams was smaller and parenchymal cells were formed small in size. With an increase in the seeding rate of up to 7 million germinated seeds and the introduction of a high fertilizer dose, the small, "external" conductive bundles are located on the outer side of the stem in the form of a convex outgrowth, which increases the stem facets. The internal, large conduction beams were located closer to the outer wall and the inner cavity (6) of the stem widened somewhat. At the same time, the length of the stem increased. This is characteristic of the Aral 202, which to a certain extent reduces the lodging of the stem of this variety (Figure 2, 3).

3.2 The Anatomical Structure of the Leaf Sheath

In the studied varieties of rice (Aral 202, Marzhan, Aru) at the lower end of each interstice are the sheath of the leaf and surrounds the stalk, their edges overlap. When you rise to the top of the interstice, the margins of the leaf sheaths are less overlapped, and at the very top, where the sheath passes into the plate of the leaf, the stem is exposed.

The external and internal epidermis of the sheath differs from each other. The inner epidermis (1) of the sheath is large, monotonous, elongated-quadrangular, the walls of the epidermis are thin. On the inner epidermis, there are no cells of the stomata, hairs, twinned cells, etc.

The outer epidermis (2) of the sheath of the leaf is similar to the cells of the epidermis of the internodes of the stem. On the external epidermis of the sheath of the leaf there are stomata, silicified outgrowths (3), hairs (4). The epidermal cells located on top of the conducting beams, they are long and narrow (5). The sclerenchyma tissues (6), large (7) and small (8) conducting beams are located closer to the upper epidermis. The mechanical tissues surrounding the conductive bundles impart strength to the sheath. The named conductive bundles (7, 8) are similar in structure to the conductive bundles of internodes of stalks. On small conducting beams the number of xylem vessels is less in number, and the phloem is poorly developed. On large conducting beams phloem (9) and xylem (10) are well developed.

The mechanical tissues (11) surrounding the conductive bundles (7, 8) of the leaf sheath in the Aral 202 and Aru varieties are well developed. These mechanical fabrics (11) are similar to the same mechanical fabrics of the non-liable grade Anao. The littered Arpa-shaly variety does not have mechanical tissues surrounding the conductive sheaves of the sheath. Consequently, the Aral 202 and Aru belong to the average liable varieties.

Sclerenchyma tissues (6) of the sheathof the leaf of Aral 202 are located under the epidermis and on top of the conducting bundles and are visible in the form of a band since the cells of these tissues consist of several rows. On the variant without fertilizer (control), these sclerenchyma tissues (6) consist of 1-2 rows of cells, therefore they are visible with a thin band, only above the conducting bundles, these sclerenchyma cells (6) are arranged in several rows, and they are seen by a thicker band (Figure 3).

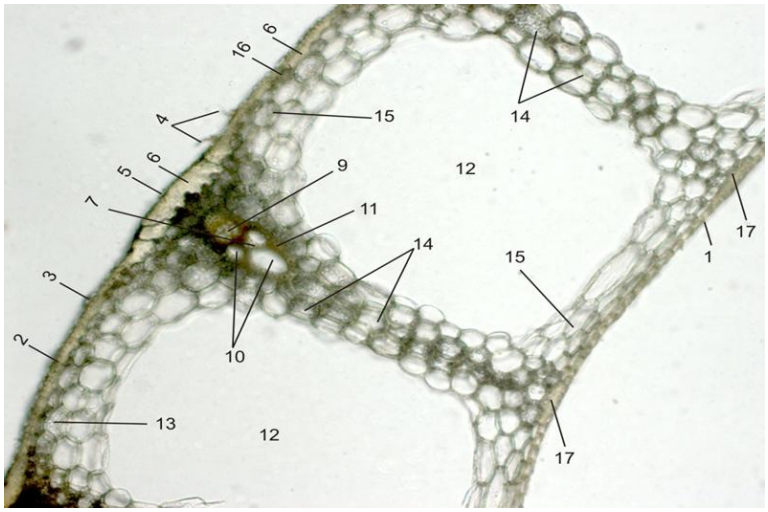

Figure 4. Anatomical Structure of the Sheath of a Leaf of Rice Aral 202
Option: sowing 5 million seeds; an optimally high dose (N60P120 + N120 kg/ha a.i.) was introduced.
Notations: 1 - internal epidermis; 2 - external epidermis; 3 - silicon outgrowths; 4 - hairs; 5 - epidermal cells located on top of conductive bundles; 6 - sclerenchyma cells; 7 - large conducting beams; 8 - small conducting beams; 9 - phloem; 10 - xylem; 11 - mechanical tissues surrounding the bundles; 12 - air-conduction cavities); 13 - starch granules inside the cell; 14, 15 - parenchymal cells; 16 - small parenchymal cells; 17 - low sclerenchyma cells.

The sheath of the leaf of the Aral 202 and Aru varieties has air-conducting cavities (12), called an aerenchyma (12). These cavities are located in the parenchymal cells (14, 15) and surrounded by these cells. Parenchymal cells (14, 15) are the main tissues of the vagina. They are shaped in shape 5-6, the angles of these facets are arcuate, so these cells can be seen in shape as roundish-long. The walls of the cell are thin. Parenchymal cells (15), which are closer to the epidermis, have chloroplasts, so they are capable of photosynthesis.

Between the upper and lower epidermis, the airborne aerophytes (12) are separated by radially arranged, several rows of parenchymal cells (14) (Figure 3). These cells contain starch grains. Among these cells, which are closer to the epidermis, the starch grains are larger.

Sclerenchyma (mechanical) cells on the surface of the sheath are not disposed of in continuous rows, there are several rows of small parenchymal cells between them (16). In these cells, there are green plastids.

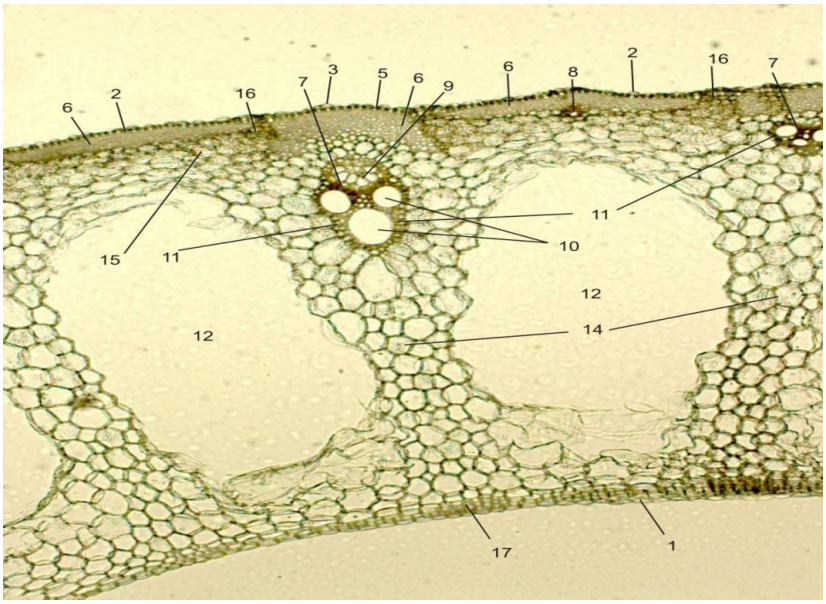

Figure 5. The Anatomical Structure of the Vaginal Leaf of the Rice Variety of Aru
Option - seeding 5 million seeds; an optimally high dose (N60P120 + N120 kg/ha a.i.) was introduced.

This arrangement of cells gives the sheath leaf elasticity, elasticity, increase their resistance to lodging. Such features are found in the Aru variety and partly in the Aral 202 (Figure 3).

The main functional property of the leaf sheath is the process of photosynthesis, and at the same time gives the stalk resistance to lodging, elasticity, and elasticity. The armature of the sheath of the leaf consists of the following elements: sclerenchyma cells (11) surrounding the conduction beams, parenchymal cells (14, 15) located around the airway, aerochymal cavities (12), sclerenchyma cells (6) located under the epidermis on the vaginal surface and under the lower epidermis (17), against several conducting beams, several rows of sclerenchyma cells (17).

The named cells are well developed in Aral 202 and Aru varieties. In the variant without fertilization (control) on large conducting beams, xylem vessels are somewhat smaller and

equal in size. When applying the optimal dose (N60P120 + N120 kg/ha a.i.) of fertilizers on large conducting beams, the two upper meta-xylem vessels are somewhat smaller in size, and the lower xylem vessels are larger. On the control of the Aral 202 variety, rows of parenchymal cells (14) that are smaller in number with interstitial air-conduction aeruginosa cavities (12) consist of 2-3 rows. When applying the optimal dose of fertilizers, the number of rows of such cells (14) is larger, 4-6 rows (Figure 4, 5).

4 Conclusion

Modification variability - changes in the body caused by environmental influences and which in most cases are adaptive in nature. The phenotype changes, but the genotype does not change.

Modification variability characteristic:

- the phenotype changes, but not the genotype - the phenotype changes caused by the physiological reactions of the cells.
- certainness (predictability): a specific active factor of the environment corresponds to a specific phenotype reaction characteristic of the given genotype (in most cases, to all representatives of the population).
- changes can be reversible (more or less) or irreversible at the level of an individual organism, depending on the mechanism by which this form of variability is realized in a particular case.
- lack of steady inheritance of emerging changes.
- the mathematically aligned relationship between the strength of the acting medium factor and the degree of change in the feature. This dependence can have different forms, and in each specific case, it is determined by the evolutionary history of the species.

Modification variability is the result not of changes in the genotype, but of its immediate response to environmental conditions. With modification variability, the hereditary material does not change, - the manifestation of genes changes.

The stimuli of the environment affect the behavior of cells and multicellular organisms due to the presence of sensitive receptors (they are present not only in the sense organs of animals but also in each living cell), which transmit chains of signals that change the regulation of the functioning of certain genes. Thus, environmental factors are able to regulate the intensity of the production of specific proteins by cells, on which the development, physiology, and behavior of the organism depend.

A genotype is a collection of genes of a given organism. The genotype, unlike the concept of a gene pool, characterizes an individual, not a species. (5) In a narrower sense, a genotype is understood as the combination of alleles of a gene or locus in a particular organism. The process of genotype determination is called genotyping. (8) The genotype together with environmental factors determines the phenotype of the organism. In this case, individuals with different genotypes may have the same phenotype, and individuals with the same genotype can differ from one another under different conditions. (30)

Most often, the quantitative characteristics are subject to modifications: growth, weight, fertility, etc.

