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ECONOMICS

SIMULTANEOUS METHODOLOGY OF FORMING THE CONCEPT OF STATE REGULATION BY INNOVATIVE ENTREPRENEURSHIP IN THE CONTEXT OF TRANSFORMATION OF THE INSTITUTIONAL PARADIGM OF MANAGEMENT AND DIGITALIZATION

Valentyna Aranchii,

Ph.D. in Economics, Professor, Rector,

Mykola Zos-Kior,

Doctor of Sciences (Economics), Professor,

Dmytro Diachkov,

Doctor of Sciences (Economics), Associated Professor,

Poltava State Agrarian University, Ukraine,

Yelyzaveta Snitko,

Ph.D. in Economics, Associate Professor,

Lugansk National Taras Shevchenko University, Starobilsk, Ukraine

Annotation. *The article investigates the simultaneous methodology, the effectiveness of which enables the formation of a new system of institutions within the institutional matrix, the generation of human capital capable to reform the economy and ensure its innovative development, and the timely response of the state to the negative impulses that cause inert development of innovative entrepreneurship in a transformational economy.*

Keywords: *simultaneous methodology, the concept of state regulation, innovative entrepreneurship, transformation of the institutional paradigm, management, digitalization.*

The definition of the methodology of regulating the development of innovative entrepreneurship leads us to focus our attention on relatively new theory institutionalism, which is still quite debatable in the scientific community. It is based on the conceptual consideration of the functionally divergent elements of the institutional matrix and the evolutionary dynamics arising in them and defines the postulates of transformation of innovative entrepreneurship development in the context of assessing the system of implicit or explicit incentives that direct the vector of state development in an innovative direction. The awareness of the above explains the expediency of using the theoretical foundations of institutional theory, with the help of which effective public policy tools adequate to modern conditions can be proposed. These facts determine the relevance of the research topic.

Analysis of studies and publications. A wide range of researchers in determining the methodological foundations of state regulation of innovative entrepreneurship development offer to consider theories of neo-institutionalism, institutionalism, holism

and individualism. In order to determine the application of these theories in this context, it is necessary to clarify the meaningful attributes of the central definition, which is included in the semantic core of these theories - institution [1, 2, 4-6]. The founder of the institutional school, T. Veblen, started a detailed analysis of this definition [3]. In his studies, the scientist considered the institutions that form the institutional framework of the national economy, under the prism of embodied within institutions, objects or organizations established views on the foundation of the state, which changed as a result of the functions fulfilment, implementation of communication within and outside the matrix. T. Veblen characterized such views as "traditions" operating in a certain market environment [9, 11]. The scientist put a rather broad meaning in the concept of "institution", which made it somewhat difficult to comprehend in the scientific world. The broadness of T. Veblen's views was pointed out by J. Commons [7, 8, 10], noting that this definition needs to be specified and cannot be defined only in terms of traditions inherent to certain elements of the institutional environment.

The aim of the article is to investigate simultaneous methodology of forming the concept of state regulation by innovative entrepreneurship in the context of transformation of the institutional paradigm of management and digitalization.

Presentation of the basic material. In determining the basis for the methodology of state regulation of innovative entrepreneurship, we should consider the fact that the presence of different types of entrepreneurship in the national economy is advisable (Fig. 1). Stimulation of innovation-oriented business entities, in particular, is prospective, to create a new type of knowledge-based economy. It is necessary to create such methodological frameworks that will facilitate the reform of institutions. Or to create those that will be able to provide conditions for innovative development of production and services. In conditions, when private interests of individual market players dominate in the institutional matrix and cause opportunistic phenomena, destructive or disruptive entrepreneurship develops, which causes regression of innovative development at the macro-, meso- and micro-levels.

If the interest in engaging in destructive and disruptive entrepreneurship dominates in the national economy, the development of innovative-based entrepreneurship based on fair competition is significantly damaged. Negative phenomena accumulate in the institutional matrix: bureaucracy, organized crime, corruption, forceful redistribution of business. If strong incentives for innovative entrepreneurship development exist, destructive or disruptive entrepreneurship will be absent. It is in this case that effective methodological foundations for state regulation of impossible destruction of entrepreneurship by defining the most expedient official directives, the legislative basis, the limits to unfair competition (formal rules), and by encouraging cultural values of innovative development, mental norms (informal rules).

It is important to ensure such state regulatory frameworks so that the same business entity does not simultaneously engage in productive and unproductive or destructive entrepreneurship.

The evolution of a national economy is not inherently linear. The cyclicity of

technological and innovative development has been marked by protracted crises, which have been reversed by scientific progress or an innovation revolution. At the same time, in the institutional environment, which is imperfect or depressed, has few incentives for innovative entrepreneurship.

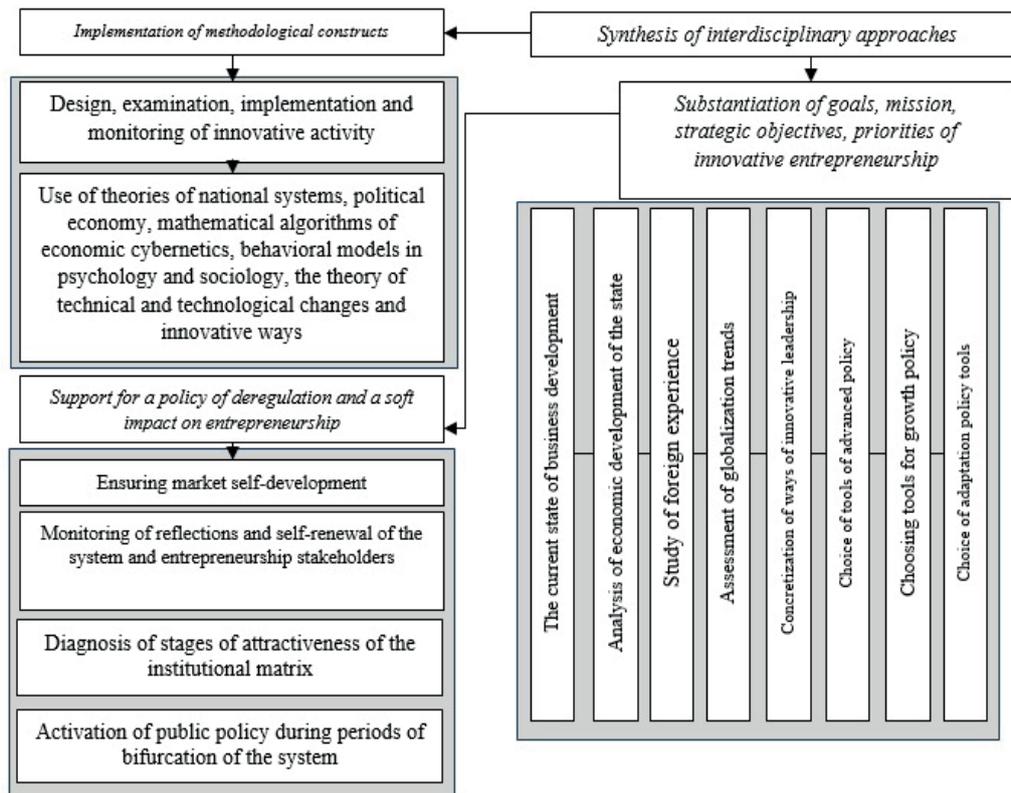


Fig. 1. Ontology of the methodology of state regulation of innovative entrepreneurship in the context of institutional paradigm transformation

Conversely, in a renewed and reformed institutional environment, innovative entrepreneurship will dominate. At the same time, there is a certain subjectivity in the choice of entrepreneurial behaviour by the business entities. Under such an approach, it was believed that any individual in the market economy has the right to choose: an entrepreneur can try to increase his income in a fair and honest way by any productive and socially useful activity or another way, in which his opportunistic behaviour is manifested. The second way is marked by destructive consequences both for the entrepreneur himself and for his environment. Thus, the conditions we have considered for the formation of methodological foundations for the implementation of state regulation of innovative entrepreneurship development in the conditions of transformation allow us to note its

fundamental basis (fig. 2).

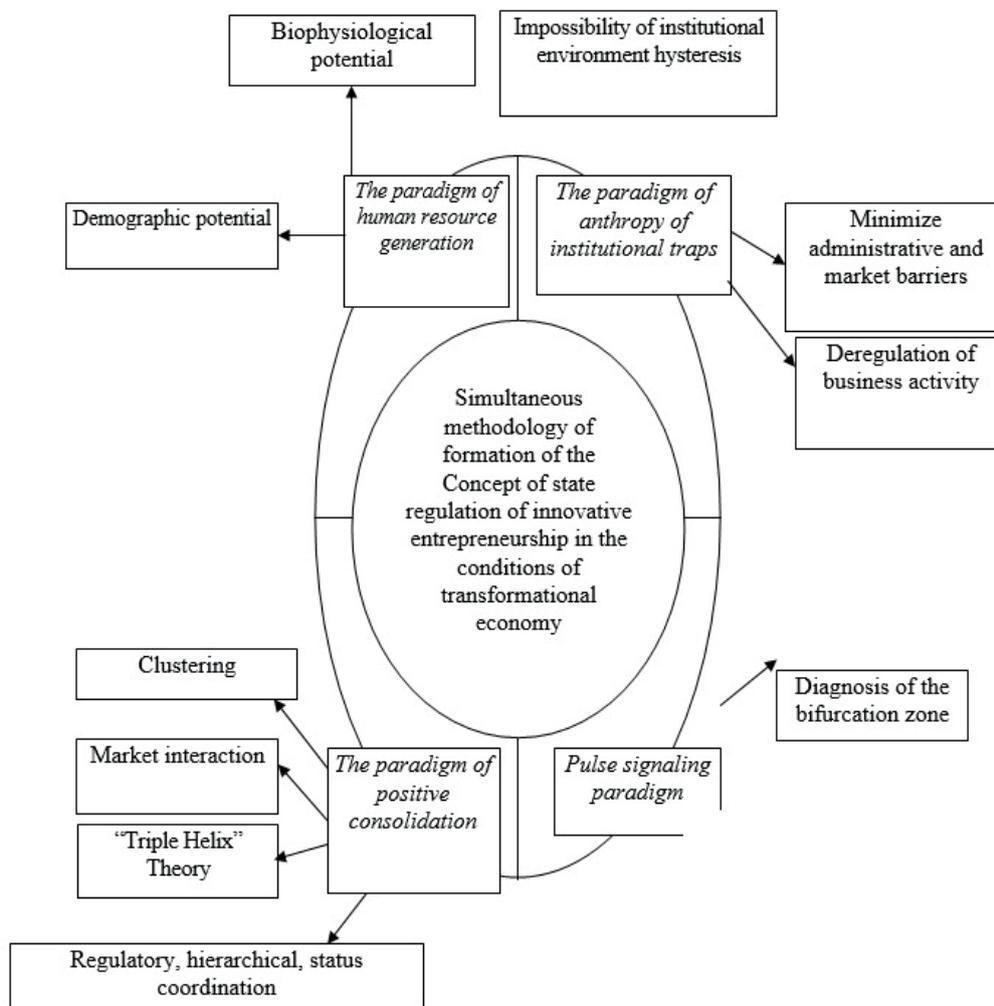


Fig. 2. Methodology of formation of the Concept of state regulation of innovative entrepreneurship in a transforming economy conditions

The use of the methodology at the state level allow to defines strategic guidelines in the following directions: defining the degree of appropriate influence on the activity of innovative entrepreneurship by implementing necessary market or administrative instruments aimed at reforming, diversifying and stimulating technological and process innovation; creating the necessary basis for ensuring the diffusion of innovation, developing advanced production technologies in industry; Improvement of formal and informal communication between all participants of innovative activities; The state

policy should take into account the interrelationships between innovation development of the enterprise, current socio-economic development status of the national economy, the resource base and priorities of territorial development; Identification of the concept of state regulation of innovative enterprise development; Identification of the concept of state regulation of innovative enterprise development; identification of the necessary state measures for clustering the economy, taking into account the parity of business and government.

Conclusions. Proposed, by us, methodology of simultaneous state regulation of innovative entrepreneurship in the context of the transformation of the economy involves a synergy of paradigms: human resource generation, the anthropology of institutional traps, positivist consolidation, and pulse signalling. It promotes a deepening of scientific theories on the decision of a problem of methodological maintenance of state regulation of innovative business in the economy, is transformed. Within the framework of the methodology, it is possible to improve the formal and informal institutions of the institutional matrix, the activity of which should be aimed at stimulating the development of innovative entrepreneurship.

The methodology of simultaneous state regulation of innovative entrepreneurship in the context of economic transformation is based on institutional theory. The efficiency of this methodology will determine the formation of a new system of institutions within the institutional matrix, generation of human capital capable of reforming the economy and ensuring its innovative development, as well as the timely response of the state to the negative impulses that cause inert development of innovative entrepreneurship in a transformational economy.

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ENTERPRISE DEVELOPMENT MANAGEMENT IN THE CONTEXT OF TECHNOLOGICAL AND INNOVATIVE TRANSFORMATIONS

Viktoriia Voronina,

Ph.D. in Economics, Associate Professor,

Olena Lopushynska,

Ph.D. in Economics, Associate Professor,

Mykola Vovk,

Postgraduate student,

Poltava State Agrarian University, Ukraine

Annotation. *At the present stage of economic development there have been changes in the paradigm of management of innovative and technological development of the enterprise. The article considers and forms an interdisciplinary approach to defining the essence of the concept of "development". The main directions of enterprise development are offered where considerable attention is paid to technological and innovative transformations. It is proposed to choose the optimal proportions of innovative development, which in the strategic approximation would allow to move holistically with a synergistic effect.*

Keywords: *enterprise development management, technological management, innovations, innovation management, innovation management.*

Problem statement in general and its connection with important scientific and practical tasks. For any state, the development of enterprises is the basis of the national economy progressive dynamics. However, in the modern world, including Ukraine, the concept of a "stable, balanced economy" is something ideal and almost unattainable. Therefore, to administer the development of the enterprise in conditions of instability, uncertainty, and economic downturn means to design and apply transformations, ensuring the flexibility of the enterprise. In view that macroeconomic factors are uncontrolled matters for the individual enterprise, it is necessary to learn how to predict and take into account their impact on the enterprise development and, if possible, to lobby the interests of enterprises and their consumers in the legislature and executive bodies [2].

Sustainable economic development, in the long run, is often based on the utilization of the highly-developed countries' experience in the sphere of innovative activities and the factors supporting the development of advanced achievements of domestic technology and science. Innovation factors are decisive for increasing the competitiveness of the country's economy and serve to accelerate the innovation process and development, promote the efficiency permanence of the innovation system [11,17].

Analysis of recent research that has begun to solve the problem. The issues of innovation theory, the impact of innovations on economic development are in the focus of researches performed by prominent foreign professional economists: F. Agion, S. Ilenkova, P. Zavlin, O. Kazantsev, M. Kondratiev, A. Kleinknecht, J. Cook, R. Cooper,

P. Myers, X. Mensh, K. Oppenlander, O. Prigogine, P. Romer, B. Santo, R. Solow, B. Twiss, M. Hammer, P. Howitt, K. Freeman, J. Schumpeter, and others.

The works of S. Valdaytsev, L. Vodochek, J. Van Dane, P. Drucker, G. Mensch, M. Porter, R. Foster, F. Hayek, S.Yu. Glazyev, D.Lviv, and others elucidate the issues of enterprise development and the formation of innovative strategies. Among the Ukrainian scientists who studied the problems of enterprise development are I.Alekseiev, O. Amosha, Y.Bazhal, B. Burkinsky, A.Grechak, M.Denysenko, J.Zhalilo, V.Zakharchenko, S. Iliashenko, M.Krupka., O.Lapko, B.Malytsky, O.Makar, I. Markina, J. Poplavska and others.

Presentation of the main material with a full justification of the obtained scientific results. Despite the obvious comprehensibility of the concept of "enterprise development" in the theory and practice of management, there are quite different views on the characteristics of this concept and its features.

Thus, it seems appropriate to analyze the etymology of the concept of development in its relatedness to enterprise management and do it on the basis of the Ukrainian and foreign scientists' findings (Fig. 1).

Essence analysis of the concept of "enterprise development" allows identifying the key aspects of this term comprehension in its narrow and broad sense. In a narrow sense, the development of the enterprise is considered as a state or result of a change in the enterprise, in other words, its transition to another quantitative and/or qualitative level, caused by the influence of internal and external factors. In a broad sense, on the other hand, enterprise development is interpreted as a vector, irreversible, natural process, which in essence is a consistent and continuous change (or set of changes) of results or states of the enterprise in time and space under the influence of internal and external factors [10; 14].

Proponents of the quantitative approach determine the development of the enterprise in terms of the growth of quantitative indicators and the general change in the scale of its activities, changes in the size of the business entity, and the like. This approach to the interpretation of the concept of "enterprise development" dates back to the mid-1980s. The production and economic activity of enterprises in this period are characterized by external and competitive environments' steadiness and stability. In view of the dynamics of modern socio-economic relations development and economic conditions, which provide a high rate of changes in the environment and increase in competition, it seems insufficient to consider the notion of enterprise development only from the standpoint of quantitative indicators.

That is why a qualitative approach is much more appropriate since it defines the development of the enterprise as a change primarily in quality characteristics under the influence of external and internal factors. In particular, within this approach, the development of the enterprise is determined as:

- a set of purposeful, intensive, and qualitative changes in economic relations that occur at the enterprise due to the contradiction of the internal environment and the influence of the external factors;

- a set of changes that lead to the emergence of a new quality and strengthening the vitality of the system, its ability to resist the destructive effects of the environment;
- objective change of only the qualitative characteristics of the system, due to the laws of individual socio-economic systems functioning in correlation with the fundamental laws of nature, economics, and management, in the case of which new properties of this system are formed [3; 14].

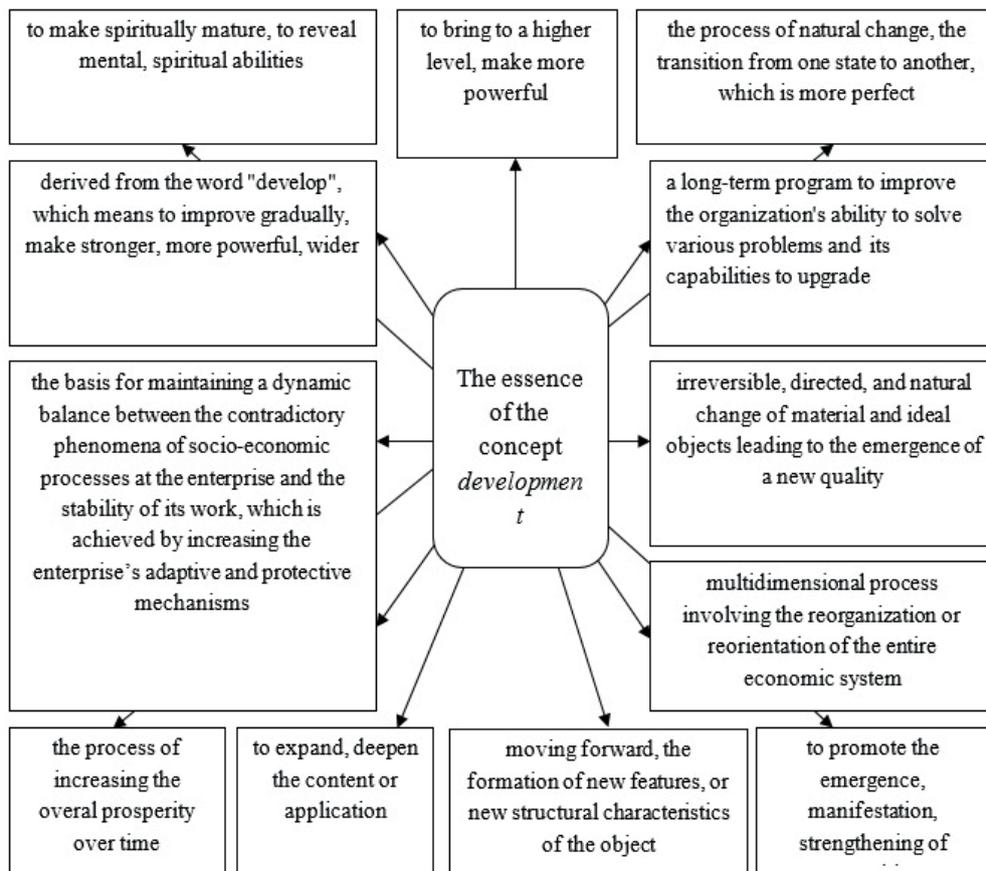


Fig. 1. Interdisciplinary approach to defining the essence of the concept of "development" [developed on the basis of 5]

From the standpoint of a systems analysis theory, enterprise development is characterized as a dynamic system of interacting subsystems, prerequisites, factors, and principles that determine the vector of quantitative and qualitative changes in the socio-economic system functioning [14].

The process approach characterizes this category as a unique process of an open system transformation in space and time, the main feature of which is the constant

change of strategic goals of the enterprise via the creation of a dissipative structure of its operation and its transfer to a new attractor, which is one of the alternative trajectories of enterprise development. Proponents of this approach argue its continuity, artificial or natural programmability of the new opportunities formation, properties, quality, and characteristics of the enterprise, which contribute to its capability to perform new functions and fundamentally different tasks, including the ability to counteract negative influences. The basic principle of this approach states that development is a change aimed at the transition of the enterprise to a new qualitative and quantitative state [1].

According to the complex or integrated approach to the development of the enterprise, the key characteristic feature is a change of quantitative and qualitative composition of structural elements of the enterprise with a focus on the qualitative changes in the enterprise functioning due to the changes of quantitative and structural characteristics of natural, material, technological, organizational, information-communicative, financial, time, and other resources, involving the effective use of intellectual and human resources. Thus, the development of the enterprise from the standpoint of the integrated approach is a transition from one qualitative state to another, caused by quantitative accumulations in the object, which lead to qualitative changes [3; 12; 13; 14].

Having analyzed the multifaceted nature of this concept, we propose to consider the development of the enterprise as a process of quantitative, qualitative, and structural changes that lead to the transition of the enterprise to a new level of its functioning.

The enterprise develops in various directions, covering all areas of economic activities. Most scientists distinguish the following kinds of enterprise development: economic, technological, managerial, organizational, social, and other ones. Every enterprise development aspect has its own characteristic features, implementation mechanisms, impact on the overall production outcomes of the enterprise. Economic development is an integrative process. Achieving economic effectiveness is the main goal for any enterprise management and other goals (social, technical, etc.), being also very important, are concomitant. Neglecting one of the areas of development can be detrimental to the company, so, in addition to the goals of increasing profits, the company must comprehensively coordinate changes in all areas of activity [7].

In terms of the development structure and its types, we distinguish economic, technological, commercial, social, and organizational development. Economic development related to macroeconomic problems dominates among these types. Research of economic development is defined by some scientists as the principal goal of the economic science. Most of them distinguish organizational, technique-technological, social, and economic development depending on the object of changes in the enterprise social-economic system. According to the type of enterprise potential, we propose to classify the development of the enterprise into production, financial, communication, innovation, marketing, management, motivation, and labor sectors (Fig. 2) [4;7].

Having examined the diversified views of scientists on the classification of enterprise development, we conclude that in terms of enterprise development content, it should be divided into economic, technical, technological, commercial, social, and organizational

branches. In addition, in our opinion, it is advisable to single out another area of development in terms of its content – resource-saving development of the enterprise. By the types of activity, we can distinguish production, innovation, investment, marketing, information, financial, and staff development. Thus, summarizing all the above mentioned, the development of the enterprise should be understood primarily as a process of all kinds of changes due to which the enterprise moves to a new level of its functioning [8; 6].

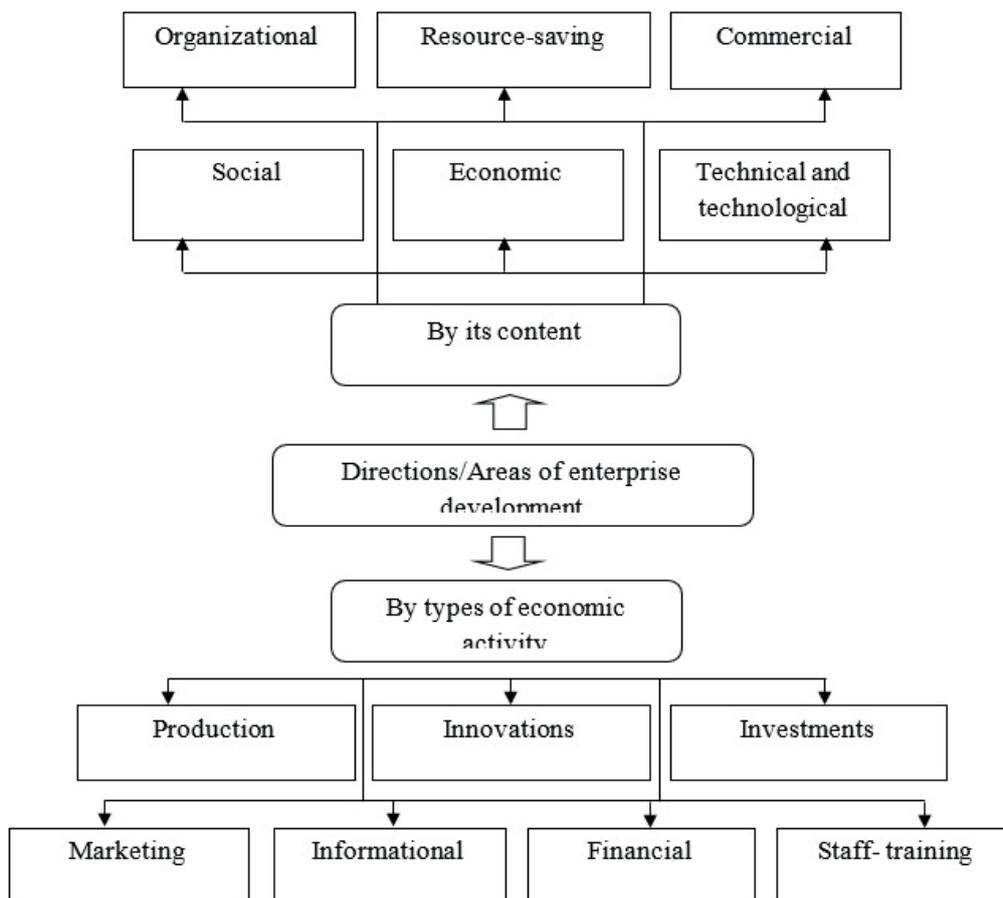


Fig. 2. Directions of enterprise development
[generalized by the author on the basis of 3;7; 12; 13;14]

Some authors emphasize that the enterprise development management structure should also involve a specialized enterprise system, which comprises all the processes that lead to changes in the composition, functioning features, structure of the inter-links and relations of the constituent elements of the enterprise's production and economic system [16; 2; 15].

Conclusions. The advantages of borrowing new knowledge from abroad include gaining experience in technology management, already tested in practice, and meeting international standards. It contributes to the formation of technological cycles together with foreign companies, allowing the enterprise to gain experience in implementing innovative approaches. But in this case, the disadvantages are: the probability of getting obsolete innovations, deepening dependence on countries-suppliers of technologies, reduction of the profit rate, low level of implementing own innovative scientific and technological potential. Having created its own fund of new knowledge, a country can facilitate its economic development, increase the efficiency of the economic activity, and help national production find its own niche in the global innovative processes. However, there exist a number of objective and subjective obstacles, such as lack of financial and human resources, time factors, etc., to overcome which advanced structural and institutional transformations are needed. It is necessary to choose the optimal proportions of innovative development, which in the strategic approximation would allow moving further holistically with a synergistic effect.

Promising area of future research, needed to ensure the effective and sustainable operation of enterprises, is the development of a methodological and technological basis for the design and implementation of well-grounded functional strategies for enterprise development in the technological, innovative, production, marketing, investment, costs, staff training, and other spheres.

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MANAGEMENT TECHNOLOGIES OF DIGITALIZATION OF BUSINESS PROCESSES IN INNOVATIVE DEVELOPMENT OF ENTERPRISES: GOALS AND TASKS

Tatiana Voronko-Nevidnycha,

Ph.D. in Economics, Associate Professor,

Natalia Chernikova,

Ph.D. in Economics, Associate Professor,

Alina Oliinyk,

Ph.D. in Economics,

Poltava State Agrarian University, Ukraine

Annotation. *The article examines the technologies of digitalization of business processes of domestic enterprises in the context of innovative development. The characteristics of the concepts of “technology”, “technology of digitalization”, “technology of digitalization of business processes of enterprises” are given. The analysis of dynamics and structure of different levels of technological sector of economy of Ukraine is carried out. The purposes and tasks concerning use of technologies of digitalization of business processes in the conditions of innovative development of the enterprises are defined. Conclusions are made about the need and importance of further developments in this direction.*

Keywords: *technologies, digitalization, business processes, digitalization technologies, innovative development, technologies of digitalization of business processes of enterprises.*

The introduction of modern technologies in the business processes of enterprises involves not only the using of modern equipment and software, but also changes in approaches to management, external communications. Digital transformations change everyone's life for the better, improve the reputation of enterprises and increase the efficiency of their activities, meet customer's needs ect. Digitization technologies here are a tool to achieve results metioned above, and innovative developments create the basis for these.

Look into the concept of technology and their evolution in the context of digitalization. The term technology translated from Greek is the science of ways to meet the needs of mankind through the use of technical means. Even in the Middle Ages, technology was an opportunity to master those crafts that were previously available only to brilliant mind people. Historians consider the emergence of technology as an opportunity to preserve the knowledge, skills and inventions of individuals, their further development.

In the scientific literature, the term “technology” is considered from different points of view, namely, as:

- a set of methods or ways to obtain products of a given quality;
- description of technological processes like instructions, technological maps, rules, schedules;
- scientific discipline about methods of production processes and their improvement.

The origin of the concept of “technology” is associated with the name of the German scientist J. Beckmann, who in the late 18th century introduced a scientific discipline, which he called “technology”. Today, this term is widely used in various scope of work and industries from everyday life to the creation of high technology.

Modern technologies are divided into related to production (mechanical engineering, construction, food and chemical industry, bio-, nano- and microtechnology, nuclear energy, etc.), as well as information and communication technology (Internet, computer technology), software, automated systems, electronic services (financial, governmental, educational, trade)) too. The first is focused on creating a material product, the second - information, but both technologies are closely intertwined and can not exist without each other, and their development is achieved through such innovative technologies as: implementation, training, consulting, transfer, engineering.

From the point of view of a life cycle distinguish technologies: the newest, advanced, modern, not new and outdated. If we recall the periodization of economic and technological development of civilization, we can say that each phase of such development (archaic or natural, agricultural, industrial, post-industrial or information) is characterized by a certain set of technologies, and those technologies that were considered as modern 20 years ago, today are already morally and physically obsolete.

Researchers of scientific and technological progress identify different technological systems of pre-industrial, industrial and post-industrial periods. If we go into history, such changes took place in a rather evolutionary way, although the transitions from one system to another were revolutionary in nature and were associated with such breakthrough achievements as mining, discovery and development of electricity networks, the Internet.

Statistics show a significant acceleration of the development of the high-tech sector of the economy, which proves the growth rate of technology renewal, however, the share of the low-tech sector is still quite high. A comparative analysis of the dynamics and structure of different levels of the technology sector is presented in table 1.

Table 1

Dynamics of the share of GVA of technological sectors in the total output in Ukraine in 2011-2019, % of GDP

Economy sector by level of manufacturability	Years								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
Low-tech	33,6	31	21,1	21,1	29,5	30	30,1	18,2	18,5
Medium low-tech	8,9	12,8	9,8	11,8	15,5	15,1	15,1	15,2	15,7
Medium high-tech	24,1	23,6	16,1	14,5	22,5	25,1	24,9	25,1	26,6
High-tech	24,1	26,9	16,2	18,2	36,5	36,2	38,6	41,5	39,2

Source: [8]

The beginning of the 21st century was marked by the “rapid” development of digital technologies, so this period can be considered the beginning of a new technological way

of “digital”. This period, instead of the post-industrial, is characterized not only by the predominance of intellectual abilities, but also the continuous digitization of production, service, management processes, etc. [7]. Digital technologies, in these conditions, allow to accelerate transition from the outdated to the modern technological environment and become a basis of such transformations.

For better understanding how the process of digitization of individual business processes, enterprises, industries and society as a whole should be carried out, it is necessary to establish which digitization technologies will be used to describe these processes. But firstly we need to find out what we mean by “digitization technology”. We have defined the concept of “technology” above. The concept of “digitalization” is interpreted mostly as a process of implementing digital technologies to improve people, society and the state [11] and as a stage of final convergence of the physical, digital and biological worlds [17].

Combining the concepts of “technology” and “digitalization” we can give the following definition of the term “digitalization technology”. It’s a set of digital tools through which happens the digital transformation of enterprises in a developed digital infrastructure. The concept of “technology for digitization of business processes of enterprises” can be described as a way to perform individual business processes or their combination aimed at meeting the growing needs of mankind.

The issue of digital transformation today confuses and arouses the interest of scientists and practitioners in many areas. For example, legal professionals are concerned about the lack of legislation to address the legal issues of digitalization of the economy, which due to the spread of robotics, automated systems for accumulation, storage, processing, use and protection of information is becoming increasingly important and requires a clear definition of individual terms. According to them, the establishment of clear legislation will clarify the digital processes taking place in the state, reduce barriers that prevent their acceleration [5; 2]. Representatives of technical areas are constantly working to improve the existing technologies, adapt foreign developments to the conditions of domestic enterprises and industries, as well as to develop new, even more modern technologies that will further facilitate the life and work of every citizen and socio-economic situation. Economists, in turn, try to assess the effectiveness of the introduction and use of digital innovations ect [4].

Today, most business processes are moving to a digital environment. Even a year and a half ago, few could have imagined that the global pandemic caused by COVID-19 would be a factor in accelerating such a transformation. If recently the Internet was used mainly for entertainment, today, with a large number of digital developments, its role and importance is shifted towards doing business, learning, communications and others [10].

Modern technologies of digitalization increasingly permeate all spheres of activity and branches of economy, separate business processes of the enterprises. The introduction of such technologies involves the using of modern equipment and software, changes in the system of production organization and enterprise management. The experience of successful companies in Ukraine and the world, which are already actively using

digital technologies, convinces of positive results, in particular, increasing productivity, customer satisfaction, creating the image of progressive and modern companies, etc. [9].

According to the Concept of Development of Digital Competences in the Society of Ukraine, digitalization technologies are defined as “any product that can be used to create, view, distribute, modify, store, select, transmit and receive information electronically in digital form (computer networks and any -what online services they provide, software and hardware, digital content, including files, information, data, etc.)” [1].

Among the most popular for implementation are:

- Internet of Things (IoT);
- mobile applications;
- big data;
- cloud computing;
- artificial intelligence (AI);
- flexible technologies (Agile);
- Chat Bot;
- Blockchaine;
- augmented reality;
- virtual reality;
- electronic data exchange technologies (EDI);
- wireless technologies, etc.

Each of these technologies has its own scope, as well as advantages and disadvantages, which are listed in table 2.

The analysis of the origin and transformation of the concept of “digitization technology”, provides a description and scope of the most popular among them, as well as the advantages and disadvantages associated with their use, allows to identify problems that can be solved with these technologies, including:

- 1) improving interaction with suppliers and customers;
- 2) make business processes more flexible and adaptable to changing environments;
- 3) reduce the execution time of the business process;
- 4) to stimulate enterprises to an innovative way of development;
- 5) simplify work with large data sets;
- 6) get additional effects (economic, social, technological and environmental) from the using of digitization technologies.

The purpose of using digitalization technologies by domestic enterprises is not simply to follow modern trends, but it can increase business efficiency, search for new forms and ways to make a profit. Vitality and competitiveness, in any field of activity, will be determined by the readiness of a socio-economic system for development and flexibility in the implementation of digital technologies.

These goals and objectives of using digitization technologies are the same for enterprises of all spheres and sectors of the economy, provided the complete transformation of all business processes of these enterprises. Also, from a theoretical point of view, all digitization technologies can be provided in practice of any enterprise. But today almost

all enterprises in the country are in the process of digital transformation, so there are digital technologies that are more or less inherent in a particular industry or field of activity.

Table 2

Analysis of the most common digitization technologies

Digitization technologies	Characteristics of technology	Scope	Advantages	Disadvantages
Big Data	A set of information from various sources of income, including through gadgets	Business analytics in various fields and areas of activity	Obtaining, storing, analyzing a large amount of previously unavailable information to improve management efficiency	Storing a large array of data is not always cost-effective, data refresh rate and “actual” time interval are not always reasonably comparable
Cloud computing	Providing access to data, applications and services	Any industries and areas of activity where a large amount of information is accumulated and stored	Eliminates the need to purchase expensive equipment, opens opportunities to work anywhere	Dependence on the company that provides cloud services, mandatory connection to the network, the risk of hacker attacks on the server
Mobile applications	Transformation of ways of interaction of employees and clients with the enterprise	Any business operations, relationships with customers	Simplification of enterprise activity	Some mobile applications are expensive
Flexible technologies (Agile)	Flexible approaches in short cycle management	Project management, software development	Risk minimization, creating a quality product without clear rules and conditions	Risk of loss of time and finances in case of ineffective decision-making, additional costs for creating comfortable conditions for quality communication of employees
Artificial intelligence and machine learning	Performing tasks that previously could only be done by humans	Management of various automated systems in almost all areas of the economy and industries	Minimization of errors and other types of human factor	Narrow specialization (performance of one specific task), inability to work in a multitasking environment

Chat boots	Virtual assistant of the company	Sphere of services, trade	Saving human resources, speeding up the response to customer requests	Performs only typical programmed tasks
Blockchain	Storage of certain information	Digital calculations in various fields	Information security, transparency of transactions	Low bandwidth per second of 7 transactions (while Visa and Master Card - 45000)
Wireless technology	Transfer of information without connection of wires by means of Bluetooth, Wi-Fi, GPS, etc.	Internet of Things, connecting any (at least two) things at any distance	Reduce costs by avoiding the need to pay for cable products and complex installation	Signal instability or its complete loss, vulnerability to hacker attacks
Additive technologies (3D printing)	Making a physical 3D object (based on a 3D model, using a 3D printer)	Production of various parts and mechanisms for mechanical engineering, aircraft construction, etc.	Ability to print parts and mechanisms with different properties in one process	Requires a lot of manual labor at the stage of preparation and further processing of printed parts to achieve the desired quality
Robotization	Programming robots to perform repetitive mechanical tasks	Industry, automotive, medicine, military affairs	Ensuring the quality of manufactured products, increasing its profitability, reducing the level of danger in the workplace, saving the lives and health of workers	Loss of jobs and rising unemployment, increased investment costs
Unmanned technologies	Automatic control systems for vehicles and aircraft	Agriculture, industry, military affairs, law enforcement	Allow to save time, labor, finances, to carry out safe monitoring of the area in real time	Short flight duration, dependence of video and photo shooting quality on weather conditions

Source: [3; 6; 12; 13; 14; 15; 16; 18; 19; 20]

For example, the financial (in particular, banking) sector, as a representative of high-tech business, is based on interaction with customers, so they are interested in constantly accelerating the provision of services and improving their quality. Enterprises in this field are constantly working to reduce maintenance costs, reduce staffing. To achieve this goal and solve problems in the banking sector, digitalization technologies

such as: robotization of business processes; identification technologies and biometric technologies (use of facial voice, fingerprints for contactless payment, guarantee of financial and economic security, etc.); chatbots (to provide standard information); big data analysis (to get personalized current offers); mobile applications (implementation of Internet banking); artificial intelligence (when analyzing the operator's communication with customers to improve the quality of service) and more. Thanks to these technologies, both the efficiency of banks' activities and customer satisfaction increase, and time is freed up for resolving non-standard situations, developing new innovative products and implementing innovative projects.

The activity of industrial and agricultural enterprises is at the stage of almost complete automation of business processes. Digitization technologies help them increase productivity and reduce costs for many articles. Machine learning, the Internet of Things, virtual and augmented reality, unmanned and wireless technologies, 3D printing and other digital technologies already allow you to effectively, efficiently and transparently manage internal communications and business processes.

The main purpose of using digitalization technologies in the transport and logistics industry with ensuring economic efficiency is road safety. For example, monitoring the health of drivers (using special bracelets) and road situations, payment for services provided through special mobile applications. The choice of the optimal logistics solution becomes possible through the use of cloud computing, artificial intelligence and big data analysis.

Any trade enterprises, as well as enterprises that produce products (goods, works, services) for further sale, aim at increasing revenue by improving the efficiency of interaction with customers while reducing marketing costs. The tasks of digitization technologies here are as follows:

- study of customer needs and their maximum satisfaction (including to Big Data, cloud technologies);
- reducing the time to implement these needs (through electronic data exchange and e-commerce);
- opportunities to see the imaginary, to combine the virtual and the real (using virtual and augmented reality), etc.

In general, we can say that all digitization technologies used by domestic enterprises reflect global trends. However, there is a lag in some technologies compared to developed countries, due to both the unpreparedness of the digital infrastructure and insufficiently defined efficiency of the implementation of these technologies (which necessitates further development in this direction).

In the domestic market, the innovators of digital technologies are the enterprises of the financial sphere (in particular, banking), IT companies, trade and logistics companies. Industrial and agricultural enterprises lag behind in this direction.

Increasing competition in domestic and foreign markets necessitates the provision of high quality services to customers in the shortest possible time and is the main motive for the introduction of technologies for digitization of business processes of enterprises

in their activities.

In turn, the use of digitalization technologies is a prerequisite and accelerator of the digital transformation of business processes of enterprises, an incentive to update the knowledge and skills of staff, an additional opportunity to attract investors.

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DEVELOPMENT TRENDS OF RESORT SERVICES IN UKRAINE IN CONDITIONS OF UNCERTAINTY

Natalia Buhas,

Ph.D. in Economics,

Tetiana Tsalko,

Ph.D. in Economics,

Svitlana Nevmerzhytska,

Ph.D. in Technical Sciences,

Kyiv National University of Technologies and Design, Ukraine

Annotation. *The article considers and investigates the economic processes in the field of health care services in the context of the COVID-19 pandemic. It is established that one of the main conditions for the successful management of any enterprise in the conditions of the global pandemic, first of all, is the creation of an effective anti-crisis management system. Practical recommendations for enterprise management in pandemic conditions are offered.*

Keywords: *risks, crisis management, crisis phenomena, anti-crisis plan, conditions of uncertainty, state regulation, coronavirus pandemic, quarantine measures.*

Introduction and problem statement. The main purpose of the study is to analyze the main risks of exposure and justification of the level of uncertainty and unpredictability of the environment in Ukrainian tourism during the coronavirus pandemic, as quarantine paralyzed business activity all over the world. For Ukrainian entrepreneurs, this test has complicated the already difficult economic situation [1, 9].

The pandemic shook and affected almost all enterprises in Ukraine. In addition, it showed how vulnerable both business owners and employees can actually be. Whether quarantine as force majeure exempts from contractual obligations, and whether an employee can defend himself if he is fired or forced to go on unpaid leave indefinitely – yes, in the context of the COVID-19 outbreak, these issues have become very relevant, because it is unclear, when businesses will be able to return to the usual rhythm of work, and whether they can at all [5, 13].

Most entrepreneurs are concerned about the uncertainty of the current situation. When it is difficult to predict the duration of quarantine and changes in consumer behavior, it is almost impossible to calculate any scenarios for your business development [7]. Reduction of orders, disruption of procurement and delivery deadlines, paralysis of sales channels – these are just some of the problems faced by small businesses. While the revenues of many companies have decreased significantly, costs have remained virtually unchanged (rent, utilities), and there are worries about the organization of remote work or transportation of employees when traveling is restricted. The high probability of crisis phenomena in the process of enterprise activity and especially modern conditions of their functioning in the pandemic necessitate the introduction of specific measures to counteract their development and neutralization.

Presentation of the main research material. Recent statistics show that the situation in Ukraine is deteriorating, and experts predict that some areas may move to a more severe quarantine phase due to the growing number of infected people. All sanatoriums must operate in compliance with the rules established by the Ministry of Health of Ukraine. In addition, their discovery depends on the epidemiological situation in the region. Decisions on their work will be made by local governments. Thus, the coronavirus pandemic has caused an unprecedented crisis in the tourism economy.

The IMF forecasts that Ukraine's GDP in 2021 will grow to 4% from the previous forecast of 3%. Also, the forecast for the recovery of the Ukrainian economy in 2022 was updated from 3.2% to 3.4% while maintaining the growth rate in 2023 [3]. Although in the first quarter of 2021 the economy fell by 2.2% compared to last year due to continued lockdown, there are signs of a gradual return to growth in the second quarter due to higher prices for commodities [12]. The World Bank gave similar forecasts for Ukraine's GDP. In early June, it was forecasted that Ukraine's GDP would grow by 3.8% in 2021 [11]. And the Ministry of Economy of Ukraine expects 4.1% GDP growth this year and 3.8% next year. At the beginning of the year, the government talked about an optimistic 4.6% growth.

According to experts, the sphere of tourist services of the corona crisis period will be characterized by giving consumers priority over the choice of shorter vacation periods, the individual travel predominance (auto tourism) and individual accommodation, the choice of health, sea, and rural tourism. It is expected that the corona crisis will cause constant changes in consumer preferences, accelerating the introduction of online technologies, paying more attention to hygiene and healthy living, more active use of non-cash and contactless payment methods, and targeted delivery [6]. Thus, the tendency of tourists to use illegal and semi-legal resort accommodation will depend on the willingness of consumers to accept the risk of possible infection. Therefore, sanitary and hygienic conditions and the possibility of distancing during living and recreation will be important factors in competition for the consumer in the 2021 season. Consumers may also be hindered by the desire of travel service providers to compensate for the loss of part of the season by raising prices, reducing the service quality, and the cost of equipping recreation facilities. However, such tactics can only be successful for businesses that demonstrate a high level of anti-epidemic protection. Taking into account these risks and expected preferences of tourists, the support should be built for the tourism at both central and local levels to develop domestic tourism, which would not only restart the industry and reduce the negative effects of the coronary crisis but also create a basis for Ukraine's competitiveness, as a tourist state.

So, summarizing the above, it should be noted that in today's difficult conditions of sanatoriums, namely in a pandemic, anti-epidemic safety standards are of strategic importance for the spa season 2021-2022, because right now the treatment and rehabilitation of people at the resorts is essential [6, 15].

Thus, talking about the success of a business today, the main factor of development will be its sustainable development, which becomes possible to implement only with the

active introduction of new technologies and products, advanced competitive strategies. Therefore, the direct impact on the enterprise in the conditions of transient changes has changing risks [2, 8, 10].

And to prevent negative processes in the enterprise, it is necessary to detect in the early stages all the signs of the crisis, so it will help increase the likelihood of maintaining sustainable development. One of the means of counteracting the crisis is the anti-crisis management of the banking institution. Unlike traditional financial management of the banking system, crisis management is characterized by efficiency in decision-making; significant costs against the background of the general limitation of financial resources; high level of risk; taking unpopular measures; refusing strategic projects in favor of current ones.

The pandemic had a negative impact on both supply and demand, provoking further regression in a weak world economy, geopolitical, social, and trade tensions. This phenomenon is a crisis that has a long-term negative impact on the usual environment in tourism and the world economy as a whole [4, 14]. An analysis of the experience of those companies that survived the coronavirus pandemic suggests that a specialized staff center should be established to coordinate issues related to the coronavirus situation. Thus, this headquarters should be in the form of a crisis management subsystem, which combines the potential of all functional units and operational planning and, accordingly, will timely respond to certain threats. Such a headquarters center, in today's reality, should focus on the most important managerial competencies and organizational skills and give more opportunities to managers to form a preventive strategy. Organizational transformation of the crisis management system involves the creation of a specialized headquarters center for countering COVID-19 threats.

Therefore, as important measures of the anti-crisis plan to the enterprises of the sanatorium and resort sphere, the following should be considered:

- it is necessary to negotiate with all participants in the market of tourist services on the preparation of anti-crisis measures and development strategies for the tourism industry (taking into account the consequences of the corona crisis);
- prepare regional strategies to stimulate tourism development after the end of the pandemic; precisely in those regions where domestic tourism is first of all attractive;
- provide a mechanism for reimbursing tourists for unused vouchers;
- establish a mechanism for monitoring the implementation of support measures for SMEs and employees, including liquidity, lending, and transparency of support measures;
- to introduce a transparent mechanism of funds expenditures received from local tourist budgets for the domestic tourism development, to improve the environment;
- to develop and implement programs aimed at developing innovations and tourism digitalization;
- promote competitiveness and flexibility by investing in education and skills of the sector representatives;
- ensure the strengthening of coordination and partnerships with sector participants

in order to transform tourism.

When developing an anti-crisis plan to overcome the effects of COVID-19 on the tourism sector in Ukraine, it is necessary to take into account the recommendations of the Global Crisis Committee on Tourism, divided into three main areas:

1. Crisis management and mitigation: job retention; support for self-employed workers; providing liquidity; promoting skills development and the revision of taxes, fees, and regulations relating to travel and tourism.

2. Provide incentives and accelerate recovery, in particular the financial incentives, including favorable tax policies; lift travel restrictions as soon as the situation allows; assist in simplifying visas; increase consumer confidence.

3. Preparation for the future: pay more attention to the role of the tourism sector in the country's economy and achieving sustainable development goals; develop preparedness plans for future challenges and use this opportunity to move to a circular economy.

We believe that changes in the sanatorium-resort industry should be in improving the financial and economic mechanisms of reproducing the resort and recreational potential. It is also necessary to organize an accessible market of sanatorium and health services to meet the needs of the population, privatization of sanatoriums, encourage competition, and optimize the management of these institutions. Accordingly, it is for sanatoriums and resort institutions the adaptive quarantine has not improved the situation in the tourism sector, so usually, the regions simply do not comply with any quarantine restrictions, so as result hotels are becoming a major factor in spreading coronavirus.

Conclusions. Taking the above into account, we believe that the state needs to act quickly and impartially to overcome the coronavirus and its economic consequences. Effective and proactive measures need to be taken to prevent the spread of the virus, as well as clear policies to support health systems and their workers, and to protect the incomes of vulnerable social groups and businesses during this pandemic. Supportive macroeconomic policies can help restore confidence and demand. If negative risks are affected and growth is much lower over the long term, coordinated multilateral action will be needed to ensure effective health policies, contain and mitigate business controls, support businesses and ordinary citizens with low income, etc.

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PUBLIC ADMINISTRATION

STRUCTURAL AND FUNCTIONAL FEATURES OF THE ORGANIZATION OF PUBLIC PENSION MANAGEMENT IN UKRAINE

Andrii Ishchuk,

Department of Public Administration,

Vinnitsia Mykhailo Kotsiubynskyi State Pedagogical University, Ukraine

***Annotation.** The article is devoted to the coverage of the structural and functional characteristics of public management in the field of pensions in Ukraine, outlines the system of such management and defines their powers.*

***Keywords:** public administration, functional and structural characteristics, pension provision.*

Problem formulation. The current system of public administration in the field of pensions in Ukraine in its structural and functional characteristics is dual. This means that public administration in this area is divided into public, which is implemented by a system of public authorities responsible for the formation and implementation of public policy in the relevant area, and corporate, which is carried out within the relevant subject of power, and covers public administration in the accumulative pension system.

It is important to note that an optimally organized pension management system, effective distribution of management powers between the relevant management entities is the key to the success of the entire pension system, ie such functioning, which would ensure adequate funding for retirement age. However, it should be noted that currently the pension system does not meet such needs and requirements of today. One of the reasons for this is insufficient management. Therefore, public administration in this area is in the process of reform.

That is why the study of structural and functional characteristics of public administration of pensions in Ukraine is an important area of modern science of public administration.

Analysis of recent publications and research on the topic of the article. Some problems in the organization and functioning of the system of public management of pensions in Ukraine and some foreign countries have been studied in their scientific works by such scientists as I.V. Borisov, V.S. Vesely, N.P. Gaeva, T.A. Latkovskaya, N.V. Martynenko, R.S. Melnyk and others. The scientific works of these scientists are devoted mainly to the study of the principles of organization and functioning of state and non-state pension funds. At the same time, the question of the structural and functional characteristics of public management of the pension system of Ukraine remains insufficiently researched.

Research results. Speaking about the structural-functional and technological

structure of the mechanism of state management of the pension system, pay attention to the fact that the process of functioning of the mechanism of state management of the pension system is orderly both in space and time [1].

When examining the structural and functional characteristics of public pension management, it is necessary to determine the status of the subjects of such management, their structure and functions.

In particular, in Ukraine the main subject of management in the researched sphere is the Pension Fund of Ukraine. As noted in this regard in the scientific literature, the legal status of the Pension Fund of Ukraine determines its position in the system of executive authorities and creates conditions for the Fund's ability to unilaterally act (act) to generate, change or terminate legal relations in the field of social policy [2].

In Art. 58 of the Law of Ukraine "On Compulsory State Pension Insurance" Pension Fund is defined as a self-governing non-profit organization that operates on the basis of the statute approved by its board. It is also provided that the Pension Fund acquires the status of a legal entity from the date of registration of the statute in the central executive body, which implements the state policy in the field of registration (legalization) of statutes of compulsory state social insurance funds [3].

It is important to note that in accordance with paragraph 1 of the Regulation on the Pension Fund of Ukraine, approved by the Cabinet of Ministers of Ukraine dated July 23, 2014 № 280, the Pension Fund of Ukraine is a central executive body whose activities are directed and coordinated by the Cabinet of Ministers through the Minister of Social Policy, which implements the state policy on pension provision and record keeping of persons subject to compulsory state social insurance [4].

Thus, a systematic analysis of the above legal provisions shows that the Pension Fund of Ukraine is both a central executive body with the status of a legal entity and is a self-governing non-profit organization, which actually means that the Pension Fund of Ukraine is managed on a self-governing basis. Characteristically, this principle of management is provided for public associations [5], local governments [6], but not inherent in the management of executive bodies.

Thus, self-government is one of the defining features of the organization of the Pension Fund of Ukraine as a central executive body in the field of pensions. In this regard, the question arises as to how consistent the self-government of the Pension Fund of Ukraine with its status as a central executive body.

In this regard, it should be noted that in the explanatory dictionaries of the Ukrainian language the concept of "self-government" is defined as a type of social management in which the subject and object of management coincide, ie people manage their own affairs, jointly adopt norms and decisions and act with the purpose of their implementation; the main features of self-government are: belonging of power to the whole team, its implementation by the team either directly or through elected bodies; unity, coincidence of subject and object of management; self-control and self-regulation due to jointly adopted social norms; joint management of general affairs; self-financing; advocacy and protection of common interests on the basis of amateurism and self-responsibility, etc.

And further: self-government presupposes the unity of independence and responsibility in resolving all issues of self-government significance [7;8].

In this case, according to a study by N.P. Gaeva, conducted on the basis of analysis of various scientific approaches to understanding the concept of "self-government", self-organization can be defined as a characteristic (sign) of self-government, as the term "self-organization" in the scientific literature", Which is a sign of self-government. At the same time, the scientist notes that in the scientific literature there is still no unambiguous practice of using the terms "self-organization" and "self-regulation" [9].

As the analysis of the provisions of Art. Art. 59-63 of the Law of Ukraine "On Compulsory State Pension Insurance" [3], the self-government of the Pension Fund of Ukraine is manifested in a special order of management, namely - such management is based on parity by state representatives, insured persons and employers, and the organization of such management corresponds to the corporate model. The latter stipulates that the main governing bodies are the board and the executive directorate of the Pension Fund of Ukraine.

Structural and functional characteristics of the management of the Pension Fund of Ukraine are shown in Fig. 1.

Also, one of the features of the management of the Pension Fund of Ukraine is that the direct impact on such activities has the level of wages, which is an important basis for the formation of the revenue side of the budget of the fund and pension benefits [2, p. 82]. At the same time, although the Pension Fund of Ukraine is a non-profit organization by its status, the profitability of its budget has a direct impact on the ability to meet the obligations imposed on this body.

Given the above features of the status of the Pension Fund of Ukraine requires additional justification for the assignment of the latter to the subjects of public authority.

In particular, the concept of the subject of power is given in Art. 4 CAS of Ukraine [10], based on the analysis of which it can be concluded that such an entity may be not only a body of state power and local government, but also any other entity in the exercise of their public authority on the basis legislation.

In the decision of March 4, 2020 in case № 757/63985/16 the Grand Chamber of the Supreme Court (hereinafter - the Supreme Court of the Supreme Court) regarding the term "public authority management functions" explained that in the sense of paragraph 1 part 1 of Art. 3 CAS of Ukraine, the term "public" means that such functions of the entity are aimed at satisfying the public interest; the meaning of the term "authoritarian" is that the subject has the authority to use the power granted to him, through which to influence the development of legal relations. Management functions are the main activities of the authority, its official or official person or other authorized entity, aimed at managing the activities of the subordinate entity [11].

In addition to the term "subject of authority", the science of public administration uses the term "administrative body" to denote a subject authorized to perform public administration functions.