For various characteristics and properties of organisms, a greater or lesser dependence on environmental conditions is characteristic. The limits of the modification variability of a feature are called the reaction norm. The norm of the reaction is the ability of the genotype to form different phenotypes in ontogeny, depending on environmental conditions. It characterizes the share of the medium in the implementation of the characteristic and determines the modification variability of the species. The wider the norm of the reaction, the greater the influence of the medium and the less the influence of the genotype in ontogenesis. The same gene under different environmental conditions can be realized in several manifestations of the sign (phens). In each concrete ontogenesis, only one is realized from the spectrum of manifestations of the feature. Similarly, the same genotype under different environmental conditions can be realized in a whole spectrum of potentially possible phenotypes, but in each specific ontogenesis, only one phenotype is realized. The hereditary reaction norm is understood to mean the maximum possible width of this spectrum: the wider it is, the wider the reaction rate. The phenotypic value of any quantitative trait is determined, on the one hand, by its genotypic value, on the other hand, by the influence of the medium.

In this work, we studied the anatomical structure of the rice stem of the Aral Sea and Marzhan, as well as the anatomical structure of the sheathAral and Aru. With increasing fertilizer dose, especially with increasing number and dose of nitrogen fertilizing, the number of conducting beams, especially small (outer) conducting beams increases. The quantitative indices of the anatomical structure of the stem in the sectional view also change. The sheathof the leaf of the Aral 202 and Aru varieties has air-conducting cavities. The external and internal epidermis of the sheathdiffer from each other.

Literature:

1. Khush GS. Green revolution: the way forward. Nat Rev Genet. 2001; 2.
2. Peng S, Laza RC, Visperas RM, Sanico AL, Cassman KL, Khush GS. Grain yield of rice cultivars and lines developed in Philippines since 1996. Crop Sci. 2000; 40:307-314.
3. Goff SA, et al. A draft sequence of the rice genome (Oryza sativa L. ssp. japonica). Sci. 2002; 296:92-100.
4. Yu J, et al. A draft sequence of the rice genome (Oryza sativa L. ssp. indica); 2002.
5. Sang T, Ge S. Understanding rice domestication and implications for cultivar improvement. Curr Opin Plant Biol. 2013;16.
6. Gu YJ, Wang Z, Chen J, Zhao GY. The structure and function of pericarp in rice. Acta Agron Sinica. 2002; 28.
7. Yoshida H, Nagato Y. Flower development in rice; 2011.
8. Krishnan S, Dayanandan P. Structural and histochemical studies on grain-filling in the caryopsis of rice (Oryza sativa L.); 2003.
9. Saulnier L, Guillon F, Chateigner-Boutin AL. Cell wall deposition and metabolism in wheat grain; 2012.
10. Wu XB, Liu JX, Li DQ, Liu CM. Rice caryopsis development II: Dynamic changes in the endosperm; 2016.
11. Opanowicz M, Hands P, Betts D, Parker ML, Toole GA, Mills EN, Doonan JH, Drea S. Endosperm development in Brachypodium distachyon; 2011.
12. Becraft PW, Yi G. Regulation of aleuronat development in cereal grains; 2011.
13. Wang Z, Gu YJ, Zheng YK, Wang HH. Ultrastructure observation of rice endosperm cell development and its mineral element analysis; 2012.
14. Wang ET, Wang JJ, et al. Control of rice grain-filling and yield by a gene with a potential signature of domestication; 2008a.
15. Wang YQ, Wei XL, et al. Cell-wall inverters from rice are differentially expressed in caryopsis during the grain filling stage; 2008b.
16. Yin LL, Xue HW. The MADS29 transcription factor regulates the degradation of the nucellus and the nucellar projection during rice seed development; 2012.
17. Korobko VV, Kasatkin MU. Anatomical organization of vegetative organs of plants; 2014.
18. Kamshilov MM. Phenotype and genotype in evolution; 2008.
19. Johannsen W. The Genotype Conception of Heredity; 1911.
20. Azimov A. Short biology history. Moscow; 1997.
21. Camp P, Arms K. Introduction into biology. Moscow; 2000.
22. Libbert E. Common biology. Moscow; 2001.
23. Naidysh VM. Concepts of modern natural science. Moscow; 1999.
24. Nebel B. Science about environment. How world is working. Moscow; 1993.

25. Gluschenko IE. Vegetative hybridization of plants. Moscow; 1948.
26. Avyakin AA. Manage the development of plant organisms. Journal Yarovizatsia. 1938; 6.
27. Hexley J, Berr G. Experimental embryology. Biomedgiz; 1936.
28. Koltsov NK. Organization of the cell. Biomedgiz; 1936.
29. Lubimenko VN. Photosynthesis and chemosynthesis in the plant world. Silhozgiz; 1935.
30. Meller G. Selected works about genetic. Silhozgiz; 1937a.
31. Meller G. The current state of experimental data on the nature of the gene. Collection Controversial issues of genetics and breeding; 1937b.

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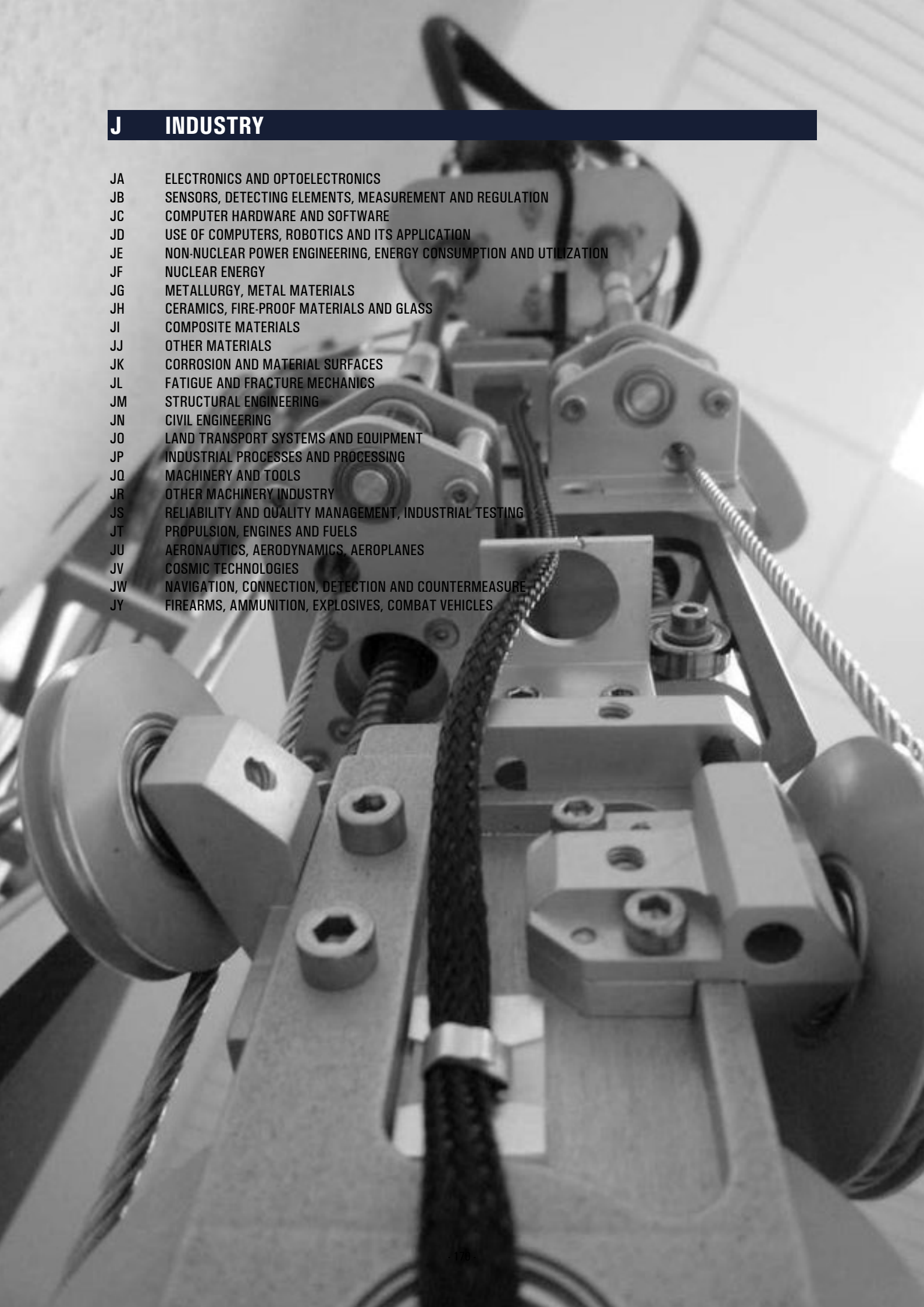
Secondary Paper Section: GE



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
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BUILDING THE HIGHER EDUCATION 4.0 IN THE ARMED FORCES ASSOCIATED WITH THE INDUSTRY 4.0: POTENTIAL AND CHALLENGES

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Abstract: Statement of the problem. Industry 4.0 is expected to bring unprecedented far-reaching influence, change the face of the world as well as raise concerns – where, the rapid development and diffusion of intelligent machines can lead to security and defense threats when the achievements of the fourth revolution are applied to an unreasonable purpose. Higher education 4.0 using the advanced technology of the Industry 4.0 will open up the potential for training and learning as well as the difficult challenges that the education institution will face. Purpose of the work. With the change and far-reaching international integration, the higher education 4.0 in the armed forces needs to transform itself to meet the changes of the Industry 4.0 in the new situation. Used methods. A systematic approach, methods of analysis, synthesis and comparison method is used to systematize, analyze and aggregate resources, and compared with model universities in the world which provide the most accurate 4.0 University Education model for the armed forces. Results. Successfully building the higher education 4.0 in the armed forces with five elements: Teaching 4.0, Research 4.0, Management 4.0, Training 4.0 and Operations 4.0; It aims to train a team of high-quality professional officers to serve the cause of security and to order protection and defense for the country. Professional human resources are confronting with urgent issues in the current period. Practical value. This is a current issue having theoretical value, high scientific and practical significance to help the higher education institutions in the armed forces to develop and meet the political and professional requirements.