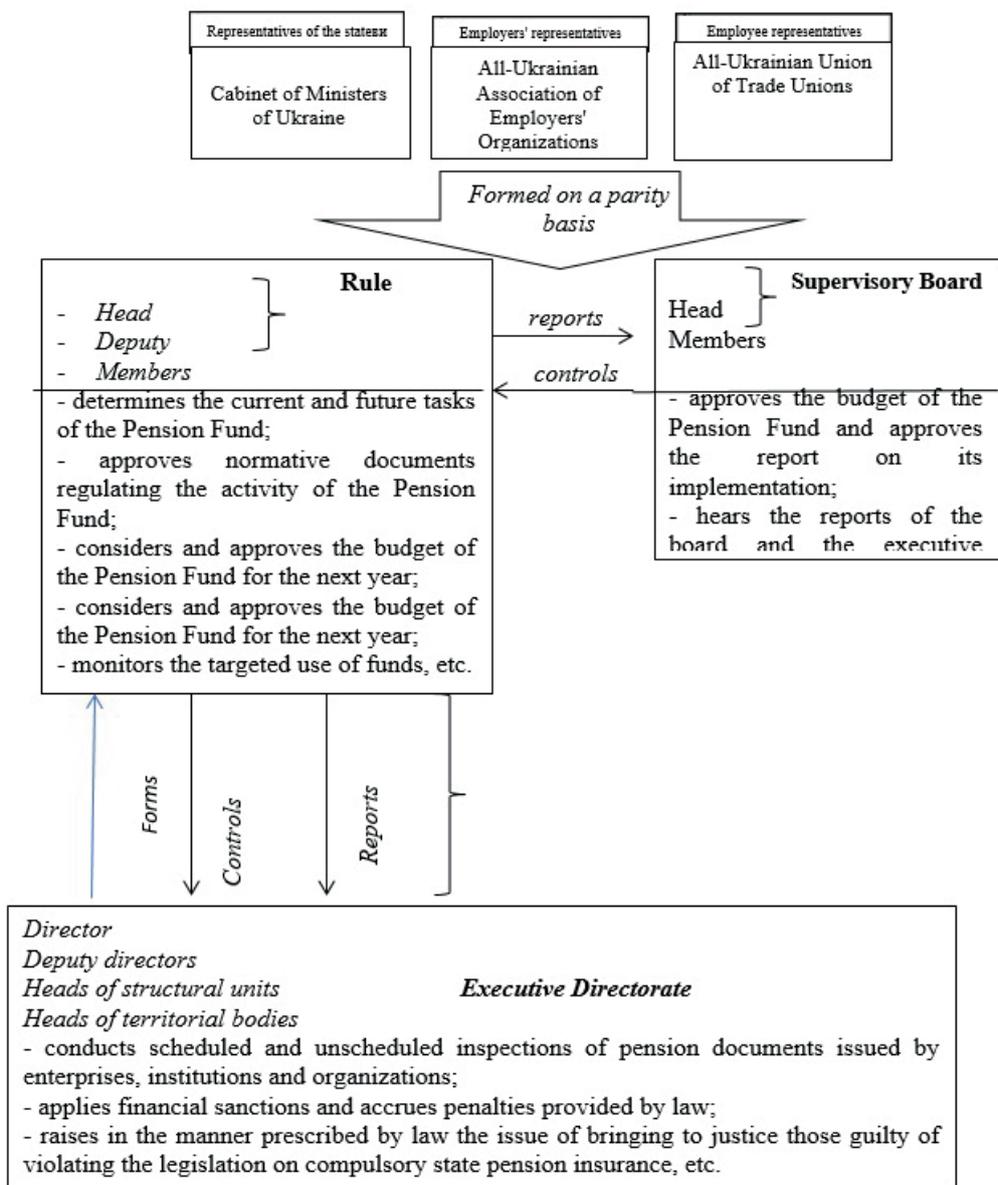


Fig. 1. Structural and functional characteristics of the management of the Pension Fund of Ukraine

In particular, in the draft Law "On Administrative Procedure" the register. № 3475 of 14 May 2020 (adopted as a basis) [12] administrative body is defined as an executive body, a body of the Autonomous Republic of Crimea, a local government body, their official, another entity that is legally authorized to carry out public authoritative

management functions. In fact, the terms "subject of authority" and "administrative body" are identical.

From the content of the above concepts it is seen that one of the characteristic features of the subject of power is that he is a bearer of public power and performer of public administration functions.

In the scientific literature, public power is defined as the ability of an extensive system of state and non-state actors to influence decisions, actions or inaction of individuals and legal entities and / or decide the legal fate of inanimate objects, aiming to achieve socially significant goals [13].

According to the conclusion of the Supreme Court in the above-mentioned resolution of March 4, 2020 in the case № 757/63985/16, in accordance with the tasks and functions of the Pension Fund of Ukraine is a subject of power in the field of accrual and payment of pensions, and disputes arising between the parties to this relationship are public law, so their decision belongs to the jurisdiction of administrative courts [11].

Thus, the Pension Fund of Ukraine, as a subject of power, exercises leadership in the solidarity system of pension provision, performing all the management functions characteristic of a state body - regulation, management, control, etc.

Management of the Pension Fund of Ukraine in districts, cities, districts in cities is carried out by its territorial bodies. In particular, in accordance with paragraph 1 of the Regulations on the management of the Pension Fund of Ukraine in districts, cities, districts in cities, as well as joint management, approved by the Board of the Pension Fund of Ukraine dated December 22, 2014 № 28-2, management of the Pension Fund of Ukraine districts, cities, districts in cities, as well as joint administrations are territorial bodies of the Pension Fund of Ukraine. Managements of the Pension Fund of Ukraine are subordinated to the Pension Fund of Ukraine and directly to the relevant main management of the Pension Fund of Ukraine in the Autonomous Republic of Crimea, oblasts, cities of Kyiv and Sevastopol, which together with these departments form a system of territorial bodies of the Pension Fund of Ukraine [14].

Paragraph 9 of the Regulations on the Management of the Pension Fund of Ukraine in districts, cities, districts in cities, as well as on joint management provides that the management of the Fund is headed by a head who is appointed by the Head of the Fund in agreement with the Minister. social policy of Ukraine and the head of the relevant local state administration, dismissed by the Chairman of the Board of the Fund in agreement with the Minister of Social Policy of Ukraine in the manner prescribed by law) [14].

With regard to management in the funded pension system, the peculiarities of the organization of such management are due to the fact that the functions of administration in this system are entrusted to the executive directorate of the Pension Fund of Ukraine.

At the same time, non-state pension provision as an integral part of the system of accumulative pension provision in modern conditions includes in addition to non-state pension funds many other entities, including those that provide services for administration and asset management of non-state pension funds, performing some functions previously performed the most pension funds. The changes that have taken

place in the mechanism of distribution of functions between the subjects in the system of private pension provision are a direct factor influencing the formation of the peculiarities of the management of the private pension system [15].

In accordance with Part 3 of Art. 64 of the Law of Ukraine "On Compulsory State Pension Insurance" [3] the executive directorate of the Pension Fund is obliged in the process of providing services for the administration of the Accumulative Fund: to provide organizational and logistical support for the Board of the Accumulative Fund; to open a current account of the Accumulative Fund in the custodian selected by the competition; provide the participant of the accumulative pension insurance system at least once a year with a written report on the amount of pension funds accounted for in his accumulative pension account, etc.

Analysis of the provisions of the Law of Ukraine "On Compulsory State Pension Insurance" [3] gives grounds to conclude that the management of the non-state pension system includes the management of the Accumulative Fund, which is carried out by the Accumulative Fund Board, and administration by the Pension Fund of Ukraine.

The structural and functional organization of public administration of the private pension system is shown in Fig. 2.

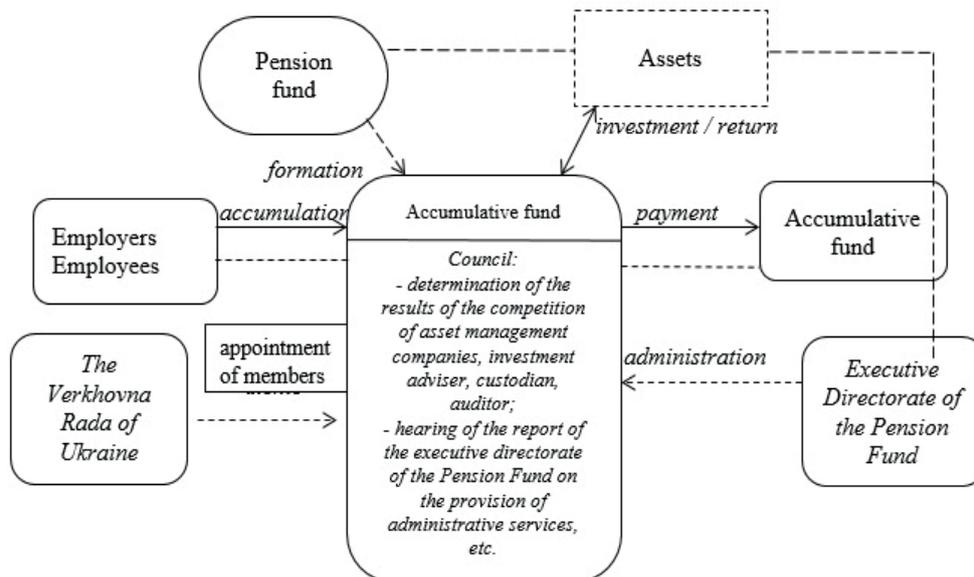


Fig. 2. Structural and functional characteristics of the management of the private pension system

Conclusions. Thus, as a result of the study conducted in this article, we can conclude that in Ukraine the main subject of pension management is the Pension Fund of Ukraine, which has the status of a central executive body and is a self-governing non-profit organization, ie management of the Pension Fund of Ukraine on the basis of

self-government - by the Board (formed on a parity basis by the state represented by the Cabinet of Ministers of Ukraine, employers represented by the All-Ukrainian Association of Employers' Organizations and employees represented by the All-Ukrainian Union of Trade Unions) and the Executive Directorate. Control and supervisory functions are performed by the Supervisory Board, which is also formed on a parity basis by the state, representatives of employers and employees. Territorial bodies are formed by the Pension Fund of Ukraine to manage the sphere of pension provision in settlements.

Management of the private pension system is carried out through the Accumulative Fund, which is formed by the Pension Fund of Ukraine; the administration is carried out by the executive directorate of the Pension Fund of Ukraine. The Verkhovna Rada of Ukraine and the President of Ukraine form a Board within the Accumulative Fund, which manages the Accumulative Fund, including the determination of the assets management company, investment adviser, custodian, and auditor based on the results of the tender.

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PEDAGOGY AND PSYCHOLOGY

THE PROGRAM OF DEVELOPMENT OF ECOLOGICAL CONSCIOUSNESS OF STUDENTS IN INSTITUTIONS OF HIGHER EDUCATION

Inessa Vizniuk,

Doctor of Psychological Sciences, Professor,

Anna Polishchuk,

Candidate of Historical Sciences,

Serhii Dolynnyi,

Assistant of Department of Psychology and Social Work,

Vinnitsia State Pedagogical University named after

Mykhailo Kotsyubynsky, Ukraine,

Inna Skvortsova,

Candidate of Historical Sciences,

Kharkiv gymnasium 39, Ukraine

Annotation. *The article is about development of international cooperation and global partnership to preserve, protect and restore the integrity of the Earth's ecosystems is relevant in such conditions as: rehabilitation of disturbed ecosystems and ecologically unstable regions, efforts to adopt effective laws to protect NPS, and the conclusion of relevant international agreements. development; ensuring free access to environmental information, development of indicators of progress on the path to sustainable development, creation of necessary databases, global and national communications and the use of other means of informatics in order to solve global problems of post-industrial information society; formation of a new legal framework and new principles of management (including supranational and global) in the field of labor protection, nature and environmental management, prevention and elimination of emergencies, which should lead to sustainable greening of economic and social activities; greening of human consciousness and worldview, radical reorientation of the system of education, morality, culture, art, science and technology to new civilized values and goals, etc.*

Keywords: *ecological education, ecological worldview, ecological consciousness, ecological competence, culture of life safety of future specialists.*

Introduction. Dynamic changes in the socio-economic life of Ukrainian society, Ukraine's entry into the European community require significant improvement of environmental education of its citizens, active, predictable changes in the use of modern environmental priorities in educational institutions, in the formation of environmental competence of the individual. ontogenesis.

Thanks to scientific and technological progress (STP) in nuclear energy, modern modes of transport, information and telecommunications technologies, bio- and nanotechnologies, etc., mankind has achieved great success in socio-economic

development. However, along with the positive impact of STP (directly, television, computer technology, media, etc.) on the formation of personality, namely on the development of its cognitive sphere, mental cognitive processes, the formation of worldviews, as we found, they can simultaneously cause destructive psychological, psychophysiological changes, to form in the human mind a number of dependencies, disorders in the psycho-emotional sphere. It depends not only on the duration of communication with such means, but also on the content, emotionality of the material, the readiness of a person of a certain age to adequately respond to them. Depending on the age of the individual, these changes may be of different nature and affect their psychosomatic health differently. The active use of these tools by modern youth indicates a lack of environmental education, knowledge and skills to harmonize the interaction of society and nature, solving environmental problems and sustainable development of society, which causes great harm to human health and personal development and especially its emotional and sensory sphere.

Modern environmental education is a continuous complex process of formation of ecological worldview, ecological consciousness and culture of all segments of the population, social groups and society as a whole. This is the process of mastering the system of knowledge about the laws of functioning, life of all living things, ecological systems and the role of man in preserving the natural environment; the process of environmental education and training, the development of professional knowledge, skills necessary for environmental activities.

The formation of environmental awareness of future professionals in higher education (HEI) will significantly increase the level of spiritual, moral and patriotic education, strengthen the cohesion of society in the face of various global and local dangers, reduce human losses and material damage in emergencies.

2. Analysis of recent research and publications. Laczkovics C., Fonzo G., Bendixsen B., Shpigel E., Lee I., Skala K., Prunas A.; Gross J., Steiner H., & Huemer J. argue that protective mechanisms are activated by mediating maladaptive effects on students' mental health. Dagani J., Buizza C., Ferrari C., & Ghilardi A. proposed psychometric validation of the cultural adaptation of the Italian questionnaire of students-aggressors in an ecological environment. Juneau C., Pellerin N., Trives E., Ricard M., Shankland R., & Dambrun M. substantiated the reliability of the equivalence questionnaire: two-factor equality scale (EQUA-S) students in an educational environment. Acquadro Maran D., & Begotti T. revealed the anxiety of teachers in terms of emotional burnout, disconnection and their self-efficacy in the manifestation of violence in the workplace in difficult situations of increased discomfort and risk. Grub E., Wydra G., Kaefer M., & Koellner V. reveal changes in motor balance during inpatient psychosomatic rehabilitation for health problems in a pandemic situation. Trudel-Fitzgerald C., Millstein R. A., von Hippel C., Howe C. J., Tomasso L. P., Wagner G. R., & VanderWeele T. J. reveal the essence of psychological well-being in discussions on health care and the formation of environmental competence [1, 2]. It is also important to study the peculiarities of the formation of ecological worldview and safety culture in future professionals, which is

why this article is devoted.

The aim of the study was to identify students' initial level of environmental awareness as a complex, holistic, individual-psychological, integrative education that combines socio-cultural knowledge, personal attitude to the eco-environment, in which they can successfully communicate with their representatives, feel confident and comfortable, which characterizes the theoretical and practical readiness for socio-cultural activities and the development of relevant qualities in future professionals.

Lack of environmental knowledge in all spheres of society underlies most violations of environmental legislation and is the cause of inadequate public response. The formation of ecological consciousness is a matter of survival or degradation, and therefore a matter of national importance. And a huge role in this issue is given to environmental education. Priority should only be given to education that prepares learners to address the social, economic and environmental challenges facing society at various levels. This position will make it possible to overcome the alienation of the education system from the environmental problems of the modern world. In this case, knowledge and skills must be supported by action - this will lead to the formation of skills of personal experience. It is necessary to green not only the educational process, but also all spheres of human life and activity, which is the essence of environmental education as a humanitarian basis for raising environmental awareness, the formation of environmental worldview, a crystallizing institution of environmental culture.

Modernization of education, carried out from the standpoint of general progressive ideas and strategies for the development of the educational system, largely depends on the revision of goals, content, structure and process of studying the whole complex of disciplines, including those that provide training for highly qualified professionals. The solution of these problems is associated with the need in recent decades to overcome a number of accumulated common shortcomings and contradictions in the education system itself between:

- declared in normative documents the purposes of formation of comprehensively developed creative highly professional personality, the expert with global thinking and real possibilities of modern subject system of training in ZVO;

- objective need for fundamentalization, humanization, integration, greening of education and rehabilitation of its subjects and the lack of a holistic theoretical concept of training a specialist in environmental worldview and safety culture in higher education in modern state educational standards;

- the need for production of specialists with new thinking (global, environmental, humanitarian, humanitarian) and existing graduates of free economic education with traditional thinking, reflecting clear pictures of the world, formed within individual subjects.

These contradictions can be resolved on the basis of:

- scientific support of the integral educational process of development and formation of the personality by means of creation of the scientifically-objective concept and expedient system of high school preparation, formation and development of culture of

safety and ecological world outlook;

- modernization of curricula for training, interdisciplinary integration of individual subjects, designing the process of their study, as well as the development of students within the modern model of the specialist, ensuring the integrity and dynamism of this process.

That is why the reform of the vocational education system is one of the most effective means of managing the worldview and mentality of man and society. Modern humanistic pedagogy clarifies the existing concepts of preparing the younger generation for life in post-industrial civilization.

Education is gradually switching to the training of human noosphere formation. The scientific and technical potential of the country now has ample opportunities to create advanced educational and information technologies as a basis for the formation of environmental awareness. Training of specialists in the field of education, forming an ecological worldview and safety culture, should be based on the active use of the results of the assimilation of educational subjects to ensure personal and public safety in danger and in emergencies. Today, the training process should be based on methodologically sound consistent direction of the educational process towards the formation of safety culture and environmental worldview using various information about complex emergencies using adapted to the educational process of advanced domestic geographic information systems, multimedia educational and interactive game training programs. promote the development of interest in learning and more effective acquisition of knowledge in the field of protection of the population and NPS, as well as appropriate action in emergencies.

Thus, further development of issues related to the study of motivational and substantive components of the professional readiness of the student ZVO to safe living and the role of specific subjects in the formation of environmental awareness.

3. Research methods. According to the results of the research, the author's development "Program of development of ecological consciousness of students in higher education institutions" was developed, substantiated and experimentally checked. On the basis of our theoretical and methodological analysis of the views of domestic and foreign scientists, as well as the results of psychological analysis of the professional activities of future professionals, the program was based on the conceptual provisions of problem-based learning as management of student activities, according to YI Mashbits (Mashbits', 2019), as well as simulation tools and case method.

3.1. Theoretical foundations of the study. The theoretical and methodological basis of the study is the philosophical concept of the dialectical connection of the phenomena of objective and subjective reality; the connection of theory and practice in the context of the unity of consciousness and activity in the process of personal formation, as well as the main provisions of the theory of cognition and the principle of taking into account the specifics of the educational process in ZVO. In developing the program, the system and personal-activity approaches were taken as a basis as a psychological and pedagogical basis for the training of future specialists.

The program took into account the conditions of unpredictability of current events, lack of time, inconsistency of anticipatory nature of social development needs and the urgent need to master the system of knowledge and skills of future professionals to gather information from different sources and the ability to establish links in decision making.

The formation of ecological consciousness took place through safety skills and abilities by means of simulation modeling, in addition to achieving the just mentioned educational goals, it also has a significant psychological impact. This is primarily manifested in the intellectual development of students. This method in the learning process activates the mental activity of students and their independence, stimulates their creative talents and abilities in solving educational tasks, frees the mind from the framework, patterns, stereotypes, encourages the search for effective ways to solve the problem. "All this contributes to the development of personality, teaches to manage their emotions and rationally plan and organize their activities." Imitation of activities, modeling in educational institutions of various production situations is accompanied by a significant activation of students, which leads to the manifestation of abilities and hidden inclinations of students. The solution of the set educational tasks takes place at a high emotional level, which causes positive feelings in students, and this, in turn, as noted by many scientists, helps to eliminate obstacles to personal development.

Case studies are the training of students with the help of case studies. Case - a description of the situation, namely: the history of creation, organizational formation of the institution (organization, firm), its development and performance. The case method was developed in the 1920s at Harvard University (USA). Today, there are two classic case study schools - Harvard and Manchester (respectively: American and Western European). Their fundamental difference is that American cases are large in size (20-25 pages of text plus 8-10 pages of illustrations). In Western Europe, cases are used in educational processes, which are 1.5-2 times shorter in volume. In addition, Harvard cases offer students the search for the only right solution. In Manchester cases, the search for solutions is multifaceted. There does not have to be a single right decision. Listeners justify their position and, based on theory and practice, defend it. The main purpose of the case study is to acquire skills to work in a particular situation, to mobilize all the acquired knowledge to develop practical recommendations for solving a problem contained in the situational problem. On the way to this goal, students master the skills of logical understanding of the problem, develop managerial thinking, train intuition, improve the ability to discuss and defend their views.

In the process of formation of ecological consciousness of future specialists, practical classes with the use of case studies become very important. This is a form of study where the teacher organizes a detailed consideration by students of certain theoretical topics and develops skills and abilities for their practical application by individual performance of relevant tasks by the student. This method of teaching allows students to use theory in practice, deepen their knowledge, learn to solve specific problems, discuss specific situations, express their opinions, defend their views. The

authors are constantly conducting practical work with the use of cases in classrooms equipped with the necessary technical means of learning. The organization of the lesson covers several areas: theoretical understanding of the lesson, instruction, performance of work, discussion of educational material with students and assessment of knowledge. After updating the topic, the teacher checks the level of preparation of students for the lesson and determines how they have theoretical material.

The program of development of ecological consciousness is a complex of purposeful influence of the teacher on the cognitive, needs-motivational and operational spheres based on the leading type of professional activity and taking into account individual psychological features of future specialists.

3.2. Methods of conducting a pedagogical experiment. The research was carried out on the basis of Vasyl Stus Donetsk National University and the Vinnytsia Academy of Continuing Education (Vinnytsia). The experimental study involved 388 people, including 201 students, 97 teachers, 90 managers on the basis of practice, including 78 stakeholders who provide employment for future professionals, taking into account their professional experience: at the beginning of training, in the process of training and practice. The sample of subjects was a category of persons aged 17 - 64 years. The experiment was conducted by the decision of the Municipal Institution of Higher Education "Vinnytsia Academy of Continuing Education" at the Department of Psychology (protocol № 12 from 29.09.2020). The ethical rights of all participants are respected. The study was conducted in the natural conditions of the educational process of ZVO, with the provision of general conditions for participation in the experiment: the same time and duration of training, the same measuring materials to diagnose the level of environmental awareness according to environmental competence assessment criteria.

4. Results. The effectiveness of the proposed program was tested in two stages. Thus, at the beginning of the 2020-2021 academic year, a diagnostic study of the level of formation of environmental consciousness in future professionals according to certain criteria (Table 1) and levels (Table 2). We have identified complementary criteria for the systematic development of professional thinking of future professionals: cognitive (in order to develop the ability to think logically and make decisions), need-motivational (for self-development, accumulation, systematization of professional knowledge, self-actualization and realization of their capabilities), and operational (for the purpose of professional professionalization and professional growth). The results of the study of the levels of formation of ecological consciousness are presented in table 2.

In order to ensure the representativeness of the study, the choice of control and experimental groups was carried out randomly. Thus, the control groups included study groups with odd numbers, and the experimental groups with even numbers. Since the faculties of psychology have certain peculiarities regarding the qualification requirements of the specialists who study, it was decided to form control and experimental groups. The experimental group (EG) was formed of 201 people. The rest of the study participants (187 people) were assigned to the control group (CG), which already have the skills of environmental competence and formed an eco-worldview in

agreement with their professional experience and education. To increase the reliability of our study, the homogeneity of control and experimental groups was tested using the statistical criterion χ^2 Pearson. The distribution according to the levels and criteria in the control and experimental groups is given in Table 1. The empirical value of the criterion was calculated using a calculation program based on Microsoft EXCEL software. The obtained empirical value of the criterion was compared with the critical $\chi^2_{kp} = 7,8815$ ($\rho \leq 0,05$) and $\chi^2_{kp} = 11,345$ ($\rho \leq 0,01$). Statistical hypotheses were constructed as follows:

The main H0 - the distribution of respondents according to this criterion in the groups of EG and CG does not differ; Competing H1 - the distribution of respondents according to this criterion in the groups of EG and CG differs significantly. When comparing the obtained empirical value with the critical one, a choice is made in favor of H0, if the empirical value is less than the critical one. If the empirical value of the criterion is greater than the critical one - hypothesis H1 is valid, and the greater the empirical value - the greater the reliability of changes, and the probability of error decreases. It should be noted that all the restrictions of this criterion were met by us.

Table 1

Criteria for environmental competence of future professionals

Criteria of ecological competence	The experimental group (201 people)				The control group (187 people)			
	Before the experiment		After the experiment		Before the experiment.		After the experiment	
	Number	%	Number	%	Number	%	Number	%
Cognitive	42	20,89	63	31,34	61	32,62	64	34,22
Need-motivational	71	35,32	67	33,33	65	34,76	66	35,29
Operating	88	43,78	71	35,32	75	40,11	71	37,96
χ^2_{emp}	0,2370		0,4655		0,4247		0,5906	

The results of the study indicate that for all criteria the levels of formation of ecological consciousness, the empirical value of Pearson's criterion did not exceed the critical values. Thus, in all cases, the basic statistical hypothesis is accepted that there are no differences between the respondents of all groups according to the specified criteria (cognitive, needs-motivational and operational). The experimental work was carried out during 2020 - 2021 as part of a formative experiment and at the final stage was re-checked the formation of levels of relevant criteria of professional thinking of future border officers, the results of which are presented in Table 2. Statistical processing was performed using Excel software. The obtained empirical values of the criterion turned out to be greater than the critical ones, which testifies to significant differences between the respondents of control and experimental criteria of ecological competence according to the levels of formation.

The results of the study at the final stage showed that future professionals have made positive changes in the formation of the appropriate level of environmental awareness (Table 2), which indicates the achievement of the purpose and objectives of the formative

experiment.

Table 2

The level of environmental awareness in future professionals

Development level	The experimental group (201 people)				The control group (187 people)			
	Before the experiment		After the experiment		Before the experiment		After the experiment	
	Number	%	Number	%	Number	%	Number	%
High	48	23,88%	78	38,81%	45	24,06%	62	31,55%
Satisfactory	101	50,25%	109	54,23%	100	53,48%	107	57,22%
Low	52	25,87%	14	6,96%	42	22,46%	21	11,23%

Thus, the consideration of modern global environmental problems only through the prism of physical "external limits of growth" (depletion of natural resources, environmental pollution, population growth on the planet, the arms race and, above all, the use of nuclear weapons) can not solve the problem. They are closely connected with the political, social and moral problems facing humanity. It is obvious that the ecological crisis is a consequence of the wrong value orientation, which guides people in their practical activities to transform the natural environment. The basis of the new approach to environmental protection (NPS) should be a new worldview (cognitive, needs-motivational, operational competencies), the focus on understanding that man is only one of the biological species of the biosphere as well as plants, animals, etc., that he must live in harmony with nature, study and be guided in its life by the laws of functioning of the biosphere.

This approach to environmental problems, aimed at awakening the ecological consciousness of people, is very important in terms of understanding the essence of the relationship between society and nature, as well as understanding the sources of contradictions that arise between man and the environment. Ensuring the environmental security of our Ukraine as a condition for achieving a sufficient standard of living for its population, also involves changing the existing priorities to environmental in all aspects of public policy, economics and law. This can be achieved only by implementing environmental ideology, changing the value system of society as a whole. That is why everyone must understand the essence of environmental problems and be responsible for what they have done. The formation of a responsible attitude of citizens to the environment is associated with a long-term breaking of the consumer stereotype of behavior, which should be directly corrected in the environment of the free environment.

5. Discussion. The human factor is manifested in relation to both material culture (for example, the development and operation of equipment) and spiritual culture (awareness of the behavior of workers in matters of personal safety, safety of others and the culture of safe production). Thus, there is a relationship between the causes of industrial destruction and injury: the lack of a culture of individual behavior, a culture of interpersonal relationships, technological culture, production culture and safety culture.

Thus, the conceptual basis of such a system of relations is based solely on the

priority of personal interests and ignoring public, disregard for the principles of unity of rights and responsibilities, the rejection of moral and ethical norms. However, it must be understood that the current stage of socio-economic development must be accompanied by observance of the norms of ethics and morality of those humanistic values that are inherent in Man, who bears the title of "intelligent being." The fall of these values inevitably causes irreparable damage to humanity, leads to numerous catastrophes, and endangers human health and life. This situation can be corrected only by changing the culture of public consciousness. And its formation at the citizen occurs at all stages of training, including, at final - in ZVO. The culture of security not only contributes to the spiritual development of the individual, but also is a way to unite people with a humane attitude to each other, as well as a conscious, responsible attitude to security issues in all spheres of human activity.

According to this concept, we can identify the basic principles of sustainable development of ecological worldview in humans:

- Everyone has the right to health and to a fruitful life in harmony with nature; living in an environmentally friendly and favorable environment;
- socio-economic development should be aimed at improving the quality of human life (improving health, increasing life expectancy, obtaining the necessary education, guarantees of freedom, rights, etc.);
- development must be carried out in such a way as to meet the needs not only of the present but also of future generations;
- the preservation of the environment should form the basis of any national policy; and this should be taken as an integral part of the development process, so economic development, the social sphere and environmental security must be integrated into a single whole;
- improving the quality of life should be ensured without exceeding the level of economic capacity of ecosystems, which can lead to their destruction;
- the criterion of progress should be safety, first of all, ecological;
- rational use of nature should be based on the maximum possible reduction of the use of non-renewable natural resources and expanded use of secondary resources, safe utilization, waste disposal, development of new safe technologies, techniques, tools, etc.

Due to environmental education, upbringing and education, people will undergo a process of greening of public consciousness.

Therefore, the greening of education should be precautionary. The content of environmental education can acquire a national character due to the wide involvement of the achievements of ethnopedagogy, local lore, folk traditions. In order to respect the native nature, we will be able to get rid of the terrible environmental consequences and contribute to the preservation and restoration of the biosphere as a whole.

Conclusions. Thus, the task of teachers is: constant introduction into the educational process of various teaching methods that fully activate the activities of students, reconciling learning with life and practice; constantly improve the forms of training aimed at mastering specific types of professional activities. For high-quality training,

students must know and possess sound theoretical knowledge, practical skills that would allow in practice not only to improve working conditions and productivity, but also to prevent the possibility of occupational diseases, occupational injuries, accidents and more. Such methods, which intensify training, help to improve the practical training of future professionals.

The statistical processing of the data of the pedagogical experiment confirmed the high probability of the results of the study. For the first time it has been practically proved that conducting practical classes with the use of simulation tools using the improved content of practical work gives a significant improvement in the formation of ecological worldview and safety skills. Since in the control groups we used traditional forms of education, and in the experimental ones - mostly simulation methods, after the end of the experiment the level of formation of labor protection skills was higher by students of the experimental groups by an average of 20%.

Systematic study of psychological principles of formation of ecological worldview of future specialists allowed the author to reach a new level of theoretical understanding of the peculiarities of respondents' thinking on the basis of problem-based learning and to develop "Program of development of ecological consciousness of students in higher education". Thus, the results of the experimental study of the development of ecological consciousness of future specialists proved the effectiveness of the developed author's program. Unfortunately, the volume of the article does not allow the author to submit all the results of the study. Ways of further scientific achievements are the development of practical recommendations for teachers of educational institutions of Ukraine on the use of the program of development of ecological worldview in applicants for higher education on the basis of problem-based learning.

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SOCIAL AND PEDAGOGICAL SUPPORT FOR REHABILITATED DRUG ADDICTS: CONCEPTUAL ASPECT

Oleksandr Klochok,

postgraduate student,

*Communal institution "Kharkiv Humanitarian and Pedagogical
Academy" of the Kharkiv Regional Council, Ukraine*

Annotation. *the article reveals the main definitions of the problem of socio-pedagogical support of rehabilitated drug addicts, including the concepts of "social policy", "social work" and "social assistance", they create the basis for understanding the basics of professional activity in the context of this work and to find out the essence of the key definition of the study "socio-pedagogical support of rehabilitated drug addicts".*

Keywords: *social policy, social work and social assistance, social and pedagogical support of rehabilitated drug addicts, drug addicts.*

The urgency of the problem of social support for rehabilitated drug addicts is due to the need to accumulate scientific research on the existence of such an individual in a dynamic social environment and the development of effective social assistance to optimize its capabilities in all circumstances.

When considering the nature and specifics of socio-pedagogical support for rehabilitated drug addicts in self-help groups, it is necessary to consider derivative definitions used in the scientific literature. Such, in our opinion, are the concepts of "social policy", "social work" and "social assistance", they create the basis for understanding the basics of professional activity in the context of this work and avoid conceptual inconsistencies and inaccuracies in understanding the concept of social pedagogical support "as a kind of socio-pedagogical activity.

The analysis of recent publications shows that I. Zvereva, L. Koval, N. Zaveriko, V. Kurbatova, S. Kharchenko devoted their research to the development of the state's social policy on the implementation of social work, namely, its socio-pedagogical aspect; problems of social assistance of the individual were developed by scientists K. Dubych, V. Kostyuk, S. Kuzmenko, M. Nakonechna; theoretical and methodological problems of social work were studied in the works of scientists A. Andryushchenko, I. Kozubovska, G. Laktionova, I. Myhovych, G. Popovych, issues related to the provision of assistance to drug addicts in different angles were studied by P. Andrukh, S. Bukaeva, Yu. Valentyk, B. Vaisov, S. Kopytin, M. Vostroknutov, Yu. Chernetska. However, we found insufficient scientific work that would fully meet the research needs to understand the essence of socio-pedagogical support for rehabilitated drug addicts, which will be the purpose of this article.

Turning to the main material, we note that researchers who have dedicated their research to the problem of social assistance to vulnerable groups, in particular V. Buyashenko, note that among these three concepts, the definition of "social assistance"

is a broader concept [1, p. 162]. We do not agree with this opinion, because we consider social assistance as a kind of social work, and the latter is the direction of the state's social policy to implement the rights of all its members.

The basis for the implementation of social policy is a number of adopted legislative acts on working with vulnerable groups. Such documents include - Laws of Ukraine "On Charitable Activities and Charitable Organizations" (2018), "On Prevention and Counteraction to Domestic Violence" (2017), "On Volunteering" (2015), "On Social Work with Children and Youth in Ukraine" (2001), Resolution of the Cabinet of Ministers "On approval and identification of families (persons) in difficult life circumstances, providing them with social services and social support of such families (persons)" of 20.11.2013 № 896, and a tool for their implementation is social and socio-pedagogical work.

In social pedagogy, thanks to the works of I. Zvereva, L. Koval, N. Zaveryko, V. Kurbatova, etc., there are several approaches to the consideration of this concept. Thus, in general, "social policy" - is public action to address societal problems, in the narrow sense - and in the sense that is relevant in this study - are actions aimed at implementing the principle of social justice and social partnership as the core values of modern civic society [2, p. 236-239]. The essence of the state's social policy on the possibility of providing social and pedagogical support to rehabilitated drug addicts in aid groups is to provide guarantees at the national level to promote their social development and further realization of their rights as citizens declared by the Constitution of Ukraine.

As noted above, the social policy of the state is seen as a methodological basis for social work. Thus, scientists (V. Savka, S. Snisarenko) [3] study the priority issues of social work in the transformation of society, mechanisms for providing social services at the territorial level, study the technology of social work in different conditions of social transformation.

In addition, the state creates a legal basis for the implementation of social policy. Studying the organizational and legal aspect of the implementation of social work of self-government bodies with youth, researchers E. Borodin, K. Raevskaya note the leading role of the state and its social policy in implementing such activities, enshrined in the Constitution of Ukraine. everyone deserves a existence that contributes to overall social progress [4]. V. Kostyuk emphasizes this, studying such a direction of social policy implementation as social assistance [5].

Exploring the issue of state social assistance, S. Kuzmenko understands this concept in a broad sense as "purposeful activities of all government agencies, providing guaranteed state social assistance, subsidies, compensations, benefits, essential goods and social services to citizens who are in difficult life situation, including caused by poverty" [6, p. 1-5]. K. Dubych holds the same opinion, seeing the meaning of social assistance in the system of social actions in the form of social support, assistance, benefits, subsidies provided by social institutions (services), individuals or groups of the population to overcome or alleviate life difficulties, maintaining their social status, ensuring full life in society" [7, p. 40]. However, the latter definition brings us somewhat closer to understanding the essence of our own concept of socio-pedagogical support for

rehabilitated drug addicts in self-help groups, as some features of this definition indicate the following: a) we are talking about specific people (group of people) who need help; b) the essence of care is reduced to overcoming (reducing) the stress of life, crisis, problem that a person feels; c) the purpose of such assistance is the social adaptation of the individual at different levels.

Notwithstanding the fact that direct social assistance in this context is not provided in self-help groups for rehabilitated drug addicts, the state does not exclude the right of such a person to receive it by registering with the relevant local governments, if it does not contradict current legislation.

Consider the essence of the concept of "social work", which in meaning and content brings us closer to understanding the concept of "social and pedagogical support".

Note that the issue of social work is well covered in the scientific literature. Methodology and theoretical prerequisites for understanding the problems of social work are laid down in the fundamental works of M. Weber, E. Durkheim, T. Parsons and others. scientists. The theoretical and methodological basis of social work as a science are the works of Russian scientists S. Belicheva, V. Bocharova, I. Zymnaya, P. Pavlenko, A. Firsov, E. Kholostova, B. Shapiro, V. Yarska and Ukrainian scientists A. Andryushchenko, I. Kozubovska, G. Laktionova, I. Myhovych, G. Popovych, in particular, the socio-pedagogical aspect of social work was studied by O. Bezpalko, I. Zvereva, A. Kapska, G. Koval, V. Polishchuk, S. Kharchenko and others.

According to O. Karpenko, "social work" is the influence of the public, professionals, individuals on the social development of society through the formation and implementation of state social policy aimed at creating favorable conditions for life of each person, family, community [8].

In Russian intelligence, the definition of "social work" is used as well as in the domestic field, in understanding the instrument of state social policy, "a special activity aimed at meeting the socially guaranteed and personal interests of various groups, creating conditions conducive to recovery or improving people's ability to function socially. The main purpose of social work, while ensuring the well-being and disclosure of opportunities and abilities of the individual, family, society to normal social functioning" [9, p.5].

Based on the scientific achievements of A. Mudryk [10, p. 10-11], we note that social activity is realized under the influence of macro-, meso- and microfactors.

We agree with V. Buyashenko that "social work" at the macro level is a system of certain measures to improve the living environment of people. At the meso level, "social work" is an activity of helping a person, family and various groups of the needy. At the micro level, "social work" is an activity aimed at meeting the needs of the individual. At this level, "social work" appears as a type of professional activity aimed at restoring or maintaining social and psychomental ties of the individual with society, group or individual [1, p. 163]. The factor approach to understanding the problem of providing social and pedagogical support to rehabilitated drug addicts allows to identify factors that will improve the level of social services, so their consideration is very important when studying the features of social work with rehabilitated drug addicts.

Over the years of creating a system of social work in world practice has accumulated a lot of understanding of the essence of this activity. Foreign researchers (F. Neumann, S. Ramon, S. Shardlow) identify social work with the provision of social assistance through the receipt of social benefits and social distribution, as well as the provision of social services [9, p. 8].

Scientists A. Andryushchenko, M. Lukashevich and others, based on the research of Russian researchers V. Bocharova and E. Kholostova, understand "social work" as a professional activity to provide assistance to people with disabilities, groups and communities, strengthening or reviving their ability to function and creating favorable conditions for achieving these goals [11, p. 123-125].

Thus, having clarified the meaning and place of the definition of "social work" among other studied concepts, we turn to the consideration of "social support" as the main definition for our study - "social and pedagogical support of rehabilitated drug addicts in self-help groups."

To this end, we turn to reference and scientific sources. Thus, the Great Explanatory Dictionary of the Modern Ukrainian Language does not define the word "support", but redirects to another definition of "support" - to provide material, moral assistance, to promote something; to keep, not to allow to perish; sharing views, showing sympathy, speaking in defense or on the side of someone or something [12, p. 785]. As we can see, the meaning of this definition is revealed through the co-creative activity of the one who provides and the one who needs help.

The Law of Ukraine "On Rehabilitation of Disabled Persons in Ukraine", № 2961-IV, dated 06.10.2005, interprets the term "psychological support" as a system of socio-psychological, psychological-pedagogical methods and methods of helping a person to optimize his psycho-emotional state in the process of formation abilities and self-awareness, promoting socio-professional self-determination, increasing competitiveness in the labor market and directing a person's efforts to realize their own professional career" [13].

Socio-pedagogical support as a scientific concept has no established interpretation and is almost absent in scientific works of social orientation. The pedagogical direction is more developed, in which the terms "pedagogical support", "psychological and pedagogical support" meet thanks to the scientific achievements of scientists O. Gazman, N. Kirillova, S. Yusfin and others.

Among the definitions of social significance, we found the definition of Claudia Dubych: "it is a system of special measures, methods and techniques aimed at supporting vulnerable groups (individuals, individuals or groups) who feel the need or difficulty in life" [7, p. 40]. We share the author's view, and add to the essence of this definition the opinion of another researcher of the problem of helping others in a psychological context - M. Nakonechna, who in her monograph argued that "helping interaction allows another person to better understand themselves, take a personal position, be sub project...» [14, p. 20].

The closest to one's own understanding of the concept of "social and pedagogical

support of rehabilitated drug addicts" is the definition of N. Zaveriko, who in relation to children with special needs understands it as "socio-pedagogical activities aimed at identifying, identifying and solving child problems to implement and protect it rights to full development and education" [15, p. 131]. The author identifies the concept of "support" and "assistance", seeing the content of the latter definition in the activity, which aims to bring relief to someone in something, and the content of support reduces to the actual implementation of this system of measures, ie the subject (social educator) to provide such assistance.

Based on the above definitions of "socio-pedagogical support of rehabilitated drug addicts", we will understand as a specially organized activity of a social educator with rehabilitated drug addicts, which takes place in self-help groups to identify, identify and solve problems of clients for their full resocialization.

Thus, analyzing the definitions from the conceptual range of "social policy", "social work" and "social assistance", we came to the essence of the main research concept of socio-pedagogical support for rehabilitated drug addicts, which is that it is a specially organized activity of a social educator. to identify, identify and solve customer problems in order to fully resocialize them.

A promising issue for further elaboration of the problem will be the study and description of the purpose, content, principles, forms and methods of providing socio-pedagogical support to rehabilitated drug addicts in self-help groups.

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CULTUROLOGICAL COMPETENCE – A CLUE COMPETENCE OF A FUTURE TEACHER

Daria Korovii,

postgraduate student,

Assistant of the department of English philology,

The Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ukraine

Annotation. Nowadays young pedagogues and future scientists face many challenges. That is not enough to be a qualified specialist in a narrow sphere of activity, to have basic skills and abilities, to teach the same that you were taught. A modern pedagogue – is a multifunctional personality, who has knowledges, skills, and abilities in different spheres of activity, is a complex of competences, among which the most preferable is culturological competence. The notion of culturological competence and the necessity of mastery the same competence by future teachers are justified in the article.

We can often meet the following terms «competency» and «competence». There is an essential difference between the interpretation of these two terms, which are very important in pedagogical research. The author differentiates two terms «competency» and «competence» for better understanding of the main notion of the research.

Culture – is ideas, approaches, traditions, customs, values, preferences, and all things that take part in the formation of culturological competence. Taking into consideration the definitions of two terms: competence and culture, we can combine and synthesize these two notions to investigate the notion of the term culturological competence, which is the main in our research. Culturological competence as one the component of future teacher – is an integral, integrative, multilevel notion, which is being formed while a training process of specialists, future teachers at universities and during a process of achieving knowledge during the whole life. The significance of formation of culturally oriented person is defined.

We pay a special attention to the process of modern state of achieving knowledges. We outline the demands to a modern future pedagogue and his\her activity.

Keywords: culture, competence, culturological competence, competency, institutions of higher education, pedagogue, teacher, student.

Introduction. We live in a fast-passed world and face a process of globalization and eurointegration. It is impossible to imagine our life or different spheres of human activity, which would not be influenced by these phenomena. Leaders of countries make agreements and cooperate in economic, political, social, cultural, scientific, social and other spheres of human activities. Nowadays the most important are intercultural connections, as a bridge between different nationalities, help to establish contacts and continuous interaction. All these processes are carried out due to awareness of identity and uniqueness. Moreover, a conscious respect to other nationalities, their recognition and understanding of culture as a language of international communication play a crucial role.

Globalization is a continuous process of spreading information and knowledge in economy, politics, science and society. In other words, this is a world-wide progress

and interconnection between countries and their structural elements. In order to measure globalization as a qualitative indicator, the Swiss Economic Institute KOF invented the Globalization Index (Kof Globalisation Index), which measures economic, political and social levels of globalization since 1970, in order to understand trends of global relations after the Cold War. The KOF Globalisation Index USA in 1970 was 58.85, in 1991 – 70.69, and in 2018 – 82.28. In comparison, Ukraine has appeared only in 1991 in this list after independence achieving – 33.01, and in 2018 the index was already 74.95. Despite the fact that Ukraine drops behind USA in amount of 7.3 points, we have chances to reduce the difference in future. Ukraine shows a positive tendency and increase of 127%, and the USA – 16%. [19].

According to the following data, it should be emphasized that globalization has a direct impact on the development of science and the rate of knowledge spreading in society. Taking into consideration this fact, current global processes create new challenges for education system, especially due to global pandemic – COVID-19. Coronavirus plays a crucial role, it causes many changes, raises a lot of questions, connected with preparedness to changes in an educational system and science at all. A process of transition into distance education and the implementation of blended education are new achievements, which were made due to global problems. We must confess that nowadays knowledge is spread with the help of modern technologies, a worldwide Web and the appropriate technical support of all participants in the educational process. Information technologies and educational process will never go separately.

Modern education requires a highly qualified specialist, sophisticated, educated and knowledgeable in various areas of human activity, consequently, a specialist of a new level of professional training, among which the cultural competence is of the great importance. A future teacher is obliged to possess not only the basic skills and abilities of his profession, but also to master foreign languages, have knowledge in humanity and constantly expand horizons, which contribute to the formation of a certain cultural level.

We can't help mentioning the fact that a competent teacher, specialist – a person who is involved into the general cultural world of values, whereas the implementation and improvement of personality throughout his or her life is realizing. What is more, we agree with words of O. Konovalov who says that «a person who has not only sufficient level of knowledge, skills, and abilities..., but also has the ability to continuous self-education» [7, pp. 39-45].

Methods. The investigation, analysis and testing of the notion of «cultural competence» and the problem of its formation in future teachers is quite popular today. This competence is especially relevant in connection with changes in the learning process, information technology and the destruction of so-called invisible barriers between countries.

Taking into consideration the processes of globalization and integration of Ukraine into the European and world educational space, we face a key problem – a question of overcoming language and cultural barriers. Future teachers need to have a high level of cultural competence for an effective professional activity.

According to the research which have been made by A. Galenko and O. Kovalenko, culturological competence of students – is one of the professional competences, integrated quality. This quality is reflected through the upbringing of the individual, his or her ability to be spiritually and aesthetically educated, to have a broad outlook. Moreover, knowledge in national and cultural spheres is quite important, among them are traditions, customs, holidays, realities, spiritual values, and spiritual heritage of the nation. The ability to find components of spiritual and material culture in ethnotexts, language and oral folk art, the ability successfully and expediently operate and present them to students, the ability to identify themselves as a representative of a nation, be a resource of a culture, form a linguistic picture of the world and influence on the process of becoming a personality. as a whole – are integral for a real professional [3], [5]

Scientists O. Pankratova and L. Khomych consider the culturological competence of the future teacher as a set of all accumulated knowledge about culture, which allow to create a holistic picture of the world. Scientists think that in the process of preparation, the formation of systemic knowledge about a person as a subject of the educational process, a person who combines learning, education and development is formed. The main thing to build a holistic picture of the world is to ensure the organization of education in the pedagogical institution, where each discipline plays a role, helps to clarify this picture. Moreover, each discipline is a mean of general development and a basis for further professional activity [12], [14].

The following scientists study, investigate and analyze the notion of culture of another nations in the process of learning a foreign language: B. Blazgin, R. Grishakov, I. Zakiryanov, O. Selivanov, T. Ter-Minasov, V. Topalov and others.

Results. We have come to the conclusion that in the modern world the culturological competence of a teacher occupies a significant place, because teachers are the bearers of culture. A teacher, regardless of the specifics of the subject, is the source of culture, he influences on the formation of worldview and conscious attitude to values and traditions, the formation of the individual as a whole.

To sum it up, culturological competence, as one of the components of a future teacher – is a holistic, integrative, multilevel notion that is formed during the process of specialists' and future teachers' training in educational institutions and in the process of acquiring knowledge throughout life. Components of culturological competence contribute to the socialization of the individual, the formation of views, pedagogical skills, motivate to self-realization, self-improvement and self-development. Therefore, we plan to study in more detail the components of cultural competence, characterize them and explore the features of the formation of future teachers in future.

Discussion. Professional activity, constant training and continuity of teacher education – are processes of acquiring competence-oriented knowledge, awareness of values and the general process of socialization and globalization.

The beginning of the XXI century is characterized by a certain dynamics of international and interethnic contacts, and this is what causes certain changes in society and in the world in general. Today there are fundamental changes and processes aimed

at creating a new society – the European socio-cultural space.

There are two main principles of the formation of cultural competence of the individual: the humanization and humanization of education.

The first principle provides an opportunity to increase academic hours in disciplines related to improving the culture of the individual. That means that there is the inclusion of the necessary components in the curriculum of all subjects and their consideration in one direction, the creation of non-formal education.

According to the second principle – E. Lyakhovych explains the humanization of education as globalization in the transmission of cultures. We can't help mentioning the fact that methods and content of transmission are focused on the modern achievement of universal spirituality, morality and intellect. The process of socialization should facilitate a search for and implementation of new ways of discovering and forming skills, abilities and capabilities [9, pp. 15-23].

The institution of higher education – is a section in the system of social institutions and it forms a future specialist, his or her culture and enlightenment. Cultural competence has a very important scientific and social significance and requires more modern and innovative comprehension, the usage of pedagogical techniques and humanitarian impact on each student, his or her development and formation of personality.

Further we would like to consider the key notions as «competence», «competency» and «culture». First of all, let's describe the difference between two notions: «competence» and «competency».

Every day a person performs certain actions, engages in certain activities and gains experience in overcoming tasks. All activities consist of actions, operations, the implementation of which is based on knowledge, skills and abilities. By performing these actions according to a certain sequence and technology, a person develops competence, his or her ability which is related to inner qualities and abilities.

Let's give several definitions for better understanding of the term of «competence».

- Sufficiency, compliance, ability to perform a specific task, job and responsibility; general abilities and skills, mental abilities – definition from the explanatory dictionary of the English language [20].

- J. Spector explains like the ability to perform activities, tasks or work according to a certain demands; a set of knowledge, skills and attitudes that enable an individual to act effectively or perform certain functions aimed at achieving certain standards in a professional field or a certain activity [18, 298 p.).

We can't help mentioning the fact that there is a contradiction between two notions of «competence» and «competency». Some researchers treat them as synonyms, while others explain their connection, but in any way their synonymy.

According to the researches of some scholars, this inexactitude arose precisely because of the inaccuracy in English translation. N. Nagorna points out that it is a mistake in the translation of the recommendations of the Council of Europe. Whereas «competency» was translated into competence according to the similar pronunciation. So, one English word «competency» corresponds to two Ukrainian equivalents: competence

and competency [11, pp. 266-268]. We have determined that the notion of competency (kompetentsiia) corresponds to the English term «competency», appropriately, the notion of competence (kompetentnist') in English – is «competence».

N. Bibik supports this theory and notes: «borrowing terminology from foreign publications due to inaccurate translation has introduced many misunderstandings in clarifying phenomena that are not new to the Ukrainian terminological tradition or pedagogical reality» [1, 11p.].

M. Holovan distinguishes the difference between the notion of «competency» and «competence» in his researches, and explains that the concept of «competency» is related to the content of activity sphere, while the concept of «competence» characterizes the ability to perform certain actions [4, pp. 224–234].

Let's give several definitions for better understanding of the term of «competency».

- Competence – good knowledge of something; the scope of powers of a particular organization or a person. Competent – who has a sufficient level of knowledge in any field; qualified, based on knowledge, well acquainted with something, intelligent – the definition from The Great Explanatory Dictionary of the Modern Ukrainian Language [2].

- V. Kraevsky and V. Khutorsky notes the complex generalized ways of activity which are mastered during training, and competence is result of acquisition of complex of competency [8, pp. 8-10].

Consequently, taking into consideration all the definitions and interpretations of both the concepts of «competence» and «competency», we came to the conclusion that competence implies the possession of a certain competency. Besides, the notion of «competence» cannot be contrasted to knowledge and skills, as competence is broader concept. Competence can be defined as a set requirement for the knowledge, skills and abilities that a person must possess in order to succeed in a particular field. Competence – is an acquisition that is based on one's own experience, knowledge, skills, abilities.

The notion of «culture» is also very important for our research, especially in the context of learning a foreign language. So, culture is an integral part of our lives. From our birth and throughout life, we are like a sponge, absorbing knowledge about what and who surrounds us. Our parents teach us in everyday life, teachers give us knowledge at school, and in society we subconsciously accumulate certain knowledge from everything around us. Culture is, of course, one of the most important components of nationality, it orients and differentiates in the world. What is more, that is impossible to learn a language without the accompaniment of the cultural realities of a people, and especially for learning a second language, its awareness and acceptance.

There are many definitions of the term «culture», there are some basic definitions of this concept for better understanding.

- E. Taylor explains as a complex that includes knowledge, beliefs, art, morality, laws, as well as other abilities and skills acquired by a person as a member of society [13, 21p.].

- L. Matveeva says that this concept distinguished the way of human life from other ways of life. Culture is a characteristic of human society in which the observance of

rules and norms of behavior is ensured by a combination of social pressure and value prestige [10, 512 p.].

In conclusion we can say that culture is a set of all knowledge, values, ideas, customs, traditions, rules of behavior and norms of communication. This treasury is enriched throughout life, and is reflected in the social and professional activities of human.

Cultural orientation begins from the birth. Growing up, we learn the first language, inherit traditions, customs and culture of our nation. Taking into consideration this fact, we can say that when a student begins to learn another language unfamiliar for him, this student can not be called a "blank sheet" from cultural point of view, opposed to linguistic one. S. Savignon and P. Sysoyev point out: «The process of studying a foreign language does not start from «absolute zero». Until this moment when students begin to study the foreign language and culture of this nation, they have already formed certain concepts, stereotypes and expectations about the language and its cultural realities, which are still unknown for them. These expectations are not fixed and unchanged. But they will influence on students` perception, understanding and interpretation of the second language culture [22, p. 510].

First of all, we may not even guess our own cultural orientation, especially in its deeper aspects, such as the system of beliefs and values. The depth and importance of values can be underestimated or not given much importance at all. But according to Lo Bianco, culture «culture is always present» and it is «omnipresent» [15, 26 p.]. What is more, our cultural orientation can be transferred to others. Omaggio Hadley emphasizes that our cultural experience forms our «attitudes, emotions, beliefs, and values, and the associated dangers of making our own system of marks on the culture that is in the process of investigating» [21, 359 p.]. The concept of value and a mark system has become very important, especially due to learning English as a foreign language, what is more we should remember that English has a special status and role. We can say that English is an international and global language. For example, M. Bayram, K. Morgan and their colleagues, among the goals of learning foreign languages distinguish the development of a positive attitude to the study of foreign languages and to native speakers and a favorable attitude to other cultures and civilizations [16, 15 p.]. D. Graddol points out that «English is the national language of most free market relations, an important aspect that ensures economic globalization and often represents certain cultural, economic and even religious values» [17, 66 p.].

Speaking about culture, it should be mentioned that this notion is relative, not absolute. We can say that the culture of another nation can be realized only through the prism of their own. Taking into consideration this fact, students during the process of studying and teachers during teaching rely on their own experience, that means that they contrast what «they» do with what «we» do according to a number of certain criteria.

All in all, pedagogical techniques and approaches that help students to think objectively about their own culture are especially important, because teachers and students must be clearly aware of their position at the initial stage of learning language and culture. The importance of students gaining an objective point of view is also

obvious, moreover, while learning a foreign language, students try on the role of researcher, ethnographer, anthropologist, and others. But firstly, a very important factor is the awareness of their own system of marks. Because only with a conscious attitude to one's own system of values, a student can comprehend those traditions, customs and rituals which are not common for his or her nation.

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THE ROLE OF ENERGY SECURITY IN ENSURING THE NATIONAL SECURITY OF THE STATE

Vladyslav Kuz,

*postgraduate student of Leonid Yuzkov,
Khmelnytskyi University of Management and Law*

Annotation. *The article deals with the study of the role of energy security in the system of economic security of the state. The essence and the content of the concepts “economic security”, “energy security” are determined. Factors influencing the functioning of the national and world energy market are identified. The key measures of institutional, regulatory, material support in order to accelerate the modernization of the fuel and energy complex and ensure energy efficiency of the economy are considered.*

Keywords: *state regulation, energy security, economic security, national security.*

Formulation of the problem. The intensification of globalization processes creates objective requirements for the state to build a well-balanced development strategy and international partnership. At the same time, the problems associated with the ensuring of the effective national and energy security of the state are the prerequisite for challenges and global threats to the proper functioning of the state, society, national economy and economic entities at any stage of the life cycle, regardless of the sphere of activity, scales and development strategies. The lack of the effective mechanism for ensuring economic and national security and guaranteeing the protection of national interests leads to vulnerability to the impact of global threats. In turn, the system of strategic, tactical and operational goals has significant differences both in content filling and in the measurement of time horizons, which, in fact, highlights the need for a thorough study of these issues. In addition, scientific researches focus on certain aspects of the study of the energy sector, which does not allow to formulate a holistic concept.

Analysis of recent research and publications. A significant number of scientific works are devoted to the systemic issue of ensuring the appropriate level of economic security. The works of the scientists Binko I. F., Holikov I. V., Rubanov V. V., Tambovtsev V. L., Shlemko V. T. deal with the research of the category “economic security” and its essential content.

In conceptual aspect, the general principles of economic security of the state, assessment of its level and the study of its components are reflected in the scientific works of Abalkin L. I., Tsvihun T. V. and Shevchuk I. V. The following scientists Kovalko M. H., Mazur M. I., Serdiuchenko O. V., Shydlovskyi A. K. made a significant contribution to the study of the concept of “energy security”. Along with a fairly thorough coverage of the researched issues by scientists, it should be noted that the aspects of defining, guaranteeing and conceptual approach to effective public policy in the mentioned sphere can serve as prerequisites for new global threats to energy security of the state. Also, attention needs to be paid to the study of public administration aspects of the formation

and implementation of the state policy in the energy sector and the search for ways to improve energy efficiency from the standpoint of the system approach.

Presentation of the main research material. Strengthening of the processes of globalization and transformation of the national economy requires measures to strengthen the stability of vital functions of the society and the state by ensuring economic security and protection of national interests. It should be emphasized that economic security determines the economic independence of the state, it is the prerequisite for preventing potential and real threats to state security, the establishment of key principles of civil society.

Abalkin L. I. defines economic security as a state of the economic system of the country, which promotes dynamic development, effective solution of social problems and characterizes it as a state of the economic system, aimed to develop and pursue independent economic policy [1]. V. L. Tambovtsev emphasizes that economic security is a set of properties of the production subsystem, which is the basis for the implementation of the goals of the system as a whole [12, p. 3]. Scientist Holikov I. V. draws attention to the fact that in determining the category of “economic security”, it should be borne in mind that this is a dynamic component of the national economy, which adapts to today’s challenges [2, p. 312]. Taking into account the variability of the influence of external environment and the possible emergence of potential threats, the concept of “economic security” can be defined as “the ability of the national economy to ensure independent development, stability of civil society institutions, sufficient defense potential of the state in various adverse conditions and events, the ability of the state to protect national interests from external and internal threats” [13, p. 151]. In turn, Petrov I. V. notes that “economic security” is a basic characteristic of any system, including economic in the process of its development and functioning [3, p. 3]. Rubanov V. V. supports the position of Petrov I. V. and adds that “economic security” is the ability of the national economy to ensure the welfare of the nation and the stability of the internal market functioning, taking into account the influence of external factors and threats [10, p. 31]. Shlemko V. T. and Binko I. F. interpreted the concept of “economic security” as a state of the national economy that allows to maintain resistance to internal and external threats, which is able to meet the needs of the individual, family, society, state, etc. [15, p. 8]. Muntiian V. I. shares the position of the scientists and defines the category of “economic security” as a set of measures aimed at ensuring sustainable development of the national economy and provides for the development of the mechanism to counter external and internal threats [7, p. 10].