Keywords: Higher education model 4.0, industrial revolution, potentials and problems, armed forces, national security.

1 Introduction

Emerged from 2011 at Hannover Fair (1, p34), Industry 4.0 promises to give people unprecedented opportunities and challenges.

We cannot accurately predict the speed or the application of technology in the future life and in education, however, the trend of education and training must be approached with the hi-tech view is inevitable. For example, we could indicate a few trends of technological education. For example, in the digital classroom: instead of only consider information technology as a singular tool and skill, it should be viewed as a trend and will change the modern classroom. For example, tablet PCs, electronic screen, interactive white boards, data projectors, etc. Tangible smart devices: the process of embedding available programs into physical materials through smart devices, connect everything via the Internet and will have a powerful impact which will change the mechanisms of learning and receiving information of the person, e.g. the reactive materials, reactive furniture, 3D printers, fact-finding through space number. Mobile applications. Mobile devices are popular technology, which has broad coverage and all the research and application are associated with a specific product. The trends of learning through mobile application have been approved for a while. Mobile and tablet devices are available everywhere, it is a tool that connects directly to the valuable resources to support learning. Distribution courses on mobile phones help students to easily learn anytime, anywhere, saving time and costs. All learning content is put in a friendly smartphone and can easily be accessed. (2-3)

One of the definitions of revolution is "the process of major and fundamental change in direction of progress in a certain field". (4, p122) Thus, we can consider that it is an Industrial Revolution when there are innovation and industrial development that transformed the face of the whole society, from economics and culture to politics. The first industrial revolution (late XVII century - the first half of the XIX century) occurred when the steam engine was invented. The second industrial revolution (late XIX century - early XX century) occurred with the emergence of power applications for mass production. The third industrial revolution, known as the Digital Revolution (from the 1970s onwards) occurred with the help of electronic devices, digital technology, information technology promoting production automation into reality. As above revolutionaries occurred, the Industry 4.0 which has potentially developing technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Big data, nanotechnology, etc. will change the way people live, think and look at the problem. Even this revolution far exceeds previous revolutions, with "unprecedented" breakthrough speed under exponential function, not linear leading to far-reaching changes. It will break and is breaking most industrial branches in every country. (5)

Education 4.0 is catering to the need of the society in 'innovative era'. It is in accordance with the changing behavior with the special characteristics of parallelism, connectivism (6), and visualization. This learning management must help to develop the learner's ability to apply the new technology, which will help the learners to develop according to the changes in society. Sinlarat (7) stated that the learning management of this era is a new learning system, allowing the learner to grow with knowledge and skills for the whole life, not just to know how to read and write. To be able to live in a society and to be equipped with the best of his/her ability. Therefore, Education 4.0 will be more than just an education.

The skills which derive from integrating life skills and innovative skills together becomes the main characteristics, to develop individuals to use Intelligent agents, Mobile technologies, Cloud computing and services, which Marinela and Andreescu (8) explained that they are the main attributes of cloud computing which are service-based, scalable, elastic, shared, metered by use, and delivered through internet technologies.

Many concepts of the learning management for the 21st Century Skills are still very interesting or could be used, such as the concept of Zhoa (9), Sinlarat (7) and Gomaratat. (10) The concept of Zhoa (9) is to arrange the learning process such as being in the real situation of working in the plant. As of Sinlarat (7), there are 4 ways: 1) Critical-Based Instruction, 2) Creativity-Based Instruction, 3) Productivity-Based Instruction, and 4) Responsibility-Based Instruction. From Gomaratat (10), arranged to adapt the Constructionist Learning, that is 3R, 3I, and 3P. The 3R is regulating the understanding, which consists of Recalling, Relating, Refining; the 3I is investigating, that consists of Inquiring, Interacting, Interpreting; and 3P is Producing, creating work by Participating, Processing, Presenting. Jeschke (11) proposed that Social & Virtual Learning must have been learning with social media, in large groups, and in a virtual environment.

The emerging technologies have huge effect on the education of people. Only qualified and highly educated employees will be able to control these technologies. The industry should collaborate with universities. The main vision the following of Industry 4.0 is the emergence of "smart factories" that will be connected to the production facilities Cyber-physical systems called CPS. (12) Using of the Internet of Things, the Internet of Services and the Internet of People will make a connection: machine-machine, human-machine or human-human, and at the same time an enormous amount of data will be obtained. (13) For this reason, it will be necessary to analyze large data (Big Data) to be able to predict possible failures and adapt in real time to the changed conditions. Currently, the human is an operator of machines and these machines only passively follow the operator's commands. (14) The main trend of Industry 4.0 will therefore replace this condition with the Prognostics-monitoring system. Production processes will have to allow effective production and at the same time be flexible due to the changing customer demand for particular products. For this reason, the companies will produce smart products. (15) The timely analysis of the obtained data is important for planning and managing in all fields including armed forces. (16)

Thus, one of the important tasks of Vietnam today is to prepare the foundation for the Industry 4.0, welcome the progress of humanity. Higher education in general, and higher education in schools of the armed forces, in particular, cannot stand outside that inevitable trend.

2 Materials and Methods

2.1 Higher Education 4.0

When Industry 4.0 occurs, it will change every field, erase the boundaries between industries, many jobs will disappear and, simultaneously, innumerable new jobs will be generated. Because robot will replace human beings to undertake heavy manual labors and Artificial Intelligence will be able to undertake complex calculation works which need intellect with high accuracy, the labor will need "talent" more than "skill" in order to desire to exist in the world of Technology 4.0.

Thus, one of the duties of higher education 4.0 in general, and higher education 4.0, in particular, is to train the human resources who are able to meet the demands of higher education 4.0 to confront with the new era opened by Industry 4.0. Therefore, an essential educational foundation 4.0 must have an enormous change in training target, transfer from transmitting knowledge to the majority to capacity exploitation (emancipate potential, capacity, motivation). Also, empower innovation to each individual. Creation, innovation will be the foundations of higher education 4.0. The trained candidates in higher education 4.0 must have not only specialized knowledge, but also high-ranking skills which cannot be replaceable by robot: problem-solving capacity, logical reasoning capacity, quick adaptation capacity, communication and skills, persuasion, teamwork skills, the demand of active, frequent, lifelong studying, etc. (17, p21)

On the other hand, higher education 4.0 is the educational model relating to applying the concept of industry 4.0 into education, is the model applying the achievement of Industry 4.0 to enhance the quality of teaching and studying. In higher education 4.0, training will be personalized meanwhile the mission of training will be directed beyond the boundary of countries to serve humankind. Higher Education 4.0 is an intelligent model linking critically between schools and managers and enterprises, to create favorable conditions for creating, increasing labor productivity in the knowledge society. Information technological breakthroughs entered into schools will improve training effectiveness, help teaching and studying take place everywhere and every time. Also, it will facilitate the cooperation between higher education and industry and unite developing efforts on sectoral and local economy.

One of the ideas concretizing this model is proposed by Prof. Gottfried Vossen (Münster University, Germany) and consists of Teaching 4.0, Research 4.0, and Management 4.0 described below.

- Teaching 4.0: there are many new studying forms, flexible time and place for studying, many appropriate changes with studying candidate, provide more appropriate skills.
- Research 4.0: new research form (include speed, result, assessment process), data system with bigger scope and more diversified sources.
- Management 4.0 consists of teaching (software system implementing more targets, more effective management tools, larger information system), scientific research (on an information system for scientific research, project management), training foundation management, financial support division. (18)

4.0 University Model has been applied to several Universities such as Coventry University (England), Complutense University de Madrid (Spain), Yeungnam University (Korea), Malaysia University of Technology, Lorraine University (France) etc. According to professor Gottfried Vossen, 4.0 education includes multiple innovative learning methods: learning through playing, interacting and communicating, group learning, learning by doing projects… The time and location of the student is unbounded and can be changed if they want. 4.0 Education provide more suitable skills for the learner: know how to apply knowledge into practice, develop the ability to solve practical problems based on scientific knowledge, proactive and creative learning...As a result, students will not only have learned scientific knowledge but also known how to apply them in practice. For example, when learning about the types of electric circuit, learners can establish a network connection and electricity used in practice instead of learning through books; the same goes to martial arts training, shooting or electronic warfare, which learners have access to the interactive model as practical work, fight. This helps remove the gap between academic knowledge and practices. (19)

In Vietnam, one of the most typical and popular example in higher education 4.0 application is the HOCMAI educational system. Up to 2018, there have been more than 3 million members who study online from Primary School to High School. Beside, FUNIX is the first online university established in our country with more than 1000 students studying. With this form of learning, a learner can actively choose among the available lectures base on his/her desire. In addition, students can choose the appropriate teachers, interacting with teachers and friends at school anytime, anywhere through the Internet and technology equipment. For truly effective learning, learners need to improve knowledge about technology, actively research and update new information. The learners also need to experience and practice the things that are learning to accumulate experience for research and development. (19)

2.2 Higher Education 4.0 in the Armed Forces

National security, as well as all other aspects, will face with many large and complex changes when the Revolution 4.0 occurred. One of the remarkable changes is the breakthrough in research and development of new technologies: nanotechnology, virtual reality technology, artificial intelligence, robotics, etc. The rate of technological development and innovation is very fast, the cost of production is getting cheaper, at present, there are no laws and international rules clearly regulating the process of monitoring and controlling research. Advances in technology 4.0 are applied to the development of military technology and military weapons. All of these factors suggest risks and threats that could threaten national security, order, and defense. The achievements of the Revolution 4.0 can be used to make genetically modified biological weapons, energy weapons, combat robots, etc. to create new types of warfare and combat. The forces, especially the powerful forces, may use Technology 4.0 for illicit purposes, intervention secret, controlling the internal situation of other countries, remote controlling for less developed countries and developing countries are depended on us. Although the cost of production will continue to decline, smaller nations will be forced to depend on larger nations on demand for the latest advanced technology in the arms race. (20) In addition, technological advances can also be used in criminal acts such as money laundering and transnational crime, or in attacks on the national information network, especially the network of national security and defense, leading to a decline in social order and security and the threat of armed struggle to protect information of national defense and security. (21)

Thus, one of the tasks of armed forces education is to equip the leaners with necessary knowledge and skills to cope with dangers posed by Industry 4.0. Namely, the higher education programs in the armed forces need to be renewed in content. The most up-to-date technologies must be constantly updated. At the same time, the curriculum must pay attention to training, practicing decision-making skills, integrate information, solving problems in unexpected cases, because, with the rate of development of technology and the modern technology as today and predicted in the future, an officer will face complex multidimensional situations and rapid changes and will not have much time to build tactics; the complex changes in the blink of an eye will make it easy to make wrong decisions based on misleading information. (22)

Higher education in the armed forces has also made important contributions to the provision of high-quality professional officers for the protection of national security, the maintenance of social order and the safety of the country. However, in keeping with the changes that accompanied the Industry 4.0 as well as the deepening international integration, the Higher education in the armed forces needs to develop a new higher education model, which has not only caught up with the industry 4.0 but also ensured the requirements of politics, professional, socio-economic and international integration.