Armed aggression by the Russian Federation and the crisis in the country have highlighted the need for the thorough study not only of the category of “economic security of the state”, but also its components, on the synergistic effect of which depends the state of security in various spheres. Fuel and energy resources are the critical factor in today’s conditions, especially given the volume of energy resources import.

In the modern world, energy is the prerequisite for the existence of the state and has a significant impact on the economy and other industries, determining the conditions

for their normal functioning. The availability of the necessary resources determines the state of energy security of the state and sustainable development of the state in the future. Regardless of whether the state is a net importer or a net exporter, ensuring energy security is a priority task, which, in turn, requires the modernization of the fuel and energy complex and the standardization of the principles of international cooperation in the energy sector. The independence of the state is also supported by energy independence, so energy security is a basic component of both economic and national security of Ukraine. According to the Article 17 of the Constitution of Ukraine “Protection of the sovereignty and territorial integrity of Ukraine, ensuring its economic and information security are the most important functions of the state, the concern of the entire Ukrainian people [4]. That is, energy security is a component of economic security of the state, so the state’s efforts are aimed at the formation and implementation of state policy on diversification of energy resources, energy saving measures and efficient use of resources, including in emergencies.

It should be noted that in the context of increasing globalization, the issue of energy supply is supranational in nature, i.e. the category of “energy security” becomes complex due to changes in scope and level of coverage: energy supply at affordable prices with minimal possible negative impact on the environment for one state requires taking into account situation in the international energy market, namely the analysis of the level of protection of the world economy from threats to the global energy system both today and in the future.

Serdiuchenko O. V. noted that “the consequences of the international energy crises of the second half of the twentieth century forced the governments of many countries to pay special attention to the problem of energy security. Ukraine did not stay away from the specified process, as recent events in its energy sector demonstrate the fragility and instability of national energy security, its dependence on internal and external factors” [11, p. 3]. That is, energy security is a defining component of economic and national security of the state, as it is a dominant prerequisite for economic independence and progressive development of the state.

Here we should consider the essence of energy security. The concept of “energy security” in the Guidelines for calculating the level of economic security of Ukraine of October 29, 2013 is defined as “the state of the economy that promotes efficient use of energy resources of the country, the availability of sufficient energy producers and suppliers at the energy market, as well as availability, differentiation and environmental friendliness of energy resources” [9].

Lipkan V. A. interpreted the studied category as “... 1) a component of economic security, the process of threat and danger management, which eliminates the deficit in providing consumers with economically available fuel and energy resources of acceptable quality in normal and emergency conditions, including violations of stable fuel and energy supply, as well as the efficient operation of the energy security subsystem is ensured; 2) the process of threat and danger management, which ensures the sustainable operation and development of the fuel and energy complex, including consistent and

active policy of energy conservation and diversification of energy sources” [5]. Thus, A. Shydlovskiy, M. Kavalko define the studied concept as one of the most important components of economic security of the state, which manifests itself as a condition of providing the state with fuel and energy resources for full life and security of fuel and energy complex (including the ability of the energy sector to ensure the functioning of the national economy, the energy independence of the state) [8].

Mazur I. M. notes that energy security “should be understood as a condition of energy system, which is characterized by energy efficiency of consumption, energy saving and energy security of the economy and the efficiency of energy supply and distribution of fuel and energy resources” [6, p. 309]. Thus, the purpose of energy security is to guarantee the protection of individuals, businesses, the region and the state from a possible shortage of fuel and energy resources, to counter global threats. Thus, the purpose of energy security is to guarantee the protection of individuals, subjects of business, the region and the state from possible shortage of fuel and energy resources, to counter threats of global nature. This is possible due to the key factors (geographical, geopolitical, resource, managerial, international) and the amount of available potential (economic, resource, political and technological). Shevchuk I. V. draws attention to the fact that among the main factors that influence the functioning of the national and world energy market it is worth to determined “the geographical location of countries consuming energy resources; location of energy deposits; volumes of energy consumption in the domestic market; amounts of exported products; reserves of energy resources for the stable functioning of the fuel and energy complex of the country, modernization of its technical and technological characteristics; rational volumes of fuel production; the price of energy in the national and world markets; competing countries that export energy” [14, p. 153-154].

Ensuring energy security is a priority task of the state regardless of resource provision. When talking about the state of energy security in Ukraine, it is unsatisfactory, as state policy in this area is not aimed at preventing the emergence of potential threats of internal and external nature, but to neutralize, counteract the negative consequences and damage.

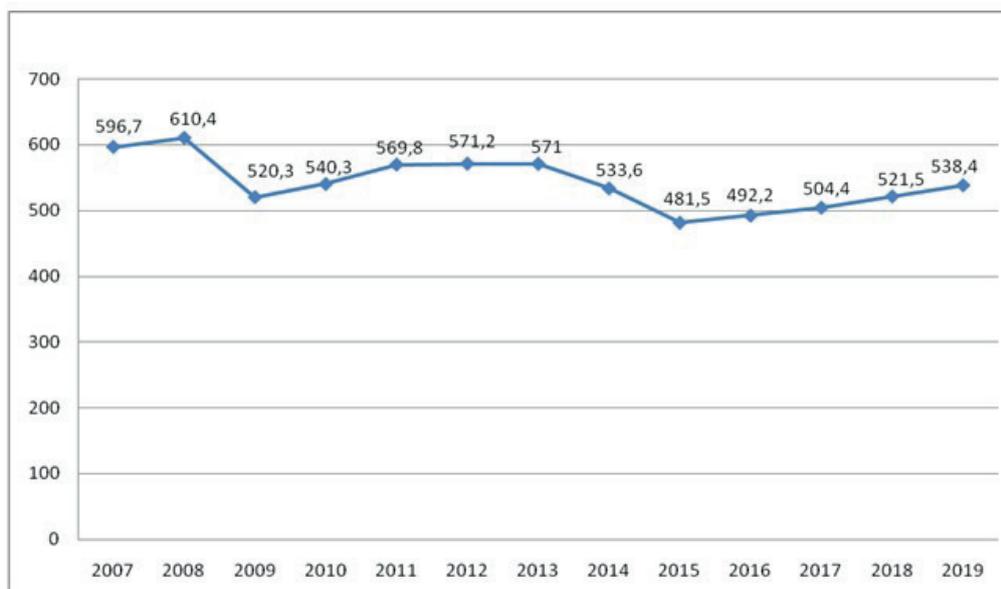
The countries of the European continent are not sufficiently provided with resources to meet their energy needs. Exhaustion of fuel resources (oil, natural gas, coal) requires intensified development of renewable or search for alternative energy sources.

Ukraine is one of the countries that is provided almost entirely with energy resources, except for natural gas. Ukraine’s powerful fuel and energy complex needs modernization and a significant reduction in energy intensity in order to reduce the import of fuel and energy resources. The basis of the complex is the coal industry, whose products can be the foundation for the production of electricity and heat energy. The country has deposits of natural gas, an extensive gas transportation system with a number of underground gas storage facilities. It is worth paying attention to the depletion of high quality gas fields and the need to strengthen the exploration of new natural gas deposits. It should be noted that the launch of the Nord Stream gas pipeline has led to a significant reduction in the

transit of energy through Ukraine.

The activity of the oil and gas complex is represented by the placement on the territory of Ukraine of a network of main oil pipelines, which are aimed at providing transit supplies to the countries of Central and Eastern Europe. Obsolete logistics of some refineries has led to a decrease in the level of domestic demand for petroleum products, which, in turn, has led to an increase in imports of such resources. The country's energy system provides a centralized supply of electricity to domestic consumers, energy systems of neighboring countries, electricity exports.

Providing the national economy of Ukraine and the social sphere with energy resources of the required quality and in appropriate amounts is a priority for the state. Since the times of independence, this problem has dominated every new composition of the Cabinet of Ministers of Ukraine and Ukrainian politicians in general and goes far beyond the economic levers of its solution. In this case, the situation is influenced by three key aspects: critical dependence on energy resources imports, the presence of excessive transit capacity and energy intensity of gross domestic product (hereinafter - GDP).



**Fig. 1 Energy intensity for 2007-2019
(GDP for PPP in 2017, billions of international dollars)**

During the period 2007-2020, the energy sector of the state underwent many transformations that led to destructive changes in all spheres of production and social life. Figure 1 shows the energy intensity of GDP at purchasing power parity for the period 2007-2019. It should be noted that the indicator ranged from 610.4 to 481.5 billion international dollars, which indicates an insufficient level of transformation processes

and modernization in the fuel and energy sector. Since 2014, Ukraine undertook international commitments to promote energy efficiency reforms. In continuation of the implementation of such steps in 2015, partial deregulation of pricing in the retail and wholesale markets of natural gas was carried out, tariffs for consumers were raised, and gas is supplied at regulated prices.

The change of priority from energy intensity to energy efficiency should take place systematically and comprehensively, covering all areas of this problem.

The high energy intensity of GDP in Ukraine is the result of the significant technological lag of the vast majority of sectors of the national economy from the level of developed countries, unsatisfactory branch structure of the economy, destructive influence of the “shadow” sector, in particular, export-import operations, which reduces the level of competitiveness of national production and is an unbearable burden for the economic sphere - especially taking into account the dependence on imports of fuel and energy resources.

Reducing the level of energy intensity of the economy requires the implementation of a number of measures of institutional, regulatory, material support in order to accelerate the modernization of the fuel and energy complex and ensure energy efficiency of the economy, in particular:

1) Improving national legislation in the sphere of energy and bringing it in line with international obligations.

2) Correct formulation of strategic, tactical and operational goals of state policy in the energy sector.

3) Preparation of the strategic plan for the implementation of the “goal tree” in the energy sector.

4) Establishment of critical limits and time horizons of purpose-oriented indices of industries.

5) Regulation of the size of the eco-league tax and increase of the percentage aimed at energy efficiency measures.

6) Carrying out of the annual state forecasting concerning change of cost of energy resources and probable change of tariffs of housing and communal services for the population and subjects of managing.

7) Search and implementation of mechanisms to stimulate the implementation of energy efficiency measures and integrated approach to energy consumption.

8) Informing business entities about the key principles of energy management.

The condition of energy saving is a key aspect of the energy strategy of the state, as the effective functioning of the national economy and all spheres of society and the state depends on it. In order to create conditions to reduce the level of energy intensity of products / services in all sectors of the national economy, the effective system of state regulation of energy security should be formed, which will improve the structure of final consumption of energy resources by expanding electrification of industries and increasing production efficiency. Taking into account the key priorities for the development of Ukraine’s energy sector, the issue of energy saving is of strategic

importance for businesses. One of the measures to implement the energy strategy of the state is to conduct energy audit to determine the threshold values of energy prices and changes in the budget of economic entities in the context of rising energy tariffs.

The priority of the state policy in the sphere of energy security of Ukraine is the need to ensure energy independence through the establishment of economically justified tariffs for housing and communal services for the population, active implementation of energy saving measures, especially for the budgetary sector.

Conclusions. Thus, the energy complex of Ukraine needs some time for modernization, transformation in accordance with the requirements of the branch factors, transformations in the socio-economic sphere with mandatory consideration of the security factor under the conditions of temporary occupation of Luhansk and Donetsk regions, Autonomous Republic of Crimea and external military aggression. It should be emphasized that the energy sector of Ukraine is currently in the process of deep transformations and modernization, which will determine the vector of the state policy in the sphere of energy security and shape the profile of the energy sector in the future.

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CONCEPTUALIZATION OF TRAFFICKING IN HUMAN BEINGS AS A GLOBAL PROBLEM

Kateryna Kulava,
Postgraduate student,
Kharkiv Humanitarian and Pedagogical Academy of the
Kharkiv Regional Council, Ukraine

Annotation. *The growing scale of the problem of human trafficking in the late twentieth - early twenty-first century. Although the study of combating trafficking in human beings, given its importance in the regional and global dimensions, is of considerable interest to scholars, the conceptual analysis of international policy frameworks and institutional mechanisms to combat the problem has not yet become the focus of political discourse. Scientists are mostly interested in certain aspects of the problem. In domestic scientific opinion, the problem of combating trafficking in human beings is mostly considered through the prism of criminal law and criminology. Therefore, the study of conceptual principles and institutional mechanisms to combat the global problem of human trafficking is an important area for political science.*

Keywords: *human trafficking, conceptual principles and institutional mechanisms for combating human trafficking, state policy in the field of combating human trafficking, National Institutional Mechanism.*

Formulation of the problem. Trafficking in human beings is an indisputable reality of the XXI century. It is a ruthless machine that is expanding more and more in global coordinates as it brings huge profits. Trafficking in human beings is one of the most serious violations of fundamental human rights, a serious crime committed in most cases by organized criminal groups. This problem is interstate in nature and has been at the center of discussions at the international level for more than a century.

Today, this phenomenon, despite the significant damage it causes not only to individuals but also to entire states, as a scientific problem is considered in world political thought mainly not in international politics, and not as a global problem that negatively affects the social order, economic and political stability of many states and entire international regions, and mainly at the national-state level of individual states in the context of law and order, health care and social security [1 - 5].

However, the problem of human trafficking at the global level has, of course, gone beyond the traditional social, criminological, legal, economic and medical issues, increasingly penetrating the sphere of international politics and becoming an urgent problem of bilateral and multilateral interstate relations. Traditional, legal and criminological analysis of the problem of human trafficking as a crime has failed to explain the true nature of such a complex, multifaceted phenomenon. Therefore, simplification, schematization of the causes, manifestations, features and consequences of human trafficking are the cause of significant shortcomings of many studies.

The aim of the article is to study the conceptual foundations and institutional mechanisms of combating human trafficking as one of the global problems of mankind.

Presenting main material. V. Glushkov, G. Kokhan, O. Removska, V. Rymarenko studied human trafficking as a modern form of slavery in domestic science from the standpoint of sociology, demography, and migration processes. [2, 3, 4] Therefore, today human trafficking is understood as a complex problem that combines a number of different factors. It is closely linked to other global problems, namely the intensification of uncontrolled migration processes, transnational crime, and the presence of a wide range of social problems. In particular, the complication of the demographic crisis.

Researcher G. Kohan, studying international legal cooperation in the fight against slavery and the slave trade, argues that the concept of "slavery" is compatible, generic with the concepts of "human trafficking" and "enslavement" [4, pp. 30-76]. This is the concept adopted by international organizations. According to it, trafficking in human beings is "the purpose of exploiting, transporting, transferring, concealing or obtaining persons by threatening or using force, or other forms of coercion, abduction, fraud, deception, abuse of power or vulnerability, or by bribery. in the form of payments or benefits, to obtain the consent of a person who controls another person. " In support of this approach, the UN High Commissioner for Human Rights recommended the use of the essentially neutral term "trafficking in human beings" and the broad concept of the slave trade, which would include all forms of forced labor.

Confirmation that human trafficking is a modern form of slavery is also a legal analysis of the very fact of illegal encroachment on human will, which is present in both cases. From a legal point of view, slavery is the status or position of a person to whom some or all of the acts inherent in property rights are applied. [13] The view that trafficking in human beings has all the hallmarks of slavery, although from a legal point of view it is a crime different from slavery, is shared by L. Lederer, a representative of J. Hopkins University (Washington) and L. Francois in "Prostitution ohne Grenzen"(Prostitution without borders). [13].

The process of transforming slavery into human trafficking took place along with historical changes, the evolution of human civilization and globalization. This is a kind of time challenge posed by history and globalization. This process is vividly described in S. Yu. Abramova's book "Four Centuries of the Slave Trade", as well as in L. Sergeeva's study "Historical Excursion to Human Trafficking: State-Legal Aspect". [53, C.125-130].

Today, everyone knows that human trafficking is the latest global problem of humanity. However, this generally accepted statement was preceded by lengthy research and the development of various classifications that would most accurately identify the location of each global problem and human trafficking in particular.

With the internationalization of production, economic and social progress increasingly depends on global problems. Their emergence of problems is an obvious manifestation of globalization, which takes place in a conflicting, contradictory form. Global problems of today are the challenges facing humanity in the second half of the XX century.

Global issues have become the subject of research for many sciences, such as the world economy, sociology, law, biology, geography, ecology, etc., and the subject of scientific

debate. Scholars link the historical development of global problems with the gradual development of society. The peculiarity of global problems is their interdependence and interdependence. Trafficking in human beings, in particular, is closely linked to global issues such as resource security, poverty, health, spirituality, democracy, organized crime, uncontrolled migration, the complexity of the demographic and educational crisis, and a number of other global human problems. The problem of human trafficking has direct links with all groups of global problems, except the group of environmental problems, but the connection with them goes through other problems [1 - 5].

The UN Protocol to Prevent, Suppress and Punish Trafficking in Human Beings of 2000 at the international level demonstrated the existence of this problem as a modern form of slavery. In the early 80's of the twentieth century. Trafficking in human beings, as well as international terrorism, drug and arms trafficking (also known as mild security threats) are among the latest global (in particular, inter-social) problems. The basis for developing such an approach was the perception of scientists of the world as a socio-ecosystem.

Many researchers, in particular, A. Matsko, I. Lukashuk, A. Naumov, justify the need to separate the concept of slavery from the concept of human trafficking. Other scholars, such as J. Rassam, K. Stirman, D. Cagill, and L. Lederer, oppose this approach and argue that human trafficking is a modern form of slavery. Their allegations are based on the practice of keeping victims of human trafficking in slavery, as it is more financially advantageous for criminals. Researcher G. Kohan, studying international legal cooperation in the fight against slavery and the slave trade, argues that the concept of "slavery" is compatible, generic with the concepts of "human trafficking" and "enslavement" [4].

It is this concept that we follow in our study, and believe that human trafficking is a modern manifestation of slavery. Given the existing approaches to the definition of human trafficking and slavery, we can say that the difference between the two concepts is only in the attitude during specific historical periods to human trafficking [1 - 5].

Modern human trafficking is a complex process in which victims go through a number of different stages (recruitment, transportation, exploitation and disposal), possible in any country. The human trafficking process can be supported by legal organizations or private entrepreneurs who cooperate with business structures involved in human trafficking. Depending on the purpose, there are the following types of human trafficking:

- 1) trafficking in women and children for the purpose of using them for the production of pornographic materials or prostitution;
- 2) trafficking in human beings for the purpose of exploiting their labor;
- 3) trafficking in human beings for the purpose of involvement in debt bondage;
- 4) trafficking in human beings for the purpose of use in armed conflicts;
- 5) trade for the purpose of involvement in criminal activity;
- 6) trafficking in children for the purpose of adoption (adoption) for commercial purposes;

- 7) trafficking in human beings for the purpose of removing organs;
- 8) trafficking in human beings for the purpose of conducting experiments on a person without his consent;
- 9) forced pregnancy.

Depending on the method of coercion, illegal exploitation of people is divided into: physical coercion with the use of violence or with the use of powerful drugs, alcohol, drugs; economic coercion in the form of debt bondage or other material dependence; mental coercion through blackmail, deception, misleading or threatening to use violence; legal dependence in connection with adoption or guardianship or in connection with marriage without the purpose of starting a family; slavery or conditions similar to slavery [4, 5].

- According to the content of the activity of victims of human trafficking, criminal exploitation is divided into the following types: exploitation of labor in the sphere of everyday life; exploitation of labor in the field of production, agricultural work; exploitation in the sphere of criminal business (participation in armed formations, in the sphere of production of illegal products); exploitation of a person for the purpose of committing acts of a sexual nature; use of human physiological parameters for organ and tissue transplantation; use of women as surrogate mothers. There are the following systems of human trafficking: Albanian, Nigerian, Eastern, Latin American, Chinese and Asian. This problem is extremely relevant in the following regions: Central and South America, Central and West Africa, the Gulf of Guinea, North America, Southeast Asia. The problem of European and CIS countries has not escaped.

- Trafficking in human beings, depending on the region, has the following features [2]:

- in Central and South America and West and Central Africa, children and young women are trafficked within one country or sold abroad, where they work mainly in the domestic service or sex industry;

- men are mostly trafficked in South America and sold abroad for work in remote rural areas, in agriculture;

- South Asia is a region of transit and destination for victims of all ages. Their work is used in carpet and clothing factories, for street trade, for begging, on construction and tea plantations, in industrial production (for example, in brick factories);

- in the Middle East and North Africa, girls, women, forced to work in domestic services, and men of Asian descent are trafficked and used as construction workers;

- flows of victims of trafficking to Western Europe from Eastern Europe and Asia (often crossing the borders of Eastern Europe) consist of women and girls working in the sex industry and men and women sold for exploitation in agriculture and construction;

- Victims from Central Asia and the Caucasus are exploited mainly in the construction and agricultural (cotton) sectors, with Russia being one of the main destinations.

In addition, the transit region is considered to be Central and East Asia; - In China, many young women and girls are victims of labor and sexual exploitation as a result of mass internal rural to urban areas. Many Chinese are smuggled and sold to ethnic business enclaves in Europe and North America to work in restaurants and home services [2, 4].

Mechanisms implemented at the international level are considered to be the most effective, as global problems also require global solutions. To do this, it is necessary to expand international cooperation and coordinate the efforts of all mankind. There is a need to improve the global institutional mechanism for combating global problems, which means the set of links between formal and informal institutions, as well as organizations that promote the principles of combating trafficking in human beings, the principles of democratic governance and sustainable development; ensure the coordination and adjustment of the interests of various social groups, coordination of activities to combat trafficking in human beings. Even before the establishment of the UN, a number of conventions aimed at ending slavery and trafficking in women were adopted [3 - 5].

Today, the governments of many countries and the international community in general are interested in solving and overcoming the problem. The phenomenon of trafficking in human beings was first declared at the international level at the International Congress on Combating Trafficking in Women in London in 1899. and punishment for it, which complements the UN Convention.

At the present stage, the fight against human trafficking takes place at all levels: global (UN and its structures, INTERPOL), regional (OSCE, Council of Europe, EU), and state (state countermeasures). The cooperation of international organizations in combating human trafficking is coordinated by the UN. The Council of Europe's activities in the field of prevention of trafficking in human beings are mainly of a recommendatory nature. The current EU Institutional Mechanism for Combating Trafficking in Human Beings is a system of EU bodies, as well as acts adopted by these bodies. It is designed to realize the values of the EU, to pursue its goals, to serve its interests, as well as the interests of its citizens and Member States, to ensure the consistency, effectiveness and continuity of its policies and actions (Article 13 TEU).

The EU institutional mechanism for combating trafficking in human beings has a complex structure, its organizational structure is based on the European Parliament, the European Council, the Council, the Commission, the European Anti-Trafficking Coordinator, the EU Expert Group on Trafficking in Human Beings, Europol, Eurojust, the European Judicial Network and Eurojust. . The EU has significantly stepped up its activities in the field of prevention of human trafficking. The integration processes taking place in the EU encourage its institutions to focus their efforts on developing effective mechanisms to prevent and combat trafficking in human beings, as well as to create a positive climate for in-depth study of this problem [1 - 5].

Signed on 13 December 2007, the Lisbon Treaty on the Principles of the Functioning of the European Union contains important new provisions that strengthen the EU in the fight against international cross-border crime and, in particular, trafficking in human beings. makes initiatives in this area. The activities of non-governmental organizations and the media as channels through which society receives information about the problem are effective in combating human trafficking.

In general, the global anti-trafficking mechanism is of fundamental political importance. Attempts by individual countries to combat human trafficking on their own

are ineffective without a coordinated international effort. As the problem has reached a global scale, all countries involved must work together in a concerted effort. After all, the current counteraction mechanism has many shortcomings. In addition to the imperfection of the legal framework for combating trafficking in human beings, and in some countries - its complete absence, there are several international political factors of low efficiency of the anti-trafficking mechanism.

It was found that no unified approach to solving the problem has been developed at the international level. We consider interstate cooperation to be insufficiently effective, first of all in relation to the protection of victims. Joint activities (for example, between the police of Poland and Germany, Austria and the Czech Republic) are mostly based on personal connections. Efforts are not coordinated at either the global or national levels. Only a few countries have interagency bodies that make recommendations for changes in existing legislation, as well as coordinate between law enforcement, migration, employment, social services and foreign ministries.

The activities of non-governmental organizations and the media, through which society receives relevant information, are effective in combating human trafficking. However, public awareness of the problem of human trafficking is still low. The extradition programs and procedures for the extradition of victims of trafficking in human beings require coordinated action, as today the case is mostly completed by their arrest and deportation. There is a lack of skilled workers in the system of law enforcement agencies, migration services and other institutions, which are responsible for combating trafficking in human beings and providing assistance to victims of this crime.

So human trafficking is a global phenomenon that has reached our country as well. Trafficking in human beings has existed on the territory of Ukraine since ancient times, from the times when Ukrainian lands were exhausted by Mongol-Tatar raids. During the XV - XVII centuries. Ukrainians were the main commodity in the Turkish slave markets in the Crimea. The current problem of human trafficking in Ukraine is significantly different from that of the past. The current circumstances that cause human trafficking in Ukraine are: the difficult socio-economic situation in the country; low moral level of the population; inconsistency of the legislation of Ukraine with the provisions of international legal norms; imperfection of the mechanism of registration of documents for departure abroad; provocative behavior of victims.

The National Institutional Mechanism for Combating Trafficking in Human Beings includes the Ministry of Social Policy, the Interdepartmental Council on Family, Gender Equality, Demographic Development and Combating Trafficking in Human Beings, the Expert Working Group on Prevention of Domestic Violence and Combating Trafficking in Human Beings, Regional Councils, Ministry Of Ukraine for Family, Youth and Sports, State Social Service for Family, Children and Youth, State Department for Adoption and Protection of the Rights of the Child, Ministry of Internal Affairs of Ukraine, Security Service of Ukraine, General Prosecutor's Office of Ukraine, Supreme Court of Ukraine and the judiciary, the State Employment Service of Ukraine, educational institutions and bodies of education. Each of the above institutions in its activities implements

appropriate tools to combat trafficking in human beings. These are various forums, decisions, programs, regulations, strategies, seminars, etc. 178 The problem of human trafficking does not exist in isolation from other threats to national security and national interests in the domestic and foreign policy spheres.

Today, Ukraine is experiencing serious political, social and economic problems that have negative consequences for combating human trafficking. The current situation in Ukraine, given the annexation of Crimea by the Russian Federation and the ongoing armed conflict in the East, remains volatile. The negative effects of the current crisis in Ukraine on anti-trafficking activities are the growing number of internal migrants, including women, children and people with disabilities, who are vulnerable to trafficking.

The media report on the rape of women and girls, the forcing of civilians, especially men, to join illegal military formations, the exploitation of their labor at checkpoints, the removal and illegal transplantation of human organs. Ukraine (both internationally and nationally) takes a multi-vector approach to combating trafficking. As a rule, this is manifested in a combination of strategies to combat trafficking in women as such, to combat illegal migration and to combat international organized crime. However, reports of international organizations, observations of experts give grounds to recognize the effectiveness of combating human trafficking in Ukraine as low. In particular, due to the inefficient work of the judiciary, and the unsatisfactory state of assistance to victims of trafficking.

Given that human trafficking is a global international problem, it cannot be solved by one state alone, and both governmental and non-governmental organizations must join in finding effective ways to combat this phenomenon. Anti-trafficking is understood as a system of measures aimed at combating trafficking in human beings by preventing and combating it and providing assistance and protection to victims of this crime.

Conclusions. In view of this, the conceptual framework for combating it serves as a basis for measures to combat trafficking in human beings. In outlining the conceptual framework for combating trafficking in human beings, the UN Protocol to Prevent and Suppress Trafficking in Human Beings is basic, and the principles set out in it are grouped into three blocks: prevention of and fight against trafficking in human beings; protection and assistance to victims of trafficking; encouraging cooperation between States Parties. It should be noted that the concept of "conceptual principles of anti-trafficking policy" is used in relation to an individual state.

The Law of Ukraine on Combating Trafficking in Human Beings defines the following principles: - prevention of trafficking in human beings by raising public awareness, preventive work, reducing the level of vulnerability of the population, overcoming demand; - combating crime related to trafficking in human beings by identifying crimes of trafficking in human beings, persons involved in the commission of a crime, bringing them to justice; - providing assistance and protection to victims of trafficking in human beings by improving the system of restoration of their rights, providing a range of services, introducing a mechanism for cooperation of actors in the field of combating trafficking in human beings. international organizations.

Thus, today the international community is faced with the challenge of combating human trafficking as a global problem of today, which creates transnational threats that need to be addressed within a comprehensive, coordinated mechanism of cooperation between government agencies, NGOs and international organizations. This mechanism should combine a system of measures such as the prevention or prevention of trafficking in human beings; protection of victims and witnesses, prosecution of criminals; punishment and criminal liability for such activities; partnership and cooperation at all levels - from local to global.