With the peculiarities of higher education in the armed forces, we propose the Higher Education 4.0 in the Armed Forces comprising five elements: Teaching 4.0, Research 4.0, Management 4.0, Training 4.0, and Operations 4.0 with

- Three elements (Teaching 4.0, Research 4.0 and Management 4.0) inheriting the model of Professor Gottfried Vossen (University of Münster, Germany).

- Training 4.0: new training (includes using technology, increasing speed, training skills, reflexes, results, evaluation process).

Virtual Reality (VR) technology is being used by the armed forces around the world to train and train the officers, especially to simulate dangerous, complex environments or expensive environments if trained in the traditional way. Thanks to the superior capabilities of Big Data, training scenarios are simulated very flexibly from the data collected on the system. Commanders continually offer training situations close to the reality, in accordance with the capabilities of the officers, the features of weapons equipped, arbitrarily adjust according to their intention to help improve the efficiency of training, combat skills without building training ground, selecting training locations, building props, etc. (23)

- Operations 4.0: Researching, proposing many new operational models, in accordance with the reality and the international situation, having appropriate changes to the learners, providing many practical situations.

Network operation is the act of disrupting information organization, preventing access and supplying data, degrading the ability or destroying information stored in the computer network as well as the computer network of the adverse party; at the same time, protecting our elements. Dr. Peter Singer, a strategist, told in Business Insider, "We are used to fighting only in a certain territory. But we have new areas, which we have not yet fought there before, and that is the area outside of space and cyberspace." (24)

Network operation happened, is happening and will happen, it is very big risk. With the terrible destructive power of many areas, it could be the hijacking of combat vehicles, important factories, military facilities, national defense and security; the inability to operate the military, political, economic and social strategic centers; combined with communication activities that creates the insecurity, chaos of a society leading the loss of control and control of a political system. (23)

However, the application of Technology 4.0 and Higher Education 4.0 will bring many benefits in the training of the armed forces.

3 Results and Discussion

3.1 The Potential of the Education 4.0 in the Armed Forces

Higher education in the armed forces following the university model 4.0 can bring great results. With many new forms of learning, learners can choose the appropriate learning method, ensuring the quality of training. Individuals can master their own skills and knowledge at their own method. Lectures, curriculum materials not only distributed and implemented in the traditional way, but also through methods such as online posting to the web, will not only reduce the cost of printing and distribution, or in the case of the lectures are the cost associated with the place, but also help the learners can see or review the materials wherever. Not only for individuals who are trained, build online knowledge systems, and constantly update their knowledge, will also provide graduates with the opportunity to access the latest information, improve the professional skills and serve the country's defense and security work more effectively, including those working in mountainous or island areas. The workshops, the great opportunities to cultivate and acquire more knowledge, with online stream technology, will give countless individuals access to learning that they previously did not have, because many reasons they cannot attend the seminar.

One of the points that need to overcome in building the armed forces is the level of theory, acumen, sharpness and political strength of many officers and soldiers who have not matched the position, requirements, the task of the armed forces in the struggle to defend the socialist fatherland. (25) These political elements can be trained in the armed forces education at the university level by combining online classroom and flipped classroom. Learners will read the material beforehand, listen to lectures on political theory, online philosophy before entering the classroom, in the classroom, lecturers will hold debates, answer questions. This gives learners the opportunity to deepen their problems, to better understand their political ideals and philosophies, as well as to train their thinking and reasoning skills quickly and properly.

With the help of artificial intelligence and software for data collection and analysis, the system will be able to study and synthesize the most appropriate learning and training programs for each subject, these subjects can further customize the program to suit their own conditions.

If virtual reality technology is included in armed forces education, the quality of teaching and learning will also increase dramatically. Virtual reality provides a variety of simulation environments for practicing, without high expense for construction of environment or equipment in reality. The learners are trained and practiced safely in the practice area, but can still experience hazardous environments with full feeling as in practice, giving them more experience responding with pressures that is not in the classroom or practice area: Learners can use virtual reality to experience parachuting, gaining a sense of disorientation when jumping from an airplane, without the cost of a real flight. They can learn to fight fighters, submarines, tanks or armored vehicles and experience cramped and stuffy conditions. From there, when facing real situations, the officer will be more ready. Currently, virtual reality devices have been developed without wires connected to the computer, thus allowing users to move freely while wearing them with programs that can be stored locally on the device, so there is no need for network connectivity, whether wired or wireless, which can be used in any location. (26)

Updating and renovating the management system under the management model 4.0 improves management works more closely and fairly. The information stored on the system can easily be found if needed, and the editing, adding, deleting will also be simpler than the previous one.

3.2 Challenges When Building the Higher Education 4.0 in the Armed Forces

In fact, the higher education system in the armed forces at the undergraduate level is still approaching traditional teaching and learning. Sometimes, it is still a heavy institution that leads to the inhibition of development. The openness of higher education institutions is limited. Particularly, the education of the armed forces is still high, the subsidy is heavy: enrollment is recruitment, the training program is quite closed, no socialization, focused learner management, etc.

All these factors are no small obstacles to the process of developing and applying the model of Higher Education 4.0 in the armed forces.

In addition, the Higher Education 4.0 requires large installation costs, modern equipment and facilities and high-tech platform that we cannot currently meet fully; similarly, many learners do not have good financial conditions to prepare the appropriate equipment for the learning environment 4.0. Moreover, this new model requires skills and specialty that are completely different from the pattern, so if not adequately trained, the instructors will not be able to work and teach effectively in an environment of Higher Education 4.0. Not only lecturers but learners, as well as staff from other positions in education and training, also have to master many skills, especially foreign language skills and usability, problem detection and problem identification of technology products 4.0. (2)

The feature of the Higher Education 4.0 is the close and comprehensive combination of the technology in general and Industry 4.0 in particular; one of the essential conditions for the operation of the model is the powerful data security software, firewall, and antivirus software. With just one virus attack, the whole network will collapse, destroying a lot of important data and paying many expenses, effort and time to recover. Thus, a solid security system is the essential need but also the obstacle we have to overcome.

According to Barrett (27), the central purpose of military education is to lead to action with a "larger objective of seeking increased global stability and security, unfettered by doctrine but informed by a shared ethical framework." Barrett continues by describing how working across the cultural divide between defense education and traditional academia adds further complexities; however, despite its uniqueness, defense education draws from all academic disciplines and must span an entire career. Cowan (28) explains how the "complexity of thought and maturity of judgment" for military members are contingent upon a strong education that counters experience.

Although military education may have a unique purpose, it also responds to typical trends in education and must consider learning technologies and approaches in moving forward. (29)

From a military perspective, changes in technology have greatly impacted traditional beliefs of a military members' role, and it is now critical to have a knowledge base that extends far beyond the task and considers the unique context locally, nationally, and internationally. (30) Given the requirement for ongoing postings and deployments that result in working in remote locations, the ability to use technology in distance education has increased learning opportunities for military students, as well as the level of interaction among students and instructors. It has also created the opportunity to engage in higher level thinking on a frequent basis.

The call for changes and necessity to respond to changes has a critical impact on the functionality of the organization. (27,29,31)

4 Conclusion

The world is preparing for the Fourth Industrial Revolution, the revolution will transform every aspect and field, including education and higher education in the Armed Forces. Getting the Education 4.0 is essential, unavoidable. However, this is not the near future. The Education 4.0 is still new, is being researched, developed, tested and perfected. (32) The application of the proposed model of 4.0 University Education in the armed forces is urgently needed in the current international situation in order to implement effectively solution, ensuring constantly improve the quality of training and retraining of staff sets, forming an elite force, gradually modernized, meet the requirements of the tasks of building and defending our Homeland. Moreover, in the current situation, Vietnam is still not qualified to build a typical higher education 4.0.

Requirements for the qualifications and skills of employees will be higher than at present, because the companies will use new technologies and smart media. (33) For this reason, the education system will be changed from Education 3.0 to Education 4.0. Education 4.0 will combine real and virtual world information. (34) Virtual resources, for example glasses for virtual reality, will be used for teaching. Higher education will be enhanced, for example the course of information science will need to include knowledge about processes management. The knowledge, qualification framework and staff training will be an essential part of Industry 4.0. Virtual learning environments (VLEs) will be used for high transfer of developed knowledge and skills. Teachers and students will meet with their avatars in the VLEs. VLE will be the first step in the education of new employees. (35) The next part of education will be the implementation of augmented reality in the real environment. In this part, the training courses of new employees will be realized through the glasses of augmented reality. These types of education are very costly. (36)

The most evident political challenge is the increasing need for funding of research programs. Governments need to support organizations with the development of new technologies as well as the integration of those technologies in the existing environment. Moreover, governments need to establish legal parameters for the usage of big data. The most important concern is the protection of privacy because data will be collected on everything while interacting with smart objects.

To mitigate diverse learners' needs, traditional instructors' roles are changing and educators need to develop relevant skills and require appropriate support to achieve current educational ideals. (37-46) Educators should regularly consider the pedagogical potential of incorporating technology into their teaching. However, in the attempt to incorporate technology into their learning, some instructors feel overwhelmed, unprepared, and nervous about implementing the changes. (39)

In considering the implications of emerging technologies on higher education, Singh (47, p5) states that "higher education institutions, faced with the massification of knowledge production and the increased use of communication information technologies, have struggled to come to terms with the current changes." The continuous changes dictated by recent trends in higher education and distance education present challenges for higher education institutions as they have yet to be fully incorporated into policy and are creating gaps of variance in ability and use by instructors. (48) Organizations must undergo a process of "unlearning" in order to change habits, routines, and welcome the current pedagogy. White (49) suggests that institutions have little "pockets" of excellence and that decision makers need to set up an institution-wide approach capitalizing on the way in which these "pockets" of individuals already function.