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GENESIS OF THE VALUE AND SEMANTIC SPHERE OF A PRIMARY SCHOOL STUDENT

Iuliia Prykhodko,

Doctor of Psychological Sciences, Professor,

Maryna Lukianenko,

Ph.D. student of the Department of Practical Psychology,

National Pedagogical Dragomanov University, Ukraine

Annotation. *The article presents the results of an experimental study of the value and semantic sphere of a primary school student and its dynamics during his education in primary school. The main concepts are revealed and modern studies of this psychological phenomenon are highlighted. The analysis of the obtained theoretical and empirical results of the study allowed us to determine the components (cognitive, emotional, conative) and accordingly, the criteria, indicators and levels of the value and semantic sphere of a primary school student. Quantitative and qualitative analysis, as well as applied statistical criteria, made it possible to establish the development of the value and semantic sphere of a primary school student depending on his age.*

Keywords: *Values, value orientations, meanings, personal meanings, value-semantic sphere, dynamics, locus of control, time orientation, conative component, emotive component, cognitive component, Primary School student's personality.*

Formulation of the problem. One of the most important meaning-forming characteristics of a personality is its value-semantic sphere. In conditions when the modern world is characterized by uncertainty and high rates of socio-psychological changes in the economy, culture, politics, and science of Ukrainian society. The reform of the education and upbringing system, the disintegration of the usual way of life in the context of a pandemic leads to a transformation of the value and semantic sphere of both adults and children.

Modern children are placed in the conditions of searching and determining value orientations and meanings, which contributes to the formation of their life model and is the basis for their personal development. The most sensitive period for the formation and development of the value-semantic sphere of the individual is the primary school age, when the individual is intensively socialized, which makes it possible to learn everything that surrounds him. In this regard, the problem of studying the value and semantic sphere of Modern Primary School students as the basis of their personal development becomes relevant for Psychological Science and practice.

The purpose of this article is to highlight the results of an experimental study of the dynamics of the development of the value and semantic sphere of a primary school student during primary school education.

An analysis of recent research and publications. The value-semantic sphere of personality attracts special attention of researchers because of its importance for understanding those psychological changes that occur in the process of growing up a child and his personal development, which is its core, one of the central formations and

a component of interpersonal relationships. This sphere determines the motivation of the child's behavior and affects all aspects of his life, outlines the vector of his development, communication, and is the basis for the formation of ideals. The value-semantic sphere is the most important component of the individual and the main indicator of its formation.

Theoretical analysis gives grounds to assert that currently in Psychological Science there is no single definition of the concepts: "value", "value orientations", "meanings", "personal meanings". This problem in modern foreign psychology is studied by such scientists as: M. Bubek, P. Wong [19], Yu. Herasymchuk, E. Davidov, A. Döring [5], A. Knafo, A. Langle [10], M. Puohiniemi [13], C. Strenger [17], B. Tonn [6], J. Ciecuch [4], Sh. Schwartz [16] and other scientists.

Modern Ukrainian Psychological Science studies the phenomenon of the value-semantic sphere of the individual in the context of its orientation and classifies it depending on the roles that it plays in society: I. Bekh [2], M. Baryshevsky [1], Z. Karpenko [9], O. Muzyka [11], E. Pomitkin [12], G. Radchuk [14], L. Romaniouk [15] and other scientists.

Value in the light of axiological concepts is considered as a personally significant meaning for an individual of certain objects, phenomena or states that provide him or the community with mental balance and satisfaction. The system of values forms the inner core of culture, the spiritual quintessence of the needs and interests of the individual and social communities [3]. Value orientations are social values interiorized by a person, which ensure the relationship between the individual and the social in his consciousness. Value orientations are a reflection in the consciousness of a person of values recognized by him as important life goals and manifested in the form of behavior, orientation of interests, motives, ideals, attitudes, life plans, norms, principles, needs, is a factor in the development and maturity of the individual. The system of value orientations affects a person's perception of time, their plans, their life orientations and achievement of what they want by giving significance to all events that take place in the process of their ontogenesis.

Meaning is considered in modern psychology as the attitude of a person to the objects for which he acts and in his mind is reflected as "significant for me". It is the basis for a person's knowledge of the world, attaches importance to his life, performs the function of long-term and transstitutional regulation, affects his activity and behavior, and can be traced over large segments of his biological life [7].

It is generally accepted that the sensitive period for the formation and development of values and meanings is the primary school age. As G. Hofstede aptly pointed out, value orientations are formed during the first ten years of life and are assimilated by the child unconsciously and indirectly [8]. Thompson, Meyer, and McGinley argue that it is in a child of primary school age that categories of desires, intentions, rules, and values are formed [18].

Value orientations and personal meanings in a person's mind are related to each other and together make up his value-semantic sphere. We consider the value-semantic sphere as a systemic education consisting of cognitive, emotional, and conative components

that are combined with each other.

Cognitive component it contains a system of axiological knowledge and ideas about socially accepted norms. Emotional – emotional and value attitude, mood of the child in the process of interaction with subjects and objects that embody certain values. Conative – formation of skills of self-control, self-regulation, the ability to act in accordance with socially acceptable values and norms of behavior.

In the formation of the value-semantic sphere of the individual, an important role is played by the locus of control and the time perspective, which are closely interrelated with the conative component. Locus of control in the context of value orientations and meanings, it means a personal variable of control that reflects semantic orientation in situations that are significant for the individual. Based on the locus of control, a person determines for himself the value of activity, which determines the purposefulness of semantic aspirations that determine the construction of his life strategy. If the realization of values in the life of a person is prompted by the efforts of other people or certain circumstances, there is an external locus of control, but if a person expresses readiness for their independent implementation – an internal one. The more developed the internal locus of control, the more a person is guided in his life by his own efforts and abilities, understands his life and is responsible for it, sees and builds goals for his own future based on his value orientations. Time perspective – this is a person's idea of their own future, past and present, combined with goals and localized events. Analyzing the value orientations and meanings of the individual, we can talk about temporary localizations, about their long-term orientation, which is a component of her world view, is necessary for awareness of the meaning of life and self-realization.

Presenting main material. The study of the value-semantic sphere was conducted on a sample of junior schoolchildren in rural areas, which amounted to 217 people.

Separate methods were used to characterize the structural components. The cognitive component was studied using the method "Rapid diagnostics of the sphere of value orientations of preschool children (5-7 years old children)". The emotional component is the "Color attitude test". Conative – observation. The locus of control and time orientation are "Incomplete sentences". Statistical analysis of the obtained results of the study was carried out using the Mann-Whitney U-criterion. The results are shown in Table 1.

Table 1

Dynamics of development of the value and semantic sphere of Primary School students (in %)

N=217

Level of development	High	Average	Low
1st grade students	27,85	37,42	34,73
2nd grade students	28,57	38,73	32,70
3rd grade students	32,90	36,56	30,54
4th grade students	43,54	28,73	27,73

It was found that the largest percentage of 27.85% of the 1st grade studied students, 28.57% – 2nd grade studied students, 32.90% – 3rd grade studied students and 43.54% – 4th grade studied students have a high level of development of the value and semantic sphere. These students are characterized by a focus of value orientations over a long period of time, which affects their behavior. In their activities and behavior, they are able to be guided by values without reinforcement and external reminders. Subjects with a high level of development of the value-semantic sphere have deep and strong systemic axiological knowledge, understand the manifestations of values in life, can lead to their examples. Value knowledge helps younger students to understand their own behavior and the behavior of others and adhere to the norms and rules in society. These subjects show an emotionally positive attitude towards values and an emotionally negative attitude towards anti-values. Their value orientations already set the general direction of interests and aspirations, on the basis of which they build their activities and behavior, form a motivational program and the level of claims for a long period of time.

The average level of development of the value and semantic sphere in 1st grade students was established in 37.42% of the subjects, in 2nd grade students – 38.73%, in 3rd grade students – 36.56%, in 4th grade students – 28.73%. This level is characterized by the orientation of value orientations to the average perspective, which is manifested in the impossibility of their influence on the behavior of students in the long term. Students with an average level have fragmented, not deep enough and strong axiological knowledge, they do not always understand the manifestation of certain values in the behavior and activities of other people. This leads to the fact that they do not fully realize the values in their behavior, in some situations they can independently adhere to the rules and regulations, in others – they need reinforcement from people who are important to them. They can adhere to both positive values and anti-values. These characteristics are supported by an insufficiently and indistinctly formed emotional-evaluative attitude of students to values, which is mostly emotionally neutral and somewhat indifferent. Usually, these students do not yet have clearly formed value orientations that can set the overall direction of interests and aspirations without the influence of others.

The low level of development of the value-semantic sphere was 34.73% in 1st grade students, 32.70% in 2nd grade students, 30.54% in 3rd grade students, and 27.73% in 4th grade students. This level is characterized by the orientation of the values of the subjects in the near future, and therefore they cannot influence their behavior in the long term. These students cannot be fully guided by value orientations in their behavior, so they need help from others who encourage them to engage in activities based on certain norms and values of society. The value-semantic sphere of these subjects is characterized by partial, superficial, haphazard or no axiological ideas and beliefs at all. They are partially or completely unaware of the values of society, its rules, which leads to non-compliance with them. This is expressed in a negative emotional and evaluative attitude to values and a positive attitude to anti-values. The values of these younger students do not yet have a semantic content for them, they cannot independently control their behavior and activities. Subjects with a low level of development of the value-semantic sphere are

not able to independently form goals and give meaning to life due to the lack of formed value orientations and personal meanings.

The study found that students of the 1st and 2nd grades have value orientations mainly aimed at a short time period, they are not yet sufficiently aware of their values. The temporal perspective of the near future does not allow these students to fill their values with a semantic load that does not affect their long-term behavior. In their activities, they cannot be independently guided by the values that society transmits to them, but need help from adults. Younger students of this age have fragmentary and not deep enough ideas about values, an emotionally positive attitude towards them and their situational manifestations in behavior and actions prevail.

In the 2nd grade studied students, in comparison with 1st grade students, no significant difference was found in the qualitative indicators of the development of the value-semantic sphere. However, quantitative indicators indicate that from the 1st to the 2nd grade, students significantly increase the orientation of value orientations for a longer period of time ($U = 22.5$ at $p = 0.033^*$), the internal locus of control increases ($U = 404.500$ at $p = 0.000^{***}$), they become more independent in the manifestation of values in their own behavior and axiological awareness increases (average values of the 1st grade – $= 23.54$ and 2nd grade – $= 25.15$). Students of the 2nd grade do not significantly reduce the manifestation of an emotionally positive attitude to values (average values of the 1st grade – $= 26.58$ and 2nd grade – $= 25.37$) and the implementation of personal values in students' behavior, it worsens (average values of the 1st grade – $= 66.87$ and 2nd grade – $= 65.14$).

A comparative analysis of the quantitative indicators of the 2nd grade studied students and 3rd grade studied students allows us to state that third grade students already have a long-term orientation of values, which are gradually formed in their minds into value orientations that stimulate their activity and which they can partially already be guided in their activities and behavior. From the 2nd to the 3rd grade, the studied students increase the manifestation of the internal locus of control ($U = 54.500$ at $p = 0.000^{***}$) and decrease the external locus ($U = 113.000$ at $p = 0.000^{***}$), which is evidence that younger schoolchildren of this age in their behavior are gradually beginning to be independently guided by the formed value orientations, regardless of the reinforcements of other people. Students' awareness of value concepts is growing, their ideas are becoming deeper and more systematic ($U = 1,081.5$ at $p = 0.003^{**}$), and the level of development of the conative component is not significantly increasing (average values of the 2nd grade – $= 65.14$ and 3rd grade – $= 65.71$). However, the manifestation of an emotionally positive attitude to values continues to decrease slightly (average values of the 2nd grade – $= 25.37$ and 3rd grade – $= 24.68$).

Analyzing the results obtained in the 4th grade studied students, it was found that in them, as in 3rd grade students, the orientation of values to the more distant future prevails and has a statistically significant increase ($U = 86.5$ with $p = 0.000^{***}$). This affects students' long-term behavior and performance, as having more temporal-distant values helps them be more meaningful and focused. In the 4th grade studied students, the

severity of the internal locus of control continues to significantly increase ($U=874.500$ at $p=0.019^*$) and awareness of value concepts ($U=1,404.500$ at $p=0.041^*$). These subjects already have a much deeper knowledge of value concepts compared to students in previous grades. A noticeable difference is observed in the emotional component, the emotionally positive attitude to values in students from the 3rd grade to the 4th grade increases significantly ($U=118.5$ at $p=0.004^{**}$), and the ability to be guided by personal values in their behavior and adhere to the norms and values of society increases ($U=869$ at $p=0.041^*$).

Conclusions. The results of our research allow us to state that during the period of primary school education, students change the temporal localization of values. In 1st and 2nd grade students, values are characterized by a shorter length in time and their focus on a slightly closer future. Their values have little meaning, and therefore cannot direct their behavior and activities to the future. In younger students of the 3rd and 4th grades, values already have a greater length in time and are directed to a more distant future. Values already have a greater semantic content, can perform the functions of long-term regulation, set a general direction for their interests and beliefs, have a hierarchy of individual preferences and patterns of behavior and activity, a motivational program and the level of claims.

The internal locus of control in younger schoolchildren in the process of learning in primary school increases its severity, a larger number of students of the 3rd and 4th grades in their activities and behavior can independently be guided by the formed value orientations, regardless of outside reinforcement. The values present in their minds gradually begin to acquire semantic content, they can, although not yet fully, be guided by them in their behavior, make decisions and build goals in accordance with their value orientations.

With age, younger students' understanding of value concepts increases, and their ideas become stronger and more systematic. 3rd and 4th grade students can easily describe people's manifestations of values in everyday life and give examples. This, in our opinion, is due to the fact that younger students of the 4th grade already have a noticeably larger amount of ideas that they learned in the process of studying in primary school.

All primary school students had a mostly emotionally positive attitude to values. However, students from the 1st to the 3rd grade showed a slight decrease in the manifestation of a positive emotional attitude towards values. Fourth-grade students had a significant increase in their emotionally positive attitude to values compared to 1st-3rd grade students.

The obtained results of the study give grounds to assert that from the 1st to the 2nd grade in younger schoolchildren, the manifestation of values in behavior decreases somewhat, their behavior worsens. Starting from the 3rd grade, the percentage of students who adhere to the rules of behavior increases, this trend is most clearly manifested in younger students of the 4th grade.

So, we can state the dynamics of the development of the value and semantic sphere

of younger schoolchildren. Values become more understandable to students, they better understand their manifestation in their own behavior and the behavior of other people, and try to adhere to them independently. Values are mostly focused on the more distant future, which can affect the effectiveness of their activities and behavior.

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THE PECULIARITIES OF FUTURE RESCUERS' PROFESSIONAL DEVELOPMENT IN HIGHER EDUCATION INSTITUTIONS OF THE STATE SERVICE OF UKRAINE FOR EMERGENCIES

*Alona Chaban,
Adjunct Professor,
National University of Civil Defense of Ukraine*

Annotation. *The article substantiates the conceptual principles of civic education of future service officers. It is shown that the system of civic education of future rescue officers is a multifaceted problem and is combined with patriotic, national, moral, legal, labor, physical, environmental, volunteer areas of education and more. It is noted that civic education is an integrated concept that reflects the process of formation of citizenship as an integrated quality of personality and emphasizes the role at the present stage of volunteer education. A model of civic education of future rescue officers in a higher education institution has been built. A number of conceptual provisions on the formation of civic education of future rescue officers have been formulated: the formation of civic education as a necessary component of professional qualities; ensuring awareness of the importance of civic activity in future professional activities; identification of features of civic education of future rescue officers; development of the concept of civic education of future rescue service officers on the basis of an integrative approach, etc.*

Keywords: *civic education, cadets, future officers, rescue service, civic education, higher education institutions.*

Formulation of the problem. Current trends in Ukraine's development have led to the growing urgency of the problem of forming civic qualities of the individual, who must fulfill not only constitutional laws and professional duties, but also feel responsible for the development of civil society. Formed civic qualities give a person the opportunity to assess social phenomena and processes, their actions and deeds from the standpoint of the interests of society. The problem of civic education of future rescue officers, whose professional activity is closely related to the level of formation of their civic qualities, requires special attention.

The Rescue Service ensures the implementation of state policy in the areas of civil protection, protection of the population and territories from emergencies and prevention of their occurrence, emergency response, rescue, firefighting, fire and man-made safety. It is also advisable to take into account that a significant part of the professional activity of rescue officers takes place in extreme conditions. Purposeful educational work is necessary for the personnel to realize the social purpose of the service, the system of values they protect.

The problem of civic education has always attracted the attention of philosophers, educators and psychologists. Considerable attention is paid to civic education in the works of modern domestic scientists (I. Bekh, V. Borisov, M. Boryshevsky, O. Vyshnevsky, P.

Ignatenko, O. Kyrychuk, O. Kobernyk, M. Koval, M. Kozyar, N. Kosarev, L. Krytska, O. Palamarchuk, M. Stelmakhovych, O. Sukhomlynska, M. Chepil, K. Chorna, etc.). The works of O. Akimova, G. Vasyanovych, A. Kolomiets, L. Korinna, O. Kosholap, G. Tarasenko, A. Tsyupryk are devoted to the education of professional qualities. Scholars also studied the ways, forms and methods of forming civic qualities (P. Verbytska, N. Derevyanko, R. Gurevych, O. Zarichansky, O. Krasovska, M. Rud, etc.) [1 - 3].

Analysis of the psychological and pedagogical literature shows that researchers focus mainly on substantiating the general theoretical foundations of civic education. At the same time, insufficient attention is paid to the content, forms and methods of civic education of future professionals in the context of their personal development and specific professional activities, which negatively affects the results of the theory and practice of problem solving.

The purpose of the article is to substantiate the components of the model of civic education of future rescue officers in higher education.

Presenting main material. Civic education in modern pedagogical science is considered on the basis of different approaches and positions: as a pedagogical process of interaction between teacher and students in order to develop citizenship, the formation of civic consciousness; as one of the directions of the Ukrainian education system; as a type of pedagogical activity, in the process of which civic knowledge is acquired, skills are acquired and worldview is formed; as a pedagogical influence on the formation of civic assessment of the surrounding reality; as a means of forming civic education, which includes individual and universal values; as a socio-pedagogical phenomenon [1].

We consider civic education of future rescue service officers as a process of purposeful educational and self-educational activity on formation of civic qualities and actions (including professional ones) for the benefit of society in future rescue service officers. Civic education of future rescue officers in a higher education institution contains cognitive, value-based and behavioral-activity components.

Civic education, as a multifaceted phenomenon, is the integration of almost all areas of education: legal, moral, ethical, labor, aesthetic, physical, economic, political, environmental, mental, patriotic, multicultural education and more. The content of civic education is aimed at gaining experience of civic actions and experiences, basic civic skills. Civic education forms the civic positions and attitudes of cadets to certain phenomena and processes of society, contributes to the formation of new algorithms of civic activity. In the process of civic education of future rescue officers, important tasks are the education of civic feelings, character, civic consciousness, civic position, civic competence, civic initiative. The core and internal engine of civic education is the social ideal. When determining the result of civic education, the concept of "citizenship" is often used [1, 2].

Civic education is considered by us as a result of civic education of future rescue officers. Civic education is determined by the knowledge, views, actions of a harmoniously and comprehensively developed person with a humanistic worldview.

Civic education of future rescue officers is an integrative quality of personality, which

consists of a set of qualities that characterize the individual as a conscious citizen and is manifested in actions (including professional) for the benefit of society. The process of civic education is inextricably linked to the educational institution, where it takes place within the framework of general professional training. The process of civic education of future rescue officers differs in duration, system and continuity. Initiated civic education in general educational institutions in higher education is deepened, expanded, filled with specific professional content [3].

Peculiarities of civic education of future rescue service officers are organized, planned, systematized, consistent and purposeful educational process aimed at mastering by future rescue service officers of national spiritual and cultural values, formation of national-patriotic consciousness, beliefs, behavior and readiness. from emergencies. Civic education of future rescue officers is based on the principles: education of cadets pride in their country, respect for state symbols, language, culture, traditions, education on the examples of the heroic past of prominent figures of our state, the history of the savior, love for state and people , the desire for mercy, kindness, respect, motivation for self-education and self-improvement. The key to the effectiveness of the educational process is an organic combination of the system of principles of education into a holistic system [1 - 3].

In the process of developing the concept of civic education of future rescue service officers in a higher education institution, it is necessary to adhere to the social and professional norms provided for in general state and sectoral documents; rely on historical experience and take into account foreign experience of civic education; use general scientific approaches (integrative, culturological, activity, axiological); to ensure the unity of national and civic education through the formation of national consciousness; determine the strategy of civic education based on the values of civil society.

That is why the model of civic education of future rescue officers in higher education includes: purpose, concept, integrative target program, criteria, indicators and levels of civic education, the result - positive trend in civic education of cadets (Fig. 1).

The main purpose of civic education of future rescue officers is to form a conscious citizen-patriot of Ukraine, an active leader of the national idea, a representative of the Ukrainian national elite through the acquisition of national consciousness, active citizenship, high moral qualities and spiritual needs.

The priority task of civic education of future rescue officers is the education of nationally conscious citizens of the state, with a sense of human dignity, patriotism, civic responsibility, respect for the national, spiritual wealth of the country, language, culture, traditions; formation of national consciousness, dignity of a citizen, education of respect and love for the native land and Ukrainian traditions; developing a clear civic position, instilling in young people faith in the rule of law, which is the only guarantee of freedom; ensuring a high level of professionalism and education of a young person, promoting the development of individual abilities, talent and self-realization, etc.

Educational activities are carried out in accordance with the calendar plan of educational work of the educational institution. Cyclicalness involves the organization

of educational work on the basis of repetition of educational activities in a certain sequence for a specific period of time (events dedicated to certain events: the celebration of memorable dates, participation in festivals, conferences).

The integrative-targeted program of civic education provides for three blocks, each of which corresponds to a separate area of educational interaction. The cognitive-developmental block synthesizes educational-developmental, information-communicative and creative-applied activity of cadets and is realized in various forms: clubs, circles, festivals of creativity, olympiads, collective creative affairs, excursions; interactive forms of education (discussions, debates, brainstorming, web quests, performances, etc.). Particular attention is paid to the study of the history of the profession, institution, flag, etc. The health-training block provides creation of conditions for physical and intellectual development, and also emotional unloading of cadets. Implemented through the following forms: sports sections, competitions, games, hikes, promotions, flash mobs, etc. The socially active block directs cadets to various activities that develop self-government, integrate interaction in the team, have a socially useful nature and are organized in the social, cultural, economic and political spheres. Implemented through various types of project activities, including volunteering.

During the research, the target project "Citizen Education" was implemented, which provides psychological and pedagogical support for the self-development of civic education of future rescue officers. Various forms of educational work were used: cadets were involved in competitions; to work of circles, clubs, to campaigns, excursions, competitions.

An important step was the involvement of cadets in volunteer activities, during which they lay the foundation of civic worldview, professionally significant personal qualities, attitude to the future profession. Volunteer practice helps to determine professional suitability and future specialization, because it reflects the needs of society and personal interests, universal values (empathy, tolerance, charity, etc.).

Conclusions. The basic concepts of determining the civic education of future rescue officers are considered as a process of purposeful educational and self-educational activities for the formation of future rescue officers civic qualities and actions (including professional) for the benefit of society, which provides cognitive, value-based and behavioral activity components. The civic education of future rescue officers is the result of civic education.

The conceptual principles of civic education of future rescue officers (adhere to social and professional norms provided in national and sectoral documents; rely on historical experience and take into account foreign experience of civic education; use general scientific approaches; ensure unity of national and civic education by defining national consciousness strategy of civic education based on the values of civil society). A model of civic education of future rescue service officers in a higher education institution has been developed, covering the purpose, conceptual principles, integrative-target program, criteria, indicators, levels of civic education, result.

The subject of further scientific research may be: problems of theory and practice

of various areas of education of future rescue officers, research of historical experience of civic education of future rescue officers, development of theoretical systems of civic education, identification of factors influencing the level of formation of future civil service officers.

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MEDICINE AND PHISIOLOGY

SPECIFICITY OF THE PSYCHOLOGY TO MODERN TIME CONSCRIPTION DURING DRAFT SITUATION FOR MILITARY SERVICE

Alexander Makarenko,

Doctor of Medical Sciences, Professor,

Alexander Khodos,

Practical psychologist,

Sergey Kravchuk,

Candidate of Psychological Sciences,

Irina Wolfe,

*MD, Director of International Education Health Care Solution Corporation of
Health Productions Academy, USA*

Annotation. *This article is devoted to highlight the main challenges during the 2021 conscription campaign. These psychological properties of the modern conscript service, indicated modern views of the role and place of the military psychologist during support of young replenishment of the Ukrainian Armed Forces. The reasons of difficulties and prospects are revealed finding ways to improve the effective service of young people.*

Keywords: *Conscription, educational work, psychological adaptation, maladaptation, servicemen for contract, the Ukrainian Armed Forces, stress, stress resistance, psychological support, loneliness.*

Actuality. The main purpose of our collective co-authors is the study of psychological adaptation processes and mechanisms in general, Ukrainian Armed Forces servicemen (hereinafter referred to as the Ukraine Armed Forces - ed.) and in particular and conscripts.

One of the tasks of our work is to bring awareness and theoretical justification of adequate psychological support to servicemen by military psychologists not only from the moment of joining the ranks of the Ukrainian Armed Forces, but also until the acquisition of the primary military knowledge, while studying at secondary schools and other educational institutions, within the limits of possible interaction with civilian psychologists.

The development of a Ukrainian modern and effective army is today's main prerequisite for Ukrainian's statehood in general, especially before the eyes of the Russian Federations – the country's aggressor. There is a courageous Ukrainian warrior, a modern knight, and a hero that the young serviceman has to equal. The main task of defense, sovereignty and territorial integrity (according to the Constitution of Ukraine) is to force state structures, in particular the Ukrainian Armed Forces [1].

The main combat component of the Armed Forces is a servicemen military service

under the contract, specialist, having a military specialty and combat experience, but to date (despite differing views on expediency and efficiency) another category continues to exist for servicemen, namely conscripts, yesterday's civilian youth. During conscription in the spring/autumn campaign of 2021, specialists in all areas clearly understand the peculiarities of considering the psychology of modern conscription during the campaign. This will ensure not only quality selection and adequate distribution of youth, but also strengthen the foundation in the near future professional army. After all, today's conscript is coming soon probable serviceman under contract, with a more negative option development of action-mobilized.

The functioning of the Armed Forces is guided by the requirements of the current legislation of Ukraine, in particular the Law of Ukraine "On military duties of Conscription and military service" [2]. Also the conscription process and dismissal to the reserve is also regulated by the decree of the President of Ukraine of 24 February 2021 № 71/2021. According to these documents, for conscription, male citizens of Ukraine fit for health are called upon, who were 18 years old by the day of sending to military units, and older persons who have not reached 27 years of age so far, says the commissioner of Kyiv Regional Center of acquisition and social support Valery Kutsenko [15].

Over time, the psychological portrait of the average recruit experiences constant changes. These changes occur simultaneously with the development of social relations, development demanding state in some places, and changing certain accents and attitudes as they become the future soldier. This applies not only to the promotion of the army and recruitment policy of the state, moreover, in our opinion, and still not there is a lack of transparent inter-institutional dialogue between the Ukrainian Armed Forces and educational institutions (high schools, colleges) sports schools-colleges, university educations, patriotic clubs, civilian civic society, adequate information - educational work. As it shows our experience, view of service in the Ukrainian Armed Forces of most recruits remains distorted - infantile, why there are many reasons; psychological work service in the Ukrainian Armed Forces needs a radical rethinking and reform, especially in the context of cooperation with civilian and social colleagues and teachers.

Presenting main materials. Studying the problems of adaptation conscripts for military service and psychological accompanied (support) by military psychologists engaged in: Makarenko O. [8,11], Yagupov V. [10], Skripin O., Deiko A. [4], Kokun O., Agayev N., Pishko I., Lozinska N. [5,6], Komar Z. [7], Syropyatov O. [9], Mozgovyi V. [12], etc.

Working in military commissariats and in carrying out professionally psychological selection of conscripts for military service, we have identified the following individually-psychological features of the modern conscript. This is a young person who is 18 -27 years old, mainly with the acquired specialty, professional experience work, formed view of life and awareness of their place in it, not a large proportion of married people and those who have children, more than 50% of incomplete families, the vast majority had acquaintances or close relatives who recently passed the army, or are currently serving in the military law enforcement agencies, and those who had experience in contract or military service for mobilization.

Having any experience or awareness of certain expectations with regard to military service, this is always approving, and can be a solid foundation positive adaptive dynamics. But when knowledge of military service is wrong, distorted or incomplete - this can lead to a problem of the sensation of an unknown threat. It's expectations may be a more stressful factor than the most traumatic event. . During individual interviews with conscripts, it is discovered the obvious "information hunger" through lack of relevant information.

The reasons why can be divided into two categories:

I. Objective

- The general state of society in Ukraine
- Information against the Russian Federation
- Destructive tendencies among modern youth (deviations, low level of morality, education, lack of fundamental interests, low physical culture, alcohol and narcotics, etc.).

II. Subjective This is a category caused by "information hunger"

That subject to a relatively easy process of leveling the effects on the psyche of the conscript (subject to the establishment of effective inter-institutional communication):

1. Conditions of service within different categories (contract, mobilization, "term") are radically different from each other and often the experience of some does not help others.

2. Poor- quality information work by military commissariats;

3. The propaganda component of popularizing military service still remains clumsy due to lack of mutual understanding between civilian directors, screenwriters and military consultants. So in turn, the military personnel can not realize and depict an adequate perspective Ukrainian Armed Forces for civil young people. The civic view of what a defender of Ukraine should be does not meets the requirements of the Armed Forces themselves.