Building the foundation for the higher education model 4.0 requires the participation of agencies, individuals and organizations in a variety of fields, along with careful study and consideration and a clear, long-term plan. However, the faster realization of this higher education model in universities in the armed forces is accelerated, the sooner we can be in tune with the power of the times, have great effect in the protection of national sovereignty and safe life of the people.

Literature:

1. Tran MT. Learn about the Industry 4.0. Science magazine of Van Lang University. 2017; 6.
2. Connor E. 8 Sensational E-Learning Trends that are Revolutionizing the Learning Game; 2016.
3. Hung JL. Trends of E-Learning Research from 2000 to 2008: Use of Text Mining and Bibliometrics. British Journal of Educational Technology; 2012.
4. Hoang P, Vu XL. Popular Vietnamese Dictionary. Da Nang Publishing House; 2015.
5. Khuong N, Duy T. (What is the Industry 4.0?; 2017 Available from: news.zing.vn
6. Goldie JGS. Connectivism: A knowledge learning theory for the digital age?. Medical teacher. 2016; 38(10):1064-9.

7. Sinlarat P. Education 4.0 is more than Education. Annual Academic Seminar of the Teacher's Council 2016 on the topic of Research of the Learning Innovation and Sustainable Educational Management. Bangkok: The Secretariat Office of Teacher's Council; 2016.
8. Marinela M, Andreescu A. Using Cloud Computing in Higher Education: A Strategy to Improve Agility in the Current Financial Crisis. Communications of the IBIMA, Article Id: 875547, IBIMA Publishing; 2011. Available from: http://www.ibimapublishing.com/journals/CIBIMA/cibima.html Vol.2011
9. Zhoa Y. World Class Learners: Educating Creative and Entrepreneurial Students. California: Corwin; 2012.
10. Gomaratat S. Ways of Progressive Learning encouraging/facilitating the ability of the learner of 21st Century. Bangkok: Education Science, Dhurakit Bandit University; 2015.
11. Jeschke S. Higher Education 4.0 - Trends and Future Perspectives for Teaching and Learning. Virtuelle Lernwelten in der Universitat Frankfurt am Main; 2014.
12. Baygin M, Yetis H, Karakose M, Akin E. An Effect Analysis of Industry 4.0 to Higher Education. Based Higher Education and Training (ITHET). 2016:1-4. DOI: 10.1109/ITHET.2016.7760744
13. Lee J. A Cyber-Physical Systems architecture for Industry 4.0-based manufacturing systems. A Cyber-Physical Systems architecture for Industry. Society of Manufacturing Engineers. 2014; 3:18–23. DOI: 10.1016/j.mfglet.2014.12.001
14. Richert A, Shehadeh M, Plumanns L, Schuster K, Jeschke S. Proceedings from the IEEE Global Engineering Education Conference (EDUCON): Educating Engineers for Industry 4.0: Virtual Worlds and Human-Robot Teams Empirical Studies towards a new educational age. Abu Dhabi; 2016. DOI: 10.1109/EDUCON.2016.7474545
15. Lee J, Kao H, Yang S. Service innovation and smart analytics for Industry 4.0. and big data environment. Procedia CIRP. 2014; 6:3-8. DOI: 10.1016/j.procir.2014.02.001
16. Nelles J, Kuz S, Mertens A, Schlick CM. Proceedings from the IEEE International Conference on Industrial Technology (ICIT): Human-centered design of assistance systems for production planning and control. Taipei; 2016. DOI: 10.1109/ICIT.2016.7475093
17. Tran TBH. Fourth industrial revolution with development of human resources in Vietnam. Vietnamese Social Sciences Magazine. 2017; 8.
18. Mô hình ĐH 4.0 – Nền tảng giáo dục thế kỷ 21 [University Model 4.0 - 21st Century Education]. International Scientific Conference. Nguyen Tat Thanh University; 2017.
19. Hoàng L. Phương thức học mới trong giáo dục 4.0 [New learning in education 4.0]; 2018. Available from: http://hvcsnd.edu.vn/home/nghien-cuu-trao-doi/dai-hoc-40/phuong-thuc-hoc-moi-trong-giao-duc-40-4062
20. Nguyen DH. The Fourth Industrial Revolution and its implications for Vietnam's defence industry; 2018. Available from: tapchiqptd.vn
21. Tran DB, Dam TT. Non-traditional security challenges from 4IR; 2018. Available from: tapchiqptd.vn
22. Cuộc cách mạng công nghiệp lần thứ tư với quản trị nhà nước [The Fourth Industrial Revolution and Governance]. Proceedings from the scientific conference. National Academy of Public Administration; 2017.
23. Industry 4.0 in the field of military and national defence; 2017. Available from: http://ct.qdnd.vn
24. Weisenthal J. Peter Singer's Un-Controversial Call for Healthcare Rationing; 2009. Available from: http://www.businessinsider.com
25. Lesson 5: Building a strong-armed force to defend the socialist Vietnamese motherland; n.d. Available from: sites.google.com/site/giaoducquocphonga
26. Using Virtual Reality for Military & Defence Training; n.d. Available from: www.classvr.com
27. Barrett AJ. Defense education curriculum: How to ensure it produces the right results for PfP members? Proceedings of the Ninth Annual Partnership for Peace Consortium Conference, Zagreb, Croatia. Syndicate 1. 2007; 35.
28. Cowan JS. RMC and the profession of arms: Looking ahead at Canada's military university. Canadian Military Journal. 2001; 2(3):5-12.
29. Barrett AJ, Green DE. The CF IT&E system is overdue for change. Canadian Military Journal. 2008; 9(1):98–9.
30. Carlson E, Andress J. Military service by twentieth-century generations of American men. Armed Forces and Society. 2009; 35(2):385-400.
31. Foot P. Military education and the transformation of the Canadian Forces. Canadian Military Journal. 2006; 7(1):13–20.
32. Anh T. Education 4.0 is needed for the future but cannot be rushed; 2017. Available from: giaoducthoidai.vn dated 21/7/2017.
33. Hecklau F, Galeitzke M, Flachs S, Kohl H. Holistic Approach for Human Resource Management in Industry 4.0. Procedia CIRP. 2016; 54:1–6. DOI: 10.1016/j.procir.201 6.05.102
34. Harkins, A. M. Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0. Leapfrog Principles and Practices. Futures Research Quarterly draft. 2008; 8:1–15.
35. Richter A, et al. Learning 4.0: Virtual Immersive Engineering Education. International Best Practices and Applications. 2015; 11:51-66.
36. Devedzic G, Bari P. Proceedings from the International Conference on Augmented Reality for Technical Entrepreneurs (ARTE'16): Engineering Design Education for Industry 4.0: Implementation of Augmented Reality Concept in Teaching CAD Courses; 2016.
37. Howell SL, Williams PB, Lindsay NK. Thirty-two trends affecting distance education: An informed foundation for strategic planning. Online Journal of Distance Learning Administration. 2003; 6(3).
38. Taylor PG. Changing expectations: Preparing students for flexible learning. International Journal for Academic Development. 2000; 5(2):108–15.
39. Simelane S, Blignaut S, Van Ryneveld L. Preparing lecturers to integrate educational technology into their teaching and learning practices. South African Journal of Higher Education. 2007; 21(7):940–53.
40. Misra PK. Preparing e-excellent teachers for the world of e-education: Potential strategies. I-Managers Journal of Educational Technology. 2010; 7(3):21–9.
41. Wood D, Bilsborow C. Proceedings from the International Conference on e-Learning: Enhancing creative problem solving in the higher education curriculum through the use of innovative e-learning technologies; n.d.
42. Crumpacker N. Faculty pedagogical approach, skill, and motivation in today's distance education milieu. Online Journal of Distance Learning and Administration. 2001; 4(4).
43. Renes SL, Strange AT. Using technology to enhance higher education. Innovations in Higher Education. 2011; 36: 203–13. DOI: 10.1007/s10755-010-9167-3
44. Paulson K. Reconfiguring faculty roles for virtual settings. The Journal of Higher Education. 2002; 73(1):123–40. DOI: 10.1353/jhe.2002.0010
45. Dearn JM. Innovation in teaching and curriculum design. International Encyclopedia of Education. 2010:448–454.
46. Ryan Y, Fraser K. Education development in higher education. International Encyclopedia of Education. 2010:411–418.
47. Singh R. Current trends in higher education learning and teaching. South African Journal of Higher Education. 2012; 26(1):5–9.
48. Carter L, Graham RD. The evolution of online education at a small northern Ontario university: Theory and practice. The Journal of Distance Education. 2012; 26(2).
49. White S. Critical success factors for e-learning and institutional change – some organizational perspectives on campus-wide e-learning. British Journal of Educational Technology 2007; 38(5):840–50.

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ENHANCING THE ENERGY EFFICIENCY OF OIL AND GAS COMPANIES AS A FACTOR OF THEIR SUSTAINABLE DEVELOPMENT

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Abstract: The article is devoted to the analysis of the problem of assessing the sustainability of enterprises in the oil and gas sector, taking into account the nature of the processes of improving the energy efficiency of a company. Modern requirements for business on the part of the state, the consumer, and other members of the business community pose many different kinds of challenges to companies. The effectiveness of decisions depends on the quality of management of enterprises and companies. Under these conditions, the basic processes for the efficient management of enterprises can be the formation of estimate indicators of the level of sustainability achieved and their monitoring. The assessment of the sustainable development of an oil and gas company under these conditions should cover all aspects of sustainable development. The article proposes and approves the author's methodology for assessing the energy efficiency of all aspects of the sustainable development of oil and gas enterprises based on the statistical data of companies and calculated integral indices.

Keywords: energy efficiency, oil and gas sector, sustainable development of an enterprise, sustainable development standards.

1 Introduction

The formation of the sustainable development of the national economy at the macro level is largely due to the sustainability of the micro level, and, therefore, due to the sustainable development of organizations and production units. The highly variable external environment of the economy causes unpredictability and a difficult predictability of changes in the economy, which is the cause of a large number of complex multidimensional risks that have a significant impact on the sustainable development of an enterprise. Under the influence of complex multidimensional risk factors, production units are doomed to search for tools and methods to increase the effectiveness of managing the sustainable development of their activities. In this regard, it is very important to solve the problem of ensuring the internal management of complex risk factors for sustainable development. The formation of estimate indicators of the achieved level of sustainability, their monitoring and the decision-making based on the data obtained are fundamental things for solving this problem. Fundamental changes in industrial production caused by both scientific and technological progress and systemic changes occurring in the process of globalization and business consolidation efforts, undertaken by the world community to overcome the protracted financial crisis, form many challenges for modern industrial production, the most important of which is restructuring and adaptation of the management system.

The oil and gas sector is the leading sector of the economy of the Russian Federation. 27 of the 600 largest companies in the Russian Federation in 2018 (according to the results of 2017) represent the oil and gas sector. They account for more than 28% of the total sales of products. The sustainable development of the oil and gas sector of Russia is one of the main conditions for ensuring the sustainable development of the country as a whole and involves the implementation of two main activities: firstly, the improvement of environmental, economic and social indicators of the development of the sector, and secondly, the consideration of the consequences of the current activities of oil and gas enterprises for the possibility of realizing the needs of future generations. In this regard, there is a need to analyze and assess the level of sustainability of the development of an oil and gas producing enterprise, which will be used to determine the influence of internal factors of the organization's development on its position in the environment (competitiveness), as well as to make a decision on the timely reorientation of the enterprise management mechanism.

These activities are predetermined by the concept of sustainable development, which, as defined by the World Commission on Environment and Development (Brundtland Commission, 1987), is a development that meets current needs but does not jeopardize the ability of future generations to meet their needs. In the corporate practice, there is no generally accepted definition of the term "sustainable development." This is due to the difference in the conditions in which companies operate at the macro and micro levels. As a rule, it is associated with the achievement of such a level of production efficiency, which, with proper technological support in the long term, would reduce the negative impact on the environment and optimize the environmental and social trends of the company.

Sustainable business development is a natural continuation of complex organizational changes. A sustainable business is an economic process that can survive in the long term. The problems of affordability and volatility in resource prices, consumer demand, investor pressure, the attraction of gifted persons, the emergence of new markets, the disappearance of old ones, and changes in financial transactions are an incomplete list of what influences the problem of sustainability. If the problem of sustainability is embedded in the company's approach to doing business, this leads, in a strategic sense, to a reduction in costs, the formation of a new consumer base, the selection and development of gifted persons in an organization. (1-2) A company involved in sustainable development receives a long-term goal that will be consistent with its core business and strengths; it will motivate employees and counterparties, and to give them optimism. The concept of sustainable development combines 3 main aspects, i.e. economic, social and environmental ones. The harmonization of these elements is a complex task, as they must be considered as a whole. (3)

The economic sustainability of an enterprise is the ability of an enterprise to maintain a certain level of values of economic parameters, which ensures its profitable functioning and stable development. The main components of economic sustainability are financial, market, organizational, production, investment, and technological sustain abilities. (4-5) It should be noted that the economic approach is the core of the concept of sustainable development. The concept of sustainable development is socially oriented and aimed at preserving social and cultural stability. In order to achieve sustainable development, modern society needs to create a more efficient decision-making system that takes into account historical experience. Regarding an enterprise, its social sustainability shows the degree of social security of its personnel. The environmental aspect of sustainable development involves the relationship of an enterprise's economy with its environmental safety, minimizing the harmful effects of production and business activities on the environment. The focus should be on preserving the abilities of natural systems to change and not on preserving them in a certain "ideal" static state.

The stability of oil and gas enterprises cannot be considered without analyzing the interest of all participants in the process in the nature and dynamics of the sustainable development of oil and gas enterprises.

In this regard, the authors propose to consider the sustainable development of oil and gas enterprises from three basic points of view: (6)

1. sustainable development of an energy enterprise;
2. sustainable development of the energy industry as a whole;
3. sustainable development of the territory as a reflection of the sustainable development of the industry.

Thus, the sustainable development of the energy industries can be considered via the socio-economic status of the enterprises of

the sector as well as via an assessment of the nature of the impact of the energy industry on the sustainable development of the regional economy and the country as a whole. At the same time, the scientific literature has not yet developed an unambiguous approach to the concept of "sustainable development of the State energy industry." In the works of David L. Green, the stability of the energy industry of a territory is defined as guarantees that future generations have energy resources that would allow at least the same level of well-being as the current generation, which is consistent with the generally accepted definition of sustainable development. (7)

N. A. Shevchenko (8), in "The scientific and innovative potential of the modern energy sector of the world economy," considers the sustainable development of the State energy industry, primarily from the point of view of social and environmental aspects and relates it to the tasks of ensuring access to energy sources and modern technologies for energy production, eliminating inequalities in this area, protecting environment, financial resource mobilization, institutional and human capacity building.

A number of experts consider sustainable energy development via the development process of a system capable of self-regulation with a view to achieving regional energy security with the rational use of energy resources, ensuring social equality in access to energy services and preserving the environment in the face of uncertainty. (9) From this point of view, it is advisable to consider the sustainable development of energy industries as a process of their technological and economic development in the face of uncertainty. This process is aimed at the reliable and uninterrupted power supply to consumers with the rational use of resources and minimal environmental impact in order to improve the functioning of the region. Y. S. Mozgovaya (10) investigates the mechanisms of sustainable development of the sector from the point of view of organizing the process of constant search and implementation of solutions to achieve a new equilibrium state between the changed environmental conditions and the capabilities of the economic entities of the energy industry to realize their national economic mission new conditions.

L.R. Abzalilova (11) provides a definition of the socio-economic sustainability of the industry as an area of its optimal functioning expressed by existing and potential opportunities to confront, in a certain period of time, the destabilizing external and internal factors, while maintaining and increasing at the same time its potential and positive direction of development.

R. Chegis and R. Pusinaite (12) believe that the main goal of the sustainable development of the energy sector is to create a situation in which the production and use of electricity will ensure the long-term development of mankind, economic growth, and environmental sustainability.

Summarizing the existing approaches to assessing the sustainability of the energy sector in the context of the concept of sustainable development, one should consider the sustainable development of energy enterprises as an opportunity for changes in all structural units of enterprises as a response to changing external and internal factors of the development of the energy industry in conjunction with the nature of the manifestation of economic, social and environmental problems of the territory. (13-14)

In this regard, the authors interpret the problem of the sustainable development of the oil and gas sector of Russia as a subsystem of the economy that has a significant impact on the economic development of society and the quality of the environment, both in the present and in a strategic perspective. Thus, almost all stages of the oil and gas production cycle are characterized by various types of negative environmental impact and economic consequences, which can be summarized and grouped into four main blocks: emission of pollutants into the environment and its components (water bodies, atmosphere, and soil); structural transformation of subterranean depths and landscape change; reduction of strategic reserves of raw energy resources extracted from subterranean depths; formation of territories and objects of accumulated environmental damage. (15)

2 Materials and Methods

At present, the practice of managing the sustainable development of enterprises both in Russia and abroad is increasingly based on numerous standards acceptable in the field of social, ecological and economic activities. (1,16) Such standards, on the one hand, provide guidelines for the sustainable development of the enterprise; on the other hand, they link the interests of many stakeholders in achieving specific results of the company's activities and development.

To date, there are more than a hundred rating systems in the field of sustainable development of companies. (1) The prerequisites for the use of indices and the increase in their number are

- increase in the number of companies for which issues of sustainable development of the company are relevant and strategically significant;
- emergence of new regulatory bodies such as the European Commission and stock exchanges interested in collecting information on the sustainable development of companies;
- change in the regulatory framework of organizations.

In this regard, in the face of tighter competition, the struggle for access to capital markets, as well as the growing attention of investors and the general public to the final results of work and processes occurring within the enterprise, management practices based on standards, mostly foreign, are expanding since Russian standards based on foreign ones are being created. (17) According to the United Nations approach, these standards regulate the social, ecological and economic activities of an enterprise, which form the basis of its sustainable development (Table 1).

Table 1. Existing Indexing Systems in the Field of Non-financial Reporting and Sustainable Development of Global Energy Companies

	Aspects		
	Ecological	Social	Economic
International treaties and charters	United Nations Global Compact		
International standards	ISO 20121:2012. ISO 26000:2010		
	The Global Reporting Initiative		
		Social Accountability 8000:2008	
			Account Ability 1000 Assurance Standard
		Ethics Compliance Management System Standard 2000	
		IC CSR-08260008000	

National treaties and charters	Social Charter of Russian Business	
National standards	National standard of the RF GOST R 54598.1-2015	
National indices	Responsibility and openness	
	Sustainable development vector	

Source: compiled by the authors.

It should be noted that the available indicators and indices are not always able to objectively assess the real state of affairs: concepts evolve and business priorities change. Accordingly, there is a need for the constant creation of new assessment systems, universal approaches to assessing the quality of management of the sustainable development of companies.

In these standards, in addition to the mandatory disclosure of financial (accounting) statements, annual and quarterly reports of enterprises, non-financial information is also used (quality of management, ethics of business behavior, structure and performance of social investments related to personnel development, maintaining workplace health, creating an enabling environment in the areas of presence). At the same time, in international practice, there is a tendency of convergence between the content of the regulatory framework for both financial and non-financial reporting. International business practice implies that the use of non-financial reporting will allow the company to solve the most likely problems in the field of sustainable development due to the presence of typical practices of their operation. (18)

In world practice, there is still no generally accepted methodology for assessing the sustainability of companies, which would cover all the modern features of the development of individual enterprises and the industry as a whole.