4. Pre-service training in schools is based on personell's experience which is limited, military training, sports competitions. Also open days on the basis of military units are not carried out in general, or pass to the edge seldom.

5. A lack of knowledge about their rights and responsibilities.

6. A painful state of the chronic political crisis is distorting in some places. The image of a veteran and military, political forces are trying appropriate military gains, etc.

It is not surprising that the conscript when arriving to the army knows nothing about the army. In an open conversation with a military psychologist, conscripts often asked silly questions. For example: "When will our those who have already listened for year beat us?", or "Will we be taught how to break a brick with my head? ", or " When will I jump out with a parachute?" etc.

Unfortunately, the honor of the "old system" (until 2012) considered reasonable toward the attitude on the personal wishes of conscripts to serve, has led to the quality of personnel selection fallening significantly. Now in the tanks units are often guys serving and training whose height is above 180 cm. At repair – restoration units are served by guys with sports categories and world laureates' artistic awards to sports.

The intelligence unit takes the guys indifferent to sport. There is a paradoxical situation and a rhetorical question: Will they want conscripts "out of place" to sign a contract for 3 - 5 years more thus prolonging their own suffering? Officials should care for personal replenishments of the Ukrainian Armed Forces often destroyed the potential of the army in its rudiments (the reason for this is the lack of preventive work aut).

To better understand the absurdity of contrast, it should be noted the psychological support and professional selection of future candidates for the service in special Israeli units have been implementing since the age of 10. We don't argue that military psychologists should implement a similar one in Ukrainian experience. But in order to get a quality result, you need to implement quality of the personnel work.

As Valery Kutsenko emphasizes in his interview: The conscript's wishes is taken into account, but there is also a draft plan, a dispatch plan, and a list military units may have been not coincide with the conscript's desire [15].

In other words, if you are a virtuoso musician and a winner of world competitions, but suitable for military service in unit of Special Forces (on according to the therapist), then you will serve in the assault troops.

Despite the fact that physical training at the level there is unsatisfactory and from obscene swearing recruit loses consciousness, commanders will understand. The main task is to fulfill the plan. At one of the training centers, we observed a case where an experienced lieutenant colonel sent a guy who all his life dreamed of becoming a tanker, to the automobile battalion, because he had driver's category of "B" rights.

Commanders and training having to work with such contingent units are sometimes deprived of the possibility of personnel selection. The military psychologists, ignoring the instructions and guidelines of the "Gray-haired Headquarters", during the psychological study of conscripts are forced to put resolutions:

- Suitable for service in educational units;
- Limitedly suitable for training in training subdivisions;
- Suitable at the discretion of the commander.

All because there is a plan, there is no correct reasonable understanding of the role and place of a military psychologist and personnel work yet.

Becoming a serviceman as a specialist in their field as well as the ability to perform tasks effectively, in our consideration, is based on combining three aspects of readiness. There is implemented exclusively in dynamics, but for didactic purposes let us consider this constant:

1. Psychological readiness;
2. Physical fitness;
3. Professional - targeted or special readiness.

The founders are psychological and professional readiness of the individual (translated from Russian - author) [11; 2].

With a skillful psychological - pedagogical approach of the commanders in young conscript is easy to develop the following positive traits:

- Communication - ability to quickly establish interpersonal contacts, ability to

quickly and efficiently transmit and convey information.

- Plastic thinking - the ability to solve problems in a non-standard way thus, a diplomatic approach to "age" bosses;
- Ability to empathize and support each other;
- Modernity - the ability to use technical innovations and modern multimedia gadgets, skillful possession computer technology;
- Desire for status, career growth;
- Responsibility for the implementation of tasks, etc.

Currently, after undergoing basic training and obtaining military specialty, conscripts provide livelihoods in military units where they serve, e.g. serve in the daily outfits, guards, perform loading and repair work.

We have observed cases when in the units, due to "energetic" introduction of the statutory order, artificially created intolerable conditions for conscripts, in order to encourage them to enter into contracts, motivating the fact that on a contract life is a little freer-easier. In 90% of cases, similar contractors occupy their place in the psychological risk group. While being on such an account their management constantly reminds them.

Algorithm of actions of a practical psychologist, developed by specialists, military psychological service expands the tools of the battalion psychologist, while working in units, the introduction of the following elements:

1. During fire training, creating obstacles, testing exercises in different weather conditions, night times of the month and year, increase the speed of the shooter, or targets (advice is valid, but fantastic, office psychologists have not heard anything about the conditions of exercise, shooting courses and security measures -auth);
2. During technical training, mastering different types of machines, reducing the time of their preparation and repair, overcoming obstacles during actions of "combat imitation" (advice is valid, but psychological service is not taking into account the training plan, clear implementation of exercises and conditions driving - auth);
3. Physical training should include march-throws, overcoming assault strips immediately after the cross, overcoming ordinary terrain, classes in hand-to-hand fight (appropriate recommendation. But kind military training as a march-throw is absent within the training no term only, also a contractor in training centers, and hand-to-hand combat is recognized as too traumatic, and conducted or formally on an paper, or prohibited - auth);
4. Elements of imitation and training are important for special training in an unfamiliar area, under conditions of toxic substances, from increase in mental load, etc. (it is a good recommendation, but the training takes place only in certain rooms or places, according to the approved plan - the synopsis approved by the senior chief, and any initiative will result in disciplinary action foreclosure - auth.) [4; 57].

In some places, practical methodical recommendations of senior chiefs impossible to implement, again due to no understanding of the realities on places. In most cases, for a conscript, military psychologist remains "Exotic" serviceman, he is the officer with

whom it is allowed to communicate without any harm to the moral and psychological state. The meeting with him (according to the plan) is provided only twice, upon arrival at the military units from the military commissariat, , for psychological study, and during selection for the positions of junior commanders, if you are lucky.

Effective professional and leadership qualities of leaders and supervisors of the training centers of the Armed Forces of Ukraine are now measured by the number of trained and specialized men sent to the army. The number of which is measured annually is tens of thousands. We propose to take into account another figure – there are a number of non-combat losses, suicides.

Since from managers and superiors, from their own example depends primarily on the moral – psychological condition of subordinates, rather than the number of concerts per unit area of the largest battlefield of Europe. In military for both contractors and conscripts, combat training must come first. This is so that everyone can do their own thing. In addition, there should be time for family, cultural life (passion- interest for which need to be developed), sports sections and competitions, a reasonable alternative to the current state of affairs.

Conclusions. In a market economy, the employer is aware of the importance of high-quality personnel selection. Executives and chiefs in the Ukrainian Armed Forces also have realized that the term is not a big base for the implementation of the PLAN senior chief. Instead of that he has to be the future contractor, mobilized, a soldier because he has a title as Ukrainian knight with whom to go to battle tomorrow to defend Ukraine. We have to cultivate and teach him.

Psychological portrait of modern youth of Ukraine is a reflection of tomorrow's state of society, in particular, depending on the military psychologist who will come to the ranks of the Army. Also in what psychological state the former the military will return to society, who will be "avatars" or worthy heroes imitation by young people.

Political leadership of the state does not stop implementation of reforms in the Ukrainian Armed Forces. It is necessary to rethink the role and place of the psychological escorting servicemen also to set a value and significance of the military psychologist for the army. We have a common goal which is a professional, contract army. Don't forget that its foundation is a term that needs to be taught, hardened and elevated, not depreciate.

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PHARMACOTHERAPY OF NEUROPATHIC PAIN IN MULTIPLE SCLEROSIS IN THE EXPERIMENT

Oleksandr Nefodov, MD., Professor,

Vladyslava Hruz, Lecturer,

Yevhen Dychko, MD., Professor,

Mykola Zhytnii, Ph.D.,

Viktor Chyrkin, Ph.D.,

Vitalii Bakunov, Ph.D.,

Dnipro State Medical University,

Dnipro Medical Institute of Traditional and Non Traditional Medicine

Annotation. Course use of carbamazepine, topiramate, sodium valproate, gabapentin and pregabalin in experimental EAE-induced neuropathic pain in varying degrees causes the restoration of thresholds of tactile and pain sensitivity, creating favorable conditions for adequate impulse. Course use of amitriptyline and trazodone, but not paroxetine or fluoxetine weakens the neuronal sensitization, allodynia and hyperalgesia induced by experimental allergic encephalomyelitis.

Keywords: multiple sclerosis, neuropathic pain, anticonvulsants, antidepressants.

Problem statement and analysis of recent research. The problem of neuropathic pain (NP) is becoming increasingly important for clinicians, which is directly related to the significant spread of this pathology and the difficulty of achieving a lasting therapeutic effect. Thus, according to available data, the prevalence of NP in the general population is 7-8%, and at the neurological stage patients with NP are about 18%. NP is found in 30-40% of cancer patients, in every 4th patient with diabetes mellitus (DM), in every 10th patient who has suffered a stroke, and in a significant proportion of people with chronic lower back pain - 10- 37%.

The problem with NP is that this type of pain is extremely difficult to treat and it is not always possible to completely eliminate the pain. Often these patients have disturbed sleep, develop depression and anxiety, reduced quality of life and efficiency. Many of them suffer from pain for a long time before they start receiving adequate therapy.

Neuropathic pain is caused by damage or disease to the somatosensory system, including peripheral fibers (A β , A δ and C) and central neurons. The somatosensory system allows you to perceive touch, pressure, pain, temperature, position, movement and vibration. Somatosensory nerves in the skin, muscles, joints, and fascia have thermo-, mechano-, chemo-, proprioceptors, and nociceptors that send signals to the spinal cord and then to the brain for further processing. Most sensory processes involve the thalamic nuclei, which receive a sensory signal that is sent to the cerebral cortex. Lesions or diseases of the somatosensory nervous system can lead to altered and disordered transmission of sensory signals to the spinal cord and brain. NP differs from other chronic diseases that are accompanied by pain, such as inflammatory pain (such as rheumatoid arthritis), the

primary cause of which is inflammation with changes in chemical processes at the site of inflammation; such pain is diagnosed and treated differently [1, 2].

At the same time, according to researchers on the problem of multiple sclerosis (MS), the disease is not only inflammatory in nature, as it has been thought for many years, but also neurodegenerative. Confirmation of the presence of the neurodegenerative component is the gradual progression of the disease; the presence of stable "black holes" on MRI; morphologically proven death of axons, apoptosis of oligodendrocytes and neurons not only in the centers of demyelination, but also in the "normal" white and gray matter, as evidenced by a decrease in N-acetylaspartate (NAA), detected by MR spectroscopy (MRS); increasing atrophy of the brain and spinal cord and the development of cognitive impairment [3, 4, 5].

There are several hypotheses that there is a link between inflammatory and neurodegenerative changes in MS. According to one of them, inflammation is primary and it is the inflammatory processes in the CNS that lead to neurodegeneration. On the other hand, inflammation and neurodegeneration in MS exist independently of each other. Finally, there is the hypothesis that primary neurodegeneration with apoptosis of myelin-forming cells - oligodendrocytes, and the inflammatory response in the brain is secondary. It is possible that all these variants of pathogenesis do occur in different types of MS. The most valid hypothesis is that inflammation and neurodegeneration are only partially interrelated - in the early stages of relapsing MS axon damage is a direct consequence of inflammatory autoimmune attack, and in secondary - and primary-progressive MS neurodegenerative processes develop independently of inflammation. It is believed that in these cases, the development of neurodegeneration is similar to postpolio - a syndrome in which cells that "survived" after a viral infection, after many years undergo apoptosis. Thus, in MS, damaged by the inflammatory process, cells can die in a few years without the development of inflammation. Nevertheless, numerous studies have shown that the high frequency of exacerbations (inflammation) leads to the rapid development of irreversible neurological deficits (neurodegeneration). This fact gives grounds for the early start of neuroprotective therapy [6, 7, 8], which will "widen" the most "bottlenecks" of neuroprotective and antioxidant protection. Currently, neuroprotection of multiple sclerosis is defined as the protection of neurons and glia from damage caused by exogenous or endogenous harmful agents or processes [6]. Neuroprotection in multiple sclerosis should provide prevention of neuroapoptosis, support of nerve and glial cells that die, as well as regeneration of damage and is presented as a universal therapeutic approach in regulating the balance of immune and neurotrophic factors in this pathology [9].

Treatment of patients with NP in the case of multiple comorbidities is a complex multidisciplinary process that requires drug therapy, psychological rehabilitation and physiotherapy. Despite the proven low efficacy of nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesics in these patients, about 2/3 of them receive these drugs. Improper choice of treatment tactics in patients with NP leads to a decrease in its effectiveness and a significant increase in the duration of treatment and costs [10]. However, only a small

proportion of physicians use in their clinical practice a complete list of recommended drugs that could be used as first-line drugs to relieve NP [11]. According to current guidelines, gabapentinoids (gabapentin and pregabalin), tricyclic antidepressants and serotonin and norepinephrine reuptake inhibitors are first-line drugs in the treatment of NP [12, 13]. Second-line drugs are tramadol and opioids, because their use increases the risk of adverse side effects, medical complications and dependence. Cannabinoids are recommended as a third-line therapy, as there are currently insufficient data on the effectiveness and safety of their use in the treatment of NP. Fourth-line drugs include methadone, anticonvulsants with lower efficacy (lamotrigine, lacosamide), tapentadol and botulinum toxin [14, 15].

Given the above, the aim of our work was through comparative systematic analysis and the use of comprehensive methodological approaches to experimentally substantiate the ways of pharmacological correction of pain and drug protection of the brain under the experimental equivalent of multiple sclerosis.

Materials and methods. To study the PC, we used an experimental model with autoimmune mechanisms of inflammatory demyelination - a model of experimental allergic encephalomyelitis (EAE). It should be noted that, as in MS, the clinical picture of EAE is heterogeneous and varies with the severity of the disease.

Experimental studies were performed on white nonlinear rats. The Commission on Bioethics of the Dnipropetrovsk Medical Academy of the Ministry of Health of Ukraine has established that the conducted scientific research on experimental animals meets ethical requirements in accordance with the order of the Ministry of Health of Ukraine № 231 of 01.11.2005. The research was carried out in accordance with the principles of the Declaration of Helsinki adopted by the General Assembly of the World Medical Association (2000), the Council of Europe Convention on Human Rights and Biomedicine (1997), relevant WHO regulations, the International Council of Medical Societies and the 1983 International Code of Medical Ethics.), "General ethical principles of animal experiments", approved by the First National Congress of Bioethics (Kiyv, 2001) in accordance with the provisions of the "European Convention for the protection of vertebrate animals used in experiments and other educational purposes" (Strasbourg, March 18, 1986).

Before the start of the experiment on rats, all animals were examined, weighed, taking into account their age, motor activity and skin condition. After external examination and culling, the experiment was started simultaneously with the control group. Before and during the experiment, rats were kept in a vivarium at a temperature of 20-25°C, humidity not less than 50%, in ventilated rooms and day / night light in standard plastic cages no more than 5 people each, on a standard diet. All animals that participated in the experiment had a healthy appearance and were active [16].

To reproduce experimental allergic encephalomyelitis, the most common method of introducing encephalitogenic emulsion intradermally into the pads of the fingers [17], in the sternum or back of animals [18, 19], and at the base of the rat tail [20].

For the formation of experimental allergic encephalomyelitis used homogenates of

homologous brain, which in encephalitogenicity occupy the first place among other drugs (homogenates of homologous, heterogeneous brain and spinal cord). Encephalitogenic mixture at the rate of 0.1 ml per 100 g of body weight was injected into the connective tissue of the base of the animal's tail. Comparison of the results was performed with a group of intact animals, which were injected with saline in the same volume. Also for the formation of a pathological condition encephalitogenic mixture was introduced into the pads of the paws of experimental animals (white rats), but in comparison with the introduction into the base of the tail, this method of introduction did not cause significant results.

Tactile allodynia was studied in a modification of the von Frey filament test by recording the pressure at which animals pulled their left hind paws, avoiding the effects of increasing stimuli [21]. Rats were placed in plexiglass cages with a wire bottom that allowed them to touch their paws and allowed them to get used to it for 10-15 minutes. The test was performed in the middle of the sole of the left hind paw, avoiding less sensitive pads on the soles. A set of 8 von Frey hairs with logarithmically increasing stiffness (0.41, 0.69, 1.20, 2.04, 3.63, 5.50, 8.51 and 15.14 m) was lifted to the paw. Von Frey's hair was applied perpendicular to the midsole in the area of distribution of the sciatic nerve processes and slowly pressed until they bend.

Evaluation of the manifestations of chemical hyperalgesia was performed using the formalin test [22]. Animals of all groups were accustomed to the observation chamber for 1 hour before receiving a subcutaneous injection of 0.05 ml of 0.5% formalin solution (Acros organics, USA) in the dorsal surface of the right hind limb. Formalin solution was used 30 minutes after the end of the course of the test sample. Behavioral reactions were recorded immediately after subcutaneous injection of formalin into the dorsal surface of the paw by counting the number of tremors in the animal. Observations were performed for 60 minutes after formalin injection and recorded as early phase responses (0-10 minutes after formalin injection) and late phase responses (20-60 minutes after formalin injection).

The study of the manifestations of thermal hyperalgesia was performed using the test "hot plate" [23]. When using this test, the animals were alternately placed on a plate heated to 57-58 °C; the surface temperature of the plate was regulated by a thermostat. The stopwatch recorded the time from the moment of placing the animal on the plate to the moment of the first licking of the paws (hind), which was the latent period of the reaction of licking the paws. The maximum time the animal was on the plate did not exceed 25 seconds.

Results and discussion. Amitriptyline, lamotrigine, carbamazepine, gabapentin, and topiramate are used to treat neuropathic pain in multiple sclerosis, although large-scale evidence-based studies of the effectiveness of these drugs have not been performed. Given the above, we considered it appropriate to conduct a comparative pharmacological analysis of the effects of anticonvulsants (carbamazepine, topiramate, sodium valproate, gabapentin and pregabalin) on the manifestations of neuropathic pain in experimental allergic encephalomyelitis (EAE).

Evaluation of the effectiveness of the studied drugs on neuronal sensitization, allodynia and hyperalgesia induced by experimental allergic encephalomyelitis was performed on white nonlinear rats, which were divided into 7 groups: I - intact animals (passive control), n = 12; II - rats with EAE (active control), n = 12; III - EAE + methylprednisolone (M) + carbamazepine (150 mg / kg), n = 12; IV - EAE + M + topiramate (300 mg / kg), n = 12; V - EAE + M + sodium valproate (155 mg / kg), n = 12; VI - EAE + M + gabapentin (100 mg / kg), n = 6; VII - EAE + M + pregabalin (100 mg / kg), n = 12.

Tactile and pain sensitivity thresholds were recorded in each group of experimental animals with EAE. Tactile allodynia was studied in a modification of the von Frey filament test by recording the pressure at which the animals pulled their left hind paw, avoiding the effects of increasing stimuli. Evaluation of the effect of drugs on the manifestations of chemical hyperalgesia was performed using the formalin test, thermal hyperalgesia - in the test "hot plate".

To determine the flow of drugs for neuronal sensitization, allodynia and hyperalgesia in animals during the week was administered methylprednisolone according to the clinical algorithm of the drug. In addition, in order to determine the pharmacological activity of anticonvulsants, they were used additionally intragastrically once a day from the second to the 16th day after induction of EAE (latent phase + clinical phase until the end of the disease peak).

It has been shown that subcutaneous inoculation of the encephalitogenic mixture caused the development of neuronal sensitization, allodynia and hyperalgesia. Thus, in animals of experimental groups after induction of EAE there was a statistically significant decrease in the threshold of tactile sensitivity by 2.3 times ($p < 0.001$) relative to intact control. The injection of 0.5% formalin solution in the dorsal surface of the foot of rats led to a statistically significant increase in the total number of tremors in 9.5 times ($p < 0,001$) in relation to the group of intact animals. In addition, in the test "hot plate" in rats with EAE-induced neuropathy, the latency period of the avoidance reaction was statistically significantly reduced by 1.7 times ($p < 0.05$) relative to the group of intact control (Table 1).

Table 1

Characteristics of manifestations of neuropathic pain in experimental allergic encephalomyelitis in rats

Animal groups	Tactile allodynia, pull-off threshold, g	Formalin test, total number of tremors	Test «Hot plate» latency avoidance period, sec
Intact control (n = 12)	12,9 + 1,40	7,3 + 0,56	10,5 + 0,99
EAE (n = 12)	5,7* + 0,66	69,6* + 6,53	5,9** + 0,77

Notes:

* - $p < 0,001$ in relation to the indicators of intact control;

** - $p < 0.05$ in relation to the indicators of intact control.

The results of the assessment of the manifestations of allodynia and hyperalgesia after a course of anticonvulsants in EAE-induced neuropathy are presented in table. 2.

Table 2

Changes in tactile sensitivity, chemical and thermal hyperalgesia in rats after a course of combined administration of methylprednisolone with anticonvulsants

Animal groups	Tactile allodynia, pull-off threshold, g	Formalin test, total number of tremors	Test «Hot plate» latency avoidance period, sec
Intact control (n = 12)	12,9 + 1,40	7,3 + 0,56	10,5 + 0,99
Active control (n = 12)	5,7* + 0,66	69,6* + 6,53	5,9** + 0,77
Carbamazepine, 150 mg/kg (n = 12)	7,0 + 0,67	56,8 + 6,99	8,7□ + 0,56
Topiramate, 300 mg/kg (n = 12)	7,8 + 1,66	49,3 + 4,57	8,8□ + 0,60
Sodium valproate, 155 mg/kg (n = 12)	8,1 + 1,53	53,0 + 4,49	9,0□ + 0,82
Gabapentin, 100 mg/kg (n = 12)	10,2 + 1,63	37,8□ + 4,64	9,3□ + 0,80
Pregabalin, 100 mg/kg (n = 12)	9,7□ + 1,80	40,0□ + 4,63	9,0□ + 0,58

Notes:

* - $p < 0,001$ in relation to the indicators of intact control;

** - $p < 0,05$ in relation to the indicators of intact control;

□ - $p < 0,05$ in relation to the indicators of active control.

It was established that in animals of III - VII experimental groups after the course of anticonvulsants during mechanical stimulation of the hind limb there was an increase in the threshold of tactile sensitivity in relation to the indicators of active control. The ability to reduce the severity of tactile allodynia decreased in a number of gabapentin (79%, $p < 0,05$) ≥ pregabalin (70%, $p < 0,05$) > sodium valproate (42%, $p > 0,05$) ≥ topiramate %, $p > 0,05$) > carbamazepine (23%, $p > 0,05$) (Table 2).

It is known that the development of stimulus-dependent pain, which occurs in response to stimulation of sensitized by damage to peripheral nociceptors, is mediated by mechanisms caused by disruption of inhibition at the level of the posterior horn. Due to the increased excitability of sensitive neurons of the posterior horns of the spinal cord associated with the area of innervation of the damaged nerve, there is a sensitization of adjacent intact neurons with the expansion of the receptive zone. Sensitization of neurons

of the posterior horns leads to a decrease in the pain threshold and the development of allodynia, ie the appearance of pain on irritation, which is not normally accompanied by them [23].

It was shown that after the course of anticonvulsants, the total number of tremors caused by injection of 0.5% formalin solution into the dorsal surface of the foot of EAE-associated rats was less than in the control group. Thus, the number of early and late phase responses under the influence of gabapentin and pregabalin was statistically significantly reduced by 46% ($p < 0.05$) and 43% ($p < 0.05$), respectively, compared with animals in the control group. The weakening of chemical hyperalgesia after administration of carbamazepine (18%, $p > 0.05$), topiramate (29%, $p > 0.05$) and sodium valproate (24%, $p > 0.05$), was a moderate trend (table 2).

In addition, it was demonstrated that under the conditions of course administration of carbamazepine, topiramate, sodium valproate, gabapentin and pregabalin there was a statistically significant increase in the latent period of the paw licking reaction by an average of 52% ($p < 0.05$) relative to control indicators (Table 2).

According to N. A. Barinov (2007), 4 types of vanilloid thermoreceptors respond to thermal stimuli: TRPV-4 and TRPV-3 receptors, which are activated at 27-35°C and 34-38°C, respectively, in the Ruffini terminations associated with myelinated A δ -afferents, and TRPV-2 and TRPV-1 receptors, which are activated at temperatures above 43 °C and above 52 °C, respectively, on the membranes of nociceptors of unmyelinated C-afferents. Damage to A δ -afferents in neuropathy leads to loss of inhibitory effects at the spinal level and changes in the thermal pain threshold. Therefore, pain occurs in connection with the irritation of TRPV-1 receptors at lower than normal temperatures due to impaired central inhibition. Probably, the course introduction of test samples helped to restore the structural organization of myelinated A δ -afferents associated with vanilloid thermoreceptors TRPV-4 and TRPV-3, normalizing inhibitory effects at the spinal level and causing central modification of the polymodal sensory pulse.

Therefore, the course of carbamazepine, topiramate, sodium valproate, gabapentin and pregabalin in experimental EAE-induced neuropathic pain in varying degrees causes the restoration of thresholds of tactile and pain sensitivity, creating favorable conditions for adequate conduct.

The maximum severity of the therapeutic effect of gabapentin and pregabalin is due primarily to their ability to bind to the $\alpha 2\delta$ subunit (alpha-2-delta) voltage-dependent calcium N-channels located in the superficial plate of the posterior horn of the spinal cord involved in the formation of neuropathy. . In addition, the antinociceptive effects of these drugs may be due to inhibition of the release of excitatory amino acids from presynaptic terminals, because in most clinical forms of neuropathic pain NMDA receptor channels are fully open, which promotes calcium influx, increased neuronal excitability, resulting in neuronal excitability and allodynia and hyperalgesia.

We considered it appropriate to conduct a comparative pharmacological analysis of the effects of amitriptyline, fluoxetine, paroxetine and trazodone (triticco) on the manifestations of neuropathic pain in experimental allergic encephalomyelitis (EAE) -

the experimental equivalent of MS.

Evaluation of the effectiveness of the studied drugs on neuronal sensitization, allodynia and hyperalgesia induced by experimental allergic encephalomyelitis was performed on white outbred rats, which were divided into 6 groups: I - intact animals (passive control), $n = 12$; II - rats with EAE (active control), $n = 12$; III - EAE + methylprednisolone (M) + amitriptyline (10 mg / kg), $n = 12$; IV - EAE + M + paroxetine (8 mg / kg), $n = 12$; V - EAE + M + fluoxetine (25 mg / kg), $n = 12$; VI - EAE + M + trazodone (40 mg / kg), $n = 12$.

To determine the effect of drugs on neuronal sensitization, allodynia and hyperalgesia in animals during the week was administered solu-medrol according to the clinical algorithm of the drug. In addition, in order to determine the pharmacological activity of antidepressants, they were used additionally intragastrically once a day from the second to the 16th day after the induction of EAE (latent phase + clinical phase until the end of the disease peak).

It is shown that subcutaneous inoculation of encephalitogenic mixture caused the development of neuronal sensitization, allodynia and hyperalgesia (Fig. 1).

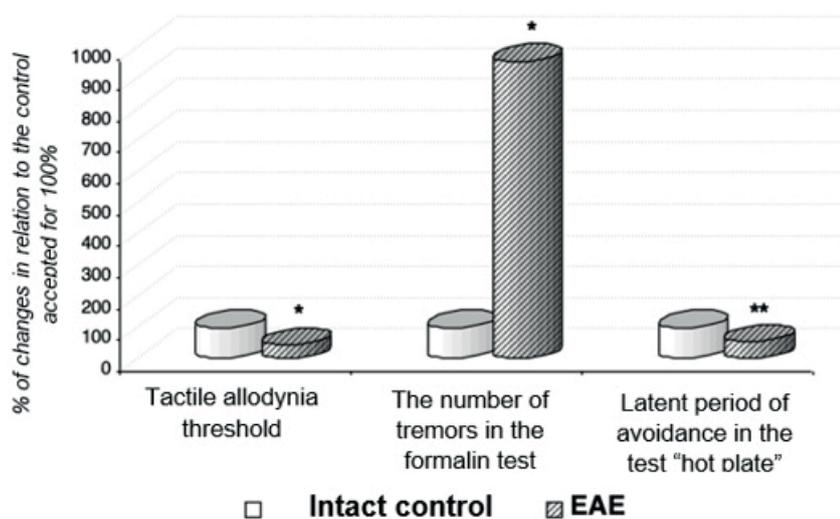


Fig. 1. Characteristics of manifestations of neuropathic pain under conditions of EAE in rats

Notes:

* - $p < 0,001$ in relation to the indicators of intact control;

** - $p < 0,05$ in relation to the indicators of intact control.

In particular, in animals of experimental groups after induction of EAE there was a statistically significant decrease in the threshold of tactile sensitivity by 2.3 times ($p < 0.001$) relative to intact control. The injection of 0.5% formalin solution in the dorsal

surface of the foot of rats led to a statistically significant increase in the total number of tremors in 9.5 times ($p < 0,001$) in relation to the group of intact animals. In addition, in the hot plate test in rats with EAE-induced neuropathy, the latency period of the avoidance reaction was statistically significantly reduced by 1.7 times ($p < 0.05$) relative to the intact control group (Fig. 1).

The results of the assessment of changes in allodynia and hyperalgesia after a course of antidepressants in EAE-induced neuropathy are presented in table. 3.

It was found that during mechanical stimulation of the hind limb after a course of antidepressants statistically significant increase in the threshold of allodynia in relation to the indicators of active control was registered only in animals of II and V experimental groups. In particular, the ability to reduce the severity of tactile allodynia decreased in a number of amitriptyline (60%, $p < 0.05$) > trazodone (40%, $p < 0.05$) >> fluoxetine (18%, $p > 0.05$) \approx paroxetine (14 %, $p > 0.05$) (Table 3).