Table 2. Existing Indexing Systems in the Field of Non-financial Reporting and Sustainable Development of Global Energy Companies

Designation of index	Developer (country)	Year of creation	Number of indexed companies	Selection criteria (selection categories)
Dow Jones Sustainability Indexes (DJSI)	USA and Switzerland	1999	2500	criteria for each industry: economy, ecology, society, quality of corporate governance, risk management, climate change mitigation
FTSE KLD GLOBAL SUSTAINABILITY INDEX (GSIN)	UK	2007	146	participation in the policy of supporting the environment and society
NYSE Energy Index	USA	2002	172	number of shares, share price (for the base and reporting periods), market capitalization
Wilderhill new energy global innovation index (NEX)	USA	2006	650	use of clean and renewable energy sources, technologies that reduce the amount of hydrocarbon emissions
FTSE4Good	UK	2001	2400	human rights support; countering bribery; occupational safety and health; climate change policy
FTSE Environmental Markets Index Series	UK	2009	590	energy efficiency, the nexus of the main activity with the development and introduction of environmental technologies, including the use of renewable, alternative energy sources, and hydraulic engineering
Rts+Skolkovo index of sustainable development	Russia	2011	50	level of environmental impact
Joint index of Interfax and Russian Federal Service for Supervision of Natural Resources (Interfax-ERA, Ecological, and Energy Rating Agency)	Russia	2011	3850	Ecological and energy efficiency of industrial production, the technological efficiency of the equipment used, dynamics of efficiency, transparency
Energy Strategy Institute	Russia	2011	52	Indicators for assessing economic, environmental and social responsibility, innovation activity and the effectiveness of public-private partnerships

Source: Tumin, Koryakov, & Kostromin, 2016

Thus, the methodological tools for studying the level of sustainable development of an enterprise in the oil and gas industry from the point of view of achieving energy efficiency include an analysis of indicators for all types of sustainability. At the same time, the analysis should take into account not only the indicators that the company independently develops and includes in the corporate sustainability report, but also integral indices that evaluate the relationship between individual parameters of all types of sustainable enterprise development: economic, social, environmental, technological, financial, managerial ones etc. An effective tool for managing the sustainable development of an enterprise in such an analysis is the monitoring of both negative and favorable factors affecting the dynamics of indicators of sustainable development proposed for calculation. The result of the monitoring should be a program of measures aimed at preventing the factors hampering the sustainable development of the enterprise. (19)

At the same time, while considering the problem of assessing the sustainability of an extractive company in modern conditions, the authors propose to consider more deeply the process of assessing the energy efficiency of a company's activities, taking into account the relationship with both its own development strategy and the socio-economic development of the territory where the company operates.

3 Results and Discussion

The troubleshooting of the assessment of the role of energy efficiency in the sustainable development of an oil and gas producing company is proposed by the authors on the basis of the analysis of 7 integral indices built on statistical indicators included in the company's sustainable development reports. These indices take into account both the parameters of energy efficiency and the context of the very energy efficiency of the sustainability of extractive companies. (6)

To select the indicators used for the calculation within each index, a multilateral monitoring of the indicators included in the reports of companies on sustainable development was carried out in order to determine the most appropriate, taking into account the following criteria:

- Correspondence of ideology for each block (index);
- Equilibrium (equivalence) of indicators within a single block;
- No correlation between indicators inside the index;
- Availability of an indicator or its parameters (sufficiency of indicators, transparency of calculations, and the possibility to make them).

In addition, the principles of selecting indicators were followed, including the following criteria: objectivity, adequacy, concreteness (unambiguity), and comparability. In the selection process, possible indicators are determined in such a way as to exclude a high degree of correlation between them.

The research selected several indicators in each of the blocks, reflecting the nature of each of the main and intermediate directions of sustainable development, as well as on the basis of a balanced scorecard reflecting the basic parameters of socio-economic development (Table 3).

Table 3. The Developed System of Indicators for Assessing the Energy Efficiency of Sustainable Development of Oil and Gas Companies

Integral indices	Statistical data of the company's corporate sustainability report taken into account in the calculation of the indicator
Managing sustainable development of extractive companies based on energy efficiency assessment	
Elasticity of the basic integral indices of energy efficiency of the company	
Energy efficiency of the company's economic sustainability	
Energy intensity of production activities	Fixed assets
	Consumed electric energy for own needs
	Consumed thermal energy for own needs
Energy efficiency of the socio-economic sustainability of the company	
Energy intensity of human labor productivity	Consumed electric energy for own needs
	Consumed thermal energy for own needs
	Labor productivity - specific revenue, million rubles/person.
Energy efficiency of the social sustainability of the company	
Energy intensity of human labor	Average number of employees, people
	Consumed electric energy for own needs
	Consumed thermal energy for own needs
Energy efficiency of the ecological and social sustainability of the company	
Energy efficiency index of environmental and social sustainability of the extractive company	Emissions into the atmosphere, thousand tons
	The ratio of annually recycled waste to newly generated waste (correction factor)
	Environmental costs
Energy efficiency of the environmental sustainability of the company	
Energy efficiency index of the environmental sustainability of the extractive company (air emissions per unit of extracted fuel (raw materials))	Emissions into the atmosphere, thousand tons
	The ratio of annually recycled waste to newly generated waste (correction factor)
	Hydrocarbon production (oil equivalent)
Energy efficiency of the ecological and economic sustainability of the company	
Energy efficiency index of environmental sustainability of the extractive company	Emissions into the atmosphere, thousand tons
	The ratio of annually recycled waste to newly generated waste (correction factor)
	Fixed assets

Source: developed by the authors

The energy efficiency of the company's economic sustainability is assessed on the basis of the energy intensity of its production activities. The proposed index reflects the nature of the relationship between the cost of electrical and thermal energies consumed for own needs and the average annual value of fixed assets (based on consolidated financial statements made according to IFRS) and is calculated as the ratio of the amount of energy consumed for own needs to a unit of fixed assets:

Epa = (Cee + Cte) / ((FAe – FAb)/2), where

Epa is the energy intensity of production activities.

Cee is consumed electric energy for own needs.

Cte is consumed thermal energy for own needs.

FAe is the value of fixed assets at the end of the fiscal year.

FAb is the value of fixed assets at the beginning of the fiscal year.

The energy efficiency of the company's socio-economic sustainability is assessed on the basis of the energy intensity of human labor productivity and is calculated as the ratio of the amount of electric and thermal energies consumed for own needs to the average labor productivity in the company.

The energy efficiency of social sustainability is estimated on the basis of the energy intensity of human labor and is calculated as the ratio of the annual amount of electric and thermal energies consumed for own needs to the average number of employees.

The energy efficiency of the company's environmental sustainability takes into account the nature of the environmental aspects of its production activities and is calculated as the amount of air emissions per unit of output (unit of fuel produced). The amount of air emissions is adjusted for the factor characterizing the intensity of the environmental activities of the company:

Iees = (Ae/Fie) / O, where

Iees is the index of energy efficiency of the environmental sustainability of the company.

Ae is air emissions, thous. t.

Fie is the factor of the intensity of environmental activities (as the ratio of annually recycled waste to newly generated waste, which is calculated by the company and included in the report on corporate sustainability).

O is the output (total annual hydrocarbon production in oil equivalent).

Energy efficiency of environmental and economic sustainability is based on the analysis of indicators reflecting the relationship of environmental, financial, and economic aspects of the nature of the company's production activities:

Iees = (Ae/Fie) / ((FAe – FAb)/2)

Iees is the index of energy efficiency of the environmental sustainability of the company.

Ae is air emissions, thous. t.

Fie is the factor of the intensity of environmental activities (as the ratio of annually recycled waste to newly generated waste, which is calculated by the company and included in the report on corporate sustainability).

FAe is the value of fixed assets at the end of the fiscal year.

FAb is the value of fixed assets at the beginning of the fiscal year.

The energy efficiency of environmental and social sustainability is assessed on the basis of the ratio of the cost of environmental protection to a unit of emissions into the atmosphere as a result of the company's activities. The amount of air emissions is adjusted for the factor characterizing the intensity of environmental activities of the company similarly to the company's index of energy efficiency of environmental sustainability:

The efficiency of managing sustainable development of extractive companies is based on the assessment of energy efficiency. The authors also propose to assess it on the basis of a total indicator of the dynamics of the basic integral energy efficiency indices of the company's activities:

Em = 1/3 ((Epae / Epab)/(FAe / FAb)) + 1/3((Esie / Esib)/(Aee / Aeb)) + 1/3 ((Ele - Elb)/(Ne - Nb)), where

Em is the index of the efficiency of sustainable development management of the extractive company.

Epae is the energy intensity of production activities at the end of the year.

Epab is the energy intensity of production activities at the beginning of the year.

FAe is the value of fixed assets at the end of the fiscal year.

FAb is the value of fixed assets at the beginning of the fiscal year.

Esie is the ecological sustainability index at the end of the year.

Esib is the ecological sustainability index at the beginning of the year.

Aee is air emissions at the end of the year.

Aeb is air emissions at the beginning of the year.

Ele is the energy intensity of human labor at the end of the year.

Elb is the energy intensity of human labor at the beginning of the year.

Ne is the average number of employees at the end of the year.

Nb is the average number of employees at the beginning of the year.

4 Conclusion

In order to test the authors' methodology for assessing the sustainability of an oil and gas company in the context of the nature of the impact of energy efficiency on its development, the authors analyzed data from Lukoil, one of the largest public vertically integrated oil and gas companies in the world, which accounts for more than 2% of world oil production and about 1% of proven hydrocarbon reserves. In 2018, the company ranked second in the top 250 largest energy companies in the world according to S & P Global Platts.

The first report on the company's activities in the field of sustainable development was published in 2005. When preparing reports, the company's specialists are guided by the following documents: AA1000 standard (1999), the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines, the UN Global Compact, and the Social Charter of Russian Business. The company's reports are placed in the GRI database, and also included in the National Register of Corporate Non-Financial Reports, which is administered by the Russian Union of Industrialists and Entrepreneurs. (20)

An analysis of the dynamics of corporate sustainability indicators laid down in the company's report demonstrates the overall high level of corporate responsibility in matters of the sustainable development of enterprises of the company and their contribution to the sustainable development of the industry and the economy as a whole. The following areas are announced as priority directions for the implementation of the company's sustainable development strategy: integration of risk management and sustainable development aspects into the company's business model and strategy; ethics and compliance with legal requirements; climate strategy and climate risk management; major environmental impacts, rational use of natural resources and biodiversity conservation; process safety; energy consumption and energy efficiency; human capital management; impact on the socio-economic development of local communities, including human rights, the supply chain, safety and product quality.

Thus, the growth of emissions into the atmosphere as a result of the activities of the company's enterprises in 2016 was offset by growth in environmental protection costs.

Table 4. Dynamics of Indicators of Sustainability of Lukoil Enterprises in the Context of Improving the Energy Efficiency of Their Activities (2015 - 2017)

reporting indicators / integral indices	**2015**	**2016**	**2017**
hydrocarbon production, million barrels	890	833	828
air emissions, thousand tons	540	628	503
ratio of annually recycled waste to newly generated waste	0,930	1,070	0,960
average number of employees, thousand people	107,040	105,539	103,647
environmental protection costs, mln. RUB	48 161	53 286	42 413
labor productivity, million rubles / person	53,7	49,5	57,3
consumed electric energy for own needs, mln. RUB	87,9	90,4	94,3
consumed thermal energy for own needs, mln. RUB	24,8	28,1	25,3
fixed assets (mln. RUB)	3 411	3 391	3 575
energy intensity of production activities (of fixed assets)	**33,13**	**34,02**	**66,91**
energy intensity of human labor productivity	**2,10**	**2,39**	**2,09**
energy intensity of human labor	**1,05**	**1,12**	**1,15**
energy efficiency index of environmental and social sustainability of the extractive company	**82,94**	**90,79**	**80,95**
energy efficiency index of environmental sustainability of the extractive company	**0,65**	**0,70**	**0,63**
energy efficiency index of environmental and economic sustainability of the extractive company	**0,18**	**0,17**	**0,15**
index of the efficiency of sustainable development management of the extractive company		**1,01**	**1,34**

The figures are calculated by the authors on the basis of the data of the Sustainable Development Reports of the Russian company Lukoil. Date of access: 23.10.2018. Electronic source: http://www.lukoil.ru

At the same time, the analysis of integral indicators shows ambiguous trends in assessing the sustainable development of the company. So, in the period 2015-2017 own energy costs per unit of fuel produced were increased: 0,127 in 2015; 0,142 in 2016 and 0,144 in 2017. The energy intensity indicators of labor increased by almost 10%, the energy intensity of industrial activity increased 2 times (according to the value of fixed assets). At the same time, the values of the indices characterizing different sides of the environmental aspects of the company's sustainable development have decreased.

Research into the implementation of the strategy for the sustainable development of an oil and gas producing company (by the example of Lukoil) shows that the extractive company manages its sustainable development, makes decisions based on indicators, which were independently developed taking into account recommendations, international and Russian standards, internal documents, etc. Each company independently determines the direction of its sustainable development depending on its business model, positioning, market position, etc. A necessary and sufficient condition for the implementation of a strategy for the sustainable development of energy companies is the formation and evaluation of a group of indicators illustrating its further sustainable development taking into account industry specialization. The company's industry specialization is a challenge in the effective management of sustainable development.

Assessment of the nature of the sustainable development of oil and gas companies is impossible without taking into account the indicators characterizing the processes of energy efficiency of companies. In modern conditions of interaction between business, society and the state, energy companies are forced to take into account in their activities not only their own economic interests, but also environmental, social and innovation benchmarks, including those reflecting the issues of energy supply, energy security and energy efficiency of the country's economy as a whole. (3, 21)

In this regard, it is necessary to form a universal system of indicators, a number of indices, as well as mechanisms for their effective implementation, which fully and objectively could reflect the internal and external aspects of companies in the impact of energy efficiency indicators on all sides of a company's sustainable development. In general, this should provide an opportunity for an effective comparison of companies at the global and national levels and the characterization of the strategies of the most successful companies based on a comprehensive benchmarking and reviewed global experience. The world practice of evaluating the effectiveness of fuel and energy companies has not yet worked out the system and culture of building universal tools for analyzing, optimizing and evaluating activities that cover all the fundamental modern issues of the development of companies and industries in general. Existing assessment systems do not allow to cover all the issues and directions of the enterprise's sustainable development; in some cases, when compiling them, it is necessary to use the company's closed information or expert assessments, which can be very subjective.

At the same time, the category "sustainable enterprise development" itself does not have an established definition; its interpretation implies a combination of a set of characteristics, whose direction and content differ. Sustainable development of enterprises is a multidimensional concept, which combines production, financial, investment, social and other aspects of the enterprise and determines the relationship with both internal (organization of economic activity of the enterprise) and external (market environment) factors. (10)

When forming approaches to assessing the role of energy efficiency in the sustainable development of an energy enterprise, it is necessary to consider all aspects of this process: economic, social, environmental, and economic, as well as the effectiveness of sustainability management. The authors' assessment method allows not only to evaluate these aspects in statics but also to analyze the dynamics of processes by calculating integral indices.

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Literature:

1. Chernyaev MV, Rodionova IA. Analysis of sustainable development factors in fuel and energy industry and conditions

for achievement energy efficiency and energy security. Inter J of Energy Econ and Policy. 2017; 7(5):16-27.
2. Chernyaev MV. Directions to increase the functioning efficiency of the oil and gas industry as the basis for ensuring energy security (Unpublished doctoral dissertation). Peoples' Friendship University of Russia (RUDN). Moscow; 2014.
3. Tyaglov SG, Shevelyova AV. Strategicheskiye oriyentiry ustoychivogo razvitiya neftegazovogo kompleksa Rossii [Strategic guidelines for the sustainable development of the oil and gas sector of Russia]. Vestnik Severo-Osetinskogo gosudarstvennogo universiteta im. K. L. Khetagurova. Obshchestvennyye nauki. 2014; 3:402-6.
4. Batyrova NS. Metodologicheskiye osnovy razrabotki i realizatsii strategii ustoychivogo razvitiya khozyaystvuyushchego subyekta [Methodological Basis for the Development and Implementation of a Sustainable Development Strategy for an Economic Entity]. Ekonomicheskiy analiz: teoriya i praktika. 2014; 44(395):14- 25.
5. Zub AT. Strategicheskiy menedzhment. Teoriya i praktika [Strategic management. Theory and practice]. Moscow: Aspekt Press; 2002.
6. Kreydenko TF, Chernyaev MV, Grigorieva EM. Issues of Developing the Tool for Diagnosis of Energy Efficiency Level of Russian Regions' Economy. Inter J of Energy Econ and Policy. 2018; 8(4):187-98.
7. Greene DL. Measuring Energy Sustainability. In: Graedel TE, Van der Voet E, editors. Linkages of Sustainability. Cambridge, MA: The MIT Press; 2009.
8. Shevchenko NA. Nauchno-innovatsionnyy potentsial sovremennogo energeticheskogo sektora mirovoy ekonomiki [Scientific and innovative potential of the modern energy sector of the world economy]; 2017. Available from: http://cyberleninka.ru/article/n/nauchno-innovatsionnyy-potentsial-sovremennogo-energeticheskogo-sektora-mirovoy-ekonomiki
9. Zorina TG. Ustoychivoye razvitiye energetiki: sushchnost i metodicheskiye podkhody k otsenke [Sustainable energy development: the nature and methodological approaches to the assessment]. Sovremennyye tekhnologii upravleniya. 2015; 1(49). Available from: http://sovman.ru/article/4905/
10. Mozgovaya YS. Sovershenstvovaniye mekhanizma ustoychivogo razvitiya toplivno-energeticheskogo kompleksa [Improving the mechanism of sustainable development of the fuel and energy sector] (Doctoral dissertation). Saratov; 2018. Available from: http://www.dissercat.com/content/sovershenstvovanie-mekhanizma-ustoichivogo-razvitiya-toplivno-energeticheskogo-kompleksa
11. Abzalilova LR. Ustoychivost khimicheskogo i neftekhimicheskogo kompleksa regiona: soderzhaniye, sostoyaniye i perspektivy: Na primere Respubliki Tatarstan [The stability of the chemical and petrochemical complex of the region: content, state and prospects: By the example of the Republic of Tatarstan] (Doctoral dissertation). Kazan; 2018. Available from: http://www.dslib.net/economika-xoziajstva/ustojchivost-himicheskogo-i-neftehimicheskogo-kompleksa-regiona-soderzhanie.html
12. Chegis R, Pusinayte R. Otritsatelnyye vneshniye effekty i ustoychivoye razvitiye v sfere energetiki [Negative external effects and sustainable development in the field of energy]. Baltiyskiy region. 2010; 1:22-40.
13. Zagoruyko IY. Formirovaniye organizatsionno-ekonomicheskogo mekhanizma upravleniya ustoychivym razvitiyem elektroenergetiki [Formation of the organizational and economic mechanism for managing the sustainable development of the electric power industry]. In: Zagoruyko IY, Khisamova AI, editors. Biznes v zakone [Business in law]. Ekonomiko-yuridicheskiy zhurnal. 2012; 3:26-31.
14. Fadeyeva IY. Upravleniye ustoychivym razvitiyem predpriyatiy gazovoy otrasli [Management of sustainable development of gas industry enterprises] (Doctoral dissertation). Astrakhan; 2017. Available from: http://www.dissercat.com/content/upravlenie-ustoichivym-razvitiem-predpriyatii-gazovoi-otrasli
15. Anpilov SM. Klyuchevyye faktory ustoychivogo razvitiya sovremennogo predpriyatiya [Key factors for the sustainable development of a modern enterprise]. Voprosy ekonomiki i prava. 2012; 6:40-5.
16. Bazarova LA. Menedzhment ustoychivogo razvitiya kompanii [Management of sustainable development of the company]. Moscow: ASV; 2007.
17. Afanasyeva MV. Otsenka effektivnosti i ustoychivosti razvitiya korporativnogo sektora mirovogo energeticheskogo kompleksa [Assessment of the effectiveness and sustainability of the development of the corporate sector of the global energy complex] [dissertation]. [Moscow]; 2018. Available from: https://www.gubkin.ru/diss2/files/Dissertation_Afanasyeva_MV_new.pdf
18. Tumin VM, Koryakov AG, Kostromin PA. Informatsionnaya prozrachnost predpriyatiya kak faktor yego ustoychivogo razvitiya v usloviyakh krizisa rossiyskoy ekonomiki [Information transparency of the enterprise as a factor of its sustainable development in the conditions of the crisis of the Russian economy]. Vestnik Moskovskogo universiteta imeni S. Y. Vitte. Seriya 1: Ekonomika i upravleniye. 2016; 2(17).
19. Kondaurova DS. Development of recommendations for the development of the mechanism of management of sustainable development of industrial enterprises. Samara: Samara State University of Economics; 2015.
20. Gazprom reports on the sustainable development; 2018. Available from: http://www.gazprom.ru
21. Biryukova VV. Ustoychivost razvitiya neftyanykh kompaniy Rossii [Sustainability of the development of oil companies in Russia]. Vestnik SibADI. 2015; 3(43). Available from: https://cyberleninka.ru/article/n/ustoychivost-razvitiya-neftyanyh-kompaniy-rossii.

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