Table 3

Changes in tactile sensitivity, chemical and thermal hyperalgesia in rats after a course of combined administration of methylprednisolone with antidepressants under EAE conditions

Animal groups	Tactile allodynia, pull-off threshold, g	Formalin test, total number of tremors	Test «Hot plate» latency avoidance period, sec
Intact control (n= 12)	12,9 + 1,40	7,3 + 0,56	10,5 + 0,99
Active control (n= 12)	5,7* + 0,66	69,6* + 6,53	5,9** + 0,77
Amitriptyline, 10 mg / kg (n = 12)	9,1 \square + 1,30	41,3 \square + 4,72	8,8 \square + 0,83
Paroxetine, 8 mg / kg (n = 12)	6,5 + 0,63	66,0 + 4,49	7,2 + 0,75
Fluoxetine, 25 mg / kg (n = 12)	6,7 + 0,86	61,7 + 4,80	7,7 + 0,76
Trazodone, 40 mg / kg (n = 12)	8,0 \square + 0,50	55,2 + 6,79	8,0 + 0,82

Notes:

* - $p < 0,001$ in relation to the indicators of intact control;

** - $p < 0.05$ in relation to the indicators of intact control;

\square - $p < 0.05$ in relation to the indicators of active control.

Mechanisms associated with disruption of the processes of inhibition at the level of the posterior horn, are involved in the development of stimulus-dependent pain that occurs in response to stimulation of sensitized by damage to peripheral nociceptors [13]. Due to the increased excitability of sensitive neurons of the posterior horns of the spinal cord associated with the area of innervation of the damaged nerve, there is a sensitization of adjacent intact neurons with the expansion of the receptive zone. Sensitization of neurons of the posterior horns leads to a decrease in the pain threshold

and the development of allodynia, ie the appearance of pain on irritation, which is not normally accompanied by them.

It was shown that after the course of antidepressants, the total number of tremors caused by injection of 0.5% formalin solution into the dorsal surface of the foot of experimental rats was less than in the control group. Thus, the number of early and late phase responses under the influence of amitriptyline was statistically significantly reduced by 41% ($p < 0.05$) compared with animals in the control group. The weakening of chemical hyperalgesia after administration of trazodone (21%, $p > 0.05$) was only a trend, and the use of fluoxetine and paroxetine had little effect on the release of mediators of pain and inflammation.

In addition, under the course of amitriptyline, fluoxetine, paroxetine and trazodone, a statistically significant increase in the latency period of the paw licking reaction by 49% ($p < 0.05$) relative to control parameters was also recorded only after amitriptyline (Table 3).

Therefore, the course of amitriptyline and trazodone, but not paroxetine or fluoxetine weakens the neuronal sensitization, allodynia and hyperalgesia induced by experimental allergic encephalomyelitis.

It is known that one of the areas of treatment of neuropathic pain is the use of psychotropic drugs that modulate opioid and monoaminergic neurotransmitter systems. Antidepressants are considered the first-line drugs for the treatment of such pain. Although their clinical use is accompanied by the development of a number of side effects, amitriptyline and nortriptyline have the largest evidence base in the treatment of neuropathic pain: proven dose-dependent analgesic effect of tricyclic antidepressants on allodynia, burning and shooting pain in MS. Selective serotonin reuptake inhibitors (fluoxetine, paroxetine), despite less severe side effects, have not been widely used due to insufficient antinociceptive potential, and clinical observations of antidepressants such as trazodone, nefazodone, and mirtazapine in their therapeutic efficacy suggest [13, 14].

It is believed that the antinociceptive properties of antidepressants are more pronounced in drugs that affect both serotonergic and noradrenergic neurotransmitter systems [13], which confirms the results of our study.

Conclusions. 1. Course use of carbamazepine, topiramate, sodium valproate, gabapentin and pregabalin in EAE-induced neuropathic pain causes normalization of tactile and pain sensitivity of varying severity.

2. The ability to alleviate the manifestations of neuropathic pain under the conditions of the experimental equivalent of MS is reduced in a number of gabapentin \geq pregabalin $>$ sodium valproate \geq topiramate $>$ carbamazepine.

3. Course use of amitriptyline and trazodone, but not paroxetine or fluoxetine in the EAE causes normalization of tactile and pain sensitivity of varying severity.

4. The ability to alleviate the manifestations of neuropathic pain in experimental allergic encephalomyelitis is reduced in a number of amitriptyline $>$ trazodone \gg fluoxetine \approx paroxetine.

Perspectives of further researches. In further studies, it would be interesting to

reveal the pharmacokinetic interaction of basic multiple sclerosis therapy with drugs for symptomatic treatment.

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EARTH SCIENCES

MONITORING OF CHEMICAL ELEMENTS IN THE ROAD LANDSCAPE ENGINEERING SYSTEM KYIV-ODESSA

Ruslana Didura,

*postgraduate student, Department of Geography,
Vinnytsia State Pedagogical University. M. Kotsyubynsky, Ukraine*

Annotation. *The problem of heavy metal contamination of the soil of the roadside lane of the Kyiv - Odessa highway is considered. Previous studies of foreign and domestic scientists on this topic are analyzed. Areas for field research have been identified, on which soil samples have been taken: the first site is located in Kyiv (Kyiv region); the second is located in the vicinity of Bila Tserkva (Kyiv region); the third is located in the village. Nesterivka (Cherkasy region); the fourth is located near the village. Pkivets (Cherkasy region); the fifth local site is located in Uman (Cherkasy region); the next full-scale site is located in the vicinity of the village of Kryve Ozero (Mykolaiv region); another local area is located within the Hadzhebey estuary (Odessa region); the eighth plot is located in Odessa (Odessa region). Chemical elements were found in the ground cover of the roadside lane of the Kyiv-Odessa highway. It was investigated that the heavy metals Zn, Cu, Cd, Pb were the most active. Soil samples were taken at a distance of 5, 10 and 15 m from the road surface, at a depth of 0-10 cm in clear weather. Almost all chemical elements are within the maximum allowable concentration, but there are also abnormal areas. Such studies on the territory of the road landscape engineering system Kyiv - Odessa have not been conducted, which is relevant today.*

Keywords: *road landscape engineering system, Kyiv - Odessa highway, heavy metals, section, MPC, soil pollution, zinc, lead, cadmium, copper.*

Relevance of the research topic. In recent years, much attention has been paid to the study and study of environmental pollution, especially soil pollution by heavy metals (HE). VMs enter the environment in different ways: the genesis of soil, quarries and mines in the extraction of polymetallic ores; enterprises of ferrous and non-ferrous metallurgy, power plants, combustible coal, chemical means of protection of crops from diseases and pests and road transport. The total amount of VM in the soil is an indicator that allows to determine the rate and degree of pollution.

One of the types of environmental pollution is road transport. Each car consumes gasoline, diesel or gas, which with the remnants of recycled substances is emitted into the atmosphere by VMs that settle in the main lanes (5-100 m from the roadway).

Along with road landscapes, agricultural, industrial, water, residential, recreational and other landscapes are always adjacent, which are adversely affected by the operation of vehicles. For humans, the action of VM primarily affects the body: liver, kidneys, heart; for plants, a large amount of VM contributes to the disruption of metabolic processes, inhibits growth and development; for the soil, an excessive amount of VM

contributes to the process of soil degradation and erosion. Therefore, VMs are among the most dangerous landscape pollutants that require constant monitoring and research.

States of study of the question, the main works: domestic and foreign scientists studied the content of heavy metals in the soil: Ilyin Parfenova O.A., Prokhorova N.V. and Matveev N.M., O.M. Valchuk-Orkusha, O.O. Galagan, O.V. Grabovsky, G.I. Denysyk, L.L. Dovbysh, J. Deriy, O. Kupchyk, T.M. Thoughtful, M.V. Тахасюк, G.O. Usmanova, G.D. Hodan, O.S. Chernysh and others.

Parfenova O.A. considered the impact of motor transport on the main territory [5]. In her research, she recorded a tendency to accumulate heavy metals in the 50-meter strip. Prokhorova N.V. and Matveev N.M. studied the influence of heavy metals in ecosystems under the influence of technogenesis [6]. Scientists have identified the main ways of getting heavy metals into the soil, their migration and accumulation.

Within Podillya G.I. Denysyk and O.M. Valchuk-Orkush identified the stages of formation of road landscapes of Podillya, studied their structure, regional types, geochemical and ecological features, conducted their classification and zoning [3]. On the territory of Chernivtsi region ecological-geochemical assessment of road geosystems was carried out by M.V. Tanasyuk and G.D. Khodan [8]. M. Voloshin and O.O. Galagan studied road landscape systems and features of pollution of highway territories within Volyn, modeled the distribution of heavy metals in the main geosystems [1]. Also in the Chernihiv region conducted their research A.I. Melnyk and G.O. Usmanov, on the content of heavy metals in the soil and vegetable products in the area of the highway Chernihiv - Gomel [7]. Migration and accumulation of heavy metals in agrocenoses adjacent to highways in the Transcarpathian region, was engaged in O.V. Grabowski [2].

Purpose of the article: research, analysis and assessment of heavy metal contamination of the soil cover of the main lane of the road landscape engineering system Kyiv - Odessa.

Research methods. The methodology of geochemical research in particular road landscapes is well developed. To determine the mobile shape of heavy metals in the soils of the roadside zone, soil samples were taken independently in accordance with GOST 17.4.3.01 and GOST 17.4.4.02, at a distance of 5, 10 and 15 m from the highway Kiev - Odessa. The depth of soil sampling ranged from 0 to 10 cm in five repetitions. Due to the meridional position of the highway, 8 full-scale sections were selected, at a distance of 50-60 km from each other. Soil samples were taken in plastic bags with a passport for each sample. Immediately after sampling, the soil samples were dried to an air-dry state in the room and transferred to the laboratory of the Cherkasy branch of the state institution "Institute of Soil Protection of Ukraine". The analyzes were performed by atomic absorption spectrometry according to MBB34-497058-015-2003.

Presenting main material. The Kyiv-Odessa highway connects the central economic part of the country with the recreational and tourist southern coast of the Black Sea. The highway stretches for 453.3 km in the meridional direction and coincides in Ukraine with the International Transport Corridor №9, which is called E-95 St. Petersburg - Merzifon. The highway crosses 5 administrative-territorial units of Ukraine. The width of the road is 14 m, the traffic intensity is 235-508 cars per hour, of which 72-160 are

trucks, in winter the number of cars is 13-14 thousand, in summer the number of cars increases to 24-25 thousand per day.

Among heavy metals there are about 40 chemical elements: V, Mn, Fe, Co, Ni, Cu, Zn, Pb, Bi, Cr, Hg, Sn and others. All chemical elements are divided into three hazard classes depending on their activity and impact on soils. However, Zn, Cu, Cd, Pb are among the most harmful, so their content in the soil was determined first.

To study the content of heavy metals, 8 full-scale sections were selected, which are directly adjacent to the road landscape engineering system Kyiv - Odessa.

The first natural plot is located in Kyiv (Kyiv region) in terms of physical and geographical location within the forest-steppe zone. In the geological structure, the site is confined to the Ukrainian Crystal Shield (UCS), which extends through the entire territory of Ukraine from northwest to southeast almost to the coast of the Sea of Azov. The landscape structure is dominated by hills with a strong anthropogenic cover on Paleogene-Neogene sediments. Where common forest hills, dissected with gray forest soils and hornbeam oaks. The content of heavy metals in the soil in this area is normal. However, there are some chemical elements that are close to excessive amounts. Cadmium in this area is 0.28 mg / kg at the maximum allowable concentration (MPC) - 0.7 mg / kg, if this element accumulates, it will move to the class of hazardous substances. Cadmium is interrelated with zinc and has similar chemical properties. Zinc in this area is also within normal limits and does not exceed the MPC. For all investigated elements at the local site in Kyiv, a tendency to decrease the content of heavy metals from the source of pollution was recorded.

The second natural plot is concentrated in the vicinity of Bila Tserkva (Kyiv region), which is located within the forest-steppe zone. According to the geological and geomorphological structure, the section of the Kyiv-Odessa highway is located within the UCC, where Precambrian sedimentary-metamorphic and igneous rocks, Archean granites, gneisses and other deposits that complicate the structure of the road landscape come to the surface. Separate structures of the crystal shield are the basis for the formation of the landscape engineering system Kyiv - Odessa. The Bila Tserkva line of tectonic rupture of the UCS, which occupies the north-eastern part of the highway, led to the formation of the valley of the rivers Ros, Gnily and Gorsky Tikich, through which engineering structures, bridges and overpasses of the Kyiv-Odessa highway were built. The landscape structure is dominated by loess hills, strongly dissected by ravines and beams, cut into the Neogene sediments, with typical medium-humus chernozems, with oak groves. The moving amount of VM is inhomogeneously stratified in the soil profile. The highest content is observed in the humus layer, as well as in the illuvial and carbonate horizons. At the study location, all chemical elements were normal. However, lead exceeds the MPC by 1.5 times and is - 9.1 mg / kg, which is dangerous for the soils of the roadside. The excessive amount of lead in the soil is explained by the fact that on the outskirts of Bila Tserkva there is one of the largest factories in Ukraine for the production of tire products "Rosava". There is also a tendency to reduce the content of heavy metals from the source of pollution.

Another local area is concentrated on the outskirts of the village. Nesterivka (Cherkasy region) and is located within the forest-steppe zone. Tectonically, the area is confined to the UCC. The landscape structure is represented by loess hills, strongly dissected ravines and beams cut into crystalline rocks, with chernozems typical low-humus and podzolic, in the plant world hornbeam groves predominate. Chemical elements at the local site are normal and do not exceed the MPC. There is a tendency to reduce heavy metal from the road surface, but at a distance of 5 meters the content of harmful elements is minimal, and at a distance of 10 m this figure increases to the maximum value, at a distance of 15 m the content of VM decreases. This is due to the fact that the terrain on which the highway is built makes changes to the scattering of VM in the roadside lane. The local area is located on a slope of 8° , which serves as a barrier and traps heavy metals that settle during the transfer of air masses. Therefore, the figure in the 10 m strip is greater than 5 m.

The next local area is located on the outskirts of Pikivets (Cherkasy region) and is located within the forest-steppe zone. Tectonically, it is confined to the UCC. The landscape structure is dominated by forest hills, dissected by ravines and beams, cut into the crystal pores, with gray and dark gray forest soils, and are represented by hornbeam oaks. Such heavy elements as: Zn, Cu, Cd, Pb were revealed. The level of lead exceeds the MPC by 1.5 times and is 9.3 mg / kg, so this element is classified as harmful heavy metals. Excessive amounts of lead cause stunted growth and development. Excessive amounts of lead are recorded in the leaves of plants. In the future, these plants will become a food base for animals and later enter the human body. Therefore, products grown near these regions need detailed attention because they affect the plant-human food chain. There is also a tendency to distribute VM from the source of pollution.

The next local area is located on the outskirts of Uman (Cherkasy region), and is located in the forest-steppe zone. Within the tectonic structure of UCC. The landscape structure is dominated by loess hills, strongly dissected by ravines and beams, cut into the Neogene sediments, with typical medium-humus chernozems, with hornbeam oaks. The studied chemical elements are within normal limits. With an excessive humus layer, VMs enter into chemical bonds and remain in the upper fertile layers of the horizon, becoming immobile. At this location, zinc exceeds its figure by 2 times. At an MPC of 23 mg / kg the indicator makes - 44,5 mg / kg. Significant Zn index is explained by the fact that the studied area is located at the fork "Clover Leaf" (Cherkasy region) where the directions of highways M - 05 Kyiv - Odessa with the highway M - 12 Stryi - Ternopil - Kropyvnytskyi - Znamyanka, where the load on the highway goes double. The full-scale study area has a small area. This made it possible to distinguish it as an anomalous area of influence of heavy metals. Monitoring for zinc content near Uman at the Clover Leaf fork showed that over time, the amount of heavy metal in the soil gradually decreases. Soil as a natural body has the property of self-renewal, over time, translates VM into a sedentary form, where they decompose and break down, and in the future this figure may reach normal.

Currently, the Zn content in the soil is in excessive amounts, which is dangerous for the normal functioning of soil biota and vegetation. Zinc is closely related to cadmium,

the higher the zinc concentration the more cadmium is in the soil. In our research, this was confirmed because the amount of cadmium in the study area is also high.

The next local area is located near the village. Kryve Ozero (Mykolaiv region), which is located in the steppe zone. Tectonically, the area is confined to the UCC. The landscape structure is represented by loess hills, strongly dissected by ravines and beams, cut into the Neogene sediments, with chernozems typical of medium humus, with oak groves. The investigated heavy metals in this area are within normal limits, some chemical elements are below normal. There is a significant difference in the content of VM between sandy and loamy rocks: in sandy ones the concentration is much lower than in loamy and clays. This is mainly due to the dissimilar mineralogical composition of the soil. In sand it exceeds quartz in which there are almost no VM, whereas in loams and clays a large number of clay minerals, which are rich in heavy metals.

The next local area is located near the Khadzhibeysky estuary (Odessa region), which is located in the steppe zone. The site is confined to the Black Sea lowlands. The landscape structure includes estuarine-marine lowlands, with salt marshes and salt marshes, wormwood-cereal and psalloyphytic-halophytic vegetation. Copper and zinc in this area are within normal limits and do not exceed the MPC. However, lead and cadmium exceed the norm. Lead exceeds 1.5-2 times the MPC, at a distance of 5, 10 and 15 m, this figure does not fall and exceeds the norm. Excess Pb in the plant can inhibit the development, growth and contributes to poorer iron supply to the plant. Pb also has a negative effect on human health, causing various diseases associated with mutagenic reactions. Cadmium in this area also exceeds its figure several times. The reason may be genetic features of the parent breed, primarily particle size and mineralogical composition, p-H environment, fertility level (humus composition). There is also a tendency to decrease the indicator from the source of pollution.

The last studied area is concentrated in the city of Odessa (Odessa region), which is located in the steppe zone and is located within the Black Sea lowlands. The landscape structure presents forest lowlands, with southern chernozems slightly saline in combination with dark chestnut saline soils, under fescue-feathergrass and saline vegetation. Heavy metals were found in the study area, but most of them are normal and do not exceed the MPC. The reason for the low content of metals in this area may be genetic features of the parent rock, primarily particle size and mineralogical composition, p-H environment, fertility level (humic composition). However, 3.0 mg / kg lead is clearly detected, if the load on the road is constant, this chemical element will accumulate over time and acquire the properties of a harmful element.

Analyzing the impact of vehicles on the environment, and especially on roadside lanes, it should be noted that the impact is significant. The main factors of pollution are: traffic intensity, terrain, geomorphological features and structure of the soil, the network of interchanges and stops (at intersections, motorway exits and stops; the amount of pollution increases many times), the arrangement of roads (the presence protective strips, fences, bumpers, recreation centers, etc.). Also, the content of Zn, Cu, Cd, Pb, may change during the application of fertilizers to agricultural products. However, these trace

elements belong to the group of heavy metals and cannot be recommended. However, one and the same trace element can be both useful and harmful if you do not follow a certain norm or concentration.

Conclusions: The obtained results allow us to conclude that chemical elements are present in the soil cover of the road landscape engineering system. These elements in most areas are within normal limits and do not exceed the MPC. However, there are chemical elements whose content refers to dangerously heavy metals, they include Zn, Cu, Cd, Pb. Lead and cadmium throughout the roadside of the Kyiv-Odessa highway are above the norm, which is unacceptable and environmentally dangerous. An anomalous area with zinc content near the city of Uman (Cherkasy region) was discovered and isolated on the territory of the road landscape engineering system Kyiv - Odessa. The mobile form of zinc exceeds 2 times and is 44.5 mg / kg, which is not typical for this area. It has also been studied that excessive amounts of VM enter the plant, and their excess is harmful to both the plant and the animal that serves as a food base. Among the main factors influencing the content of VM in the soil are: the amount of humus, carbonates, reactions of the soil environment, the intensity of vehicles and more.

Therefore, in the future, this highway will be reconstructed and built, which will increase the traffic load several times. Similar studies should be conducted in the future, because the results of the content of mobile forms of heavy metals can be used to assess the degree of soil contamination and the allocation of areas with high environmental risk.

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SOCIO-CULTURAL SCIENCES

SPORTS GAMES OF THE MODERN SYSTEM OF CLASSIFICATION OF SPORTS

Liliia Sikorska,

Vinnitsia State Pedagogical University named after Mykhailo Kotsiubynskyi

Annotation. *The article analyzes different approaches to the classification of sports and separate sports games. The level of interest of the first-year students in different sports, which are presented in the content of physical education of educational institutions, is studied. The aim of the study was to analyze the features of sports games in the modern system of classification of sports and to determine the attitude of student youth to modern sports. Research methods. Theoretical and empirical research methods are used in the work: analysis of professional and scientific-methodical literature, method of questionnaire. The results of the study. A definitive analysis of the basic theoretical concepts "sport", "sports games". The approach of well-known researchers in the field of sports psychology to the classification of sports and sports exercises on the basis of the separation of psychological features of sports activities is considered. The criteria that formed the basis of the most common classifications of sports and sports games in particular are identified. The survey found out which sports modern freshmen prefer. Key conclusions: The analysis of literary, scientific, methodical sources made it possible to outline the existing classifications of sports and in particular sports games; determine the features and significance of sports games. It was found that 59.5% of students prefer to play various kinds of sports.*

Keywords: *sport, classification, sports games, university students.*

Formulation of the problem. Recently, in Ukraine as well as in the whole world there is a steady trend to increase the number of different sports. Sport is a concept that has been formed historically. According to Wikipedia (Free Encyclopedia): "A kind of sport is a set of sports, united by similar rules, one sports federation, etc.", it is also noted that "A kind of sport is a competition according to certain rules, usually a specific sports physical or intellectual activity carried out for the purpose of competition, as well as improving health, obtaining moral and material satisfaction, striving for improvement and fame, improving skills" [3], etc.

Today, sports activities are researched and studied by many sciences and scientists. To do this, use various criteria that determine the classification of sports. Thus, pedagogical, physiological, biomechanical classifications have been developed (L. P. Matveev, Ya. Kots, V. N. Platonov, A. A. Ter-Avanessian). It should be noted that there are almost no qualification systems, which are based on criteria that consider sports from a philosophical and social point of view of the study of certain disciplines. When researching the features of sports games, it is important to take into account their socio-cultural potential, while paying attention to modern ideas and principles that are embedded in the classification systems of sports.

We should take into account the diversity of sports in modern society, there is still

no single classification of sports, so there are a large number of author's approaches to determining the characteristics of sports, which can be used as a basis for a certain classification is of sufficient research interest.

Analysis of recent research and publications. Scientists who dedicate their research to the sports field, to summarize certain features of different sports specializations always try to find some similarity or difference in representatives of sports. On the basis of which, as a rule, they develop their own classification or adhere to previously developed. Thus, in almost every manual on sports games, we can get acquainted with the classification of both sports in general and sports games separately [1,2,5,6]. The importance of sports games in the general system of sports is beyond doubts. The authors point to the complexity of the impact of sports gambling functions of the body and the manifestation of physical qualities, their emotional saturation, situational unpredictability, aesthetic appeal and global popularity among different segments of the population [2,4,10].

The emergence of new sports increases selectivity, so experts always follow the trends of change in the priority of society's preferences, this provides a basis for improving the rules of competitions, enriching techniques and tactics of sports games, changes in competitions and even the emergence of related sports that add entertainment (especially, cheerleading). Among the latest publications in this field we can mention scientific articles by V.M. Platonova, T. Yesentaieva, O.V. Borysovoi, O.O. Mitovoi, V.V. Nikolaienko, O.V. Bairachnoho, R.O. Sushko.

The purpose of the study is to analyze the features of sports games in the modern system of classification of sports and determine the attitude of student youth to modern sports.

Material and methods of research. First-year students of Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynskyi took part in the research, the number of which was 160 people (105 - women, 55 - men). The age of surveyed students is from 16 to 19: 16 - 4 people (2.5%), 17 - 120 people (75%), 18 - 34 people (21.3%), 19 - 2 people (1 , 2%). Students, their parents, as well as the administration of the institution were informed about their participation in the study and agreed to systematize and process the survey data.

The research conditionally corresponded to the following steps - analysis of literature sources on the peculiarities of teaching the discipline of physical education in free economic education in modern world, actualization of the issue of preserving and strengthening students' health during sports improvement, choice of research methods, which was partially presented in our previous publications [8 , 9]. The survey of first-year students was conducted anonymously during September-December 2019-2020 academic year.

The study uses empirical theoretical research methods, the analysis of professional and scientific-methodical literature, sociological research methods, in particular the method of questionnaires.

Theoretical elaboration of literary sources allowed us to carry out a definitive analysis of the concepts "sport", "sports games", to study the classification of sports,

to study the place of sports games in the system of modern youth education, to find out their features.

For the study, a survey of first-year students of Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynskyi was conducted. Its purpose was to determine the ranking of preferences for different sports. Students were offered 30 sports games, which are presented in the programs of physical culture of educational institutions, so that they put the ranks of a favorite kind of sport (№1) in descending order preferences (up to №30).

Research results. To find out the current state of development of sports games, their place in the general classification system of sports, we conducted a definitive analysis of basic theoretical concepts. L.N. Akimova (2004) believes that "sport as a model of a life struggle is a great arena for researching", for example, the main areas of research in sports psychology in the 20-30's – were the problems of the impact of physical activity on the mental sphere of a person, in 40- 50's –the formation and improvement of motor skills, 50-60's - emotional and volitional training, 70-80's - psychological preparation for competitions and self-regulation, 80-90's - a global problem of psychological support of sports activities and mental training [1].

To solve the problem of describing and highlighting the psychological features of sports activities, well-known researchers in the field of sports psychology have proposed classifications of sports and sports exercises. Thus, G. Berger in his classification, adopted in the United States, identified three criteria: criterion I - are sports that due to spatial and temporal uncertainty require a quick response (pair tennis, sports, wrestling) and in which most of the action is controlled by the athlete (shot putting, gymnastics); criterion II - reflects the probability of physical injury in a particular sport, where all sports are divided into two groups: with a pronounced risk of physical injury (wrestling) and with minimal risk (tennis); criterion III is a type of competition: indirect (parallel - according to the typology of Vanek and Kretti) or direct contact with another participant. Examples of indirect contact in sports are billiards, golf etc [1].

According to Berger, "athletes whose activities are directly directed against their opponents are approximately more dominant and tend to blame others rather than themselves for failures, as well as to show aggression, usually outside of sports activities", and "athletes who are engaged in "uncertain" sports, are more confident, feel freer in uncertain situations, and have a number of qualities that allow them to easily adapt to external changes " [1].

T.T. Dzhamharovykh offers a division of sports exercises into two aspects, where the first is confrontation, and the second is interaction, so all sports are combined into 9 groups: 1st group is boxing, wrestling, fencing, 2nd group is football, hockey, rugby, handball (handball), water polo, 3rd group is volleyball, tennis and badminton (doubles), 4th group is tennis, badminton (single category), 5th group is rowing (except singles category), trampoline (synchronous jumping), 6th group is athletics, skiing, swimming (relay), 7th group is running, walking, skiing, cycling (individual race); 8th group is figure skating (pair), acrobatics (pair), 9th group is gymnastics, acrobatics, weightlifting [1].

One more common classification of sports is the classification according to the predominant manifestation of physical qualities and their compliance with certain requirements: speed and power sports, which are characterized by maximum intensity and power of effort, they include - sprinting, discus, jumping, barbell lifting. ; sports that require endurance in cyclical movements, it is running medium and long distances, cross-country skiing, walking, swimming, rowing; sports that require the manifestation of coordination skills in a strictly regulated program of movements, these are acrobatic and gymnastic exercises, diving, figure skating; sports in which the complex manifestation of physical qualities prevails in the conditions of variable modes of motor activity, continuous changes of situations and forms of actions, it is boxing, fencing, wrestling, sports games, etc.[4,6].

LK Serova (2005) suggested another classification, where all sports are divided into three major groups, which makes it possible to classify sports by psychological characteristics (table 1).

Table 1

**Classification of sports by psychological features
(according to LK Serova, 2005)**

Group I- contact sports, their psychological content is a direct confrontation of rivals. The purpose of this fight is to beat the opponent and win, quantified in goals and points.	Group II - sports where you need to get ahead of opponents due to the complexity and beauty of movements and score as many points as possible. In these sports, points are awarded by judges. Therefore, it is important to make an appropriate impression on the judges. Such sports are called artistic.	Group III - sports where you can overtake the opponent, showing the best quantitative result, measured in seconds, kilograms, meters, such sports are called record. These include: speed, power and cyclic sports.
<i>Kinds of sport that belong to these groups:</i>		
Sports games are divided into individual (tennis, table tennis, badminton, etc.) and team (football, volleyball, handball, basketball, water polo, etc.). Martial arts are divided into boxing, wrestling and fencing, each of which has a number of varieties.	The second group of artistic sports includes sports, which can be divided into subspecies: single, pair, group. Some sports are represented in all three subspecies, others only in singles and doubles, and some are represented only by singles.	Speed and power types - include sprint, long jump and high jump, shot put, discus and hammer throw, weightlifting. Cyclic sports include middle and long distance running, swimming, cross-country skiing, cycling, skating, etc.

Analyzing the content of physical education programs, it can be mentioned that sports games are widely represented in the content of physical education in general, vocational and higher education institutions. Especially, in the educational activities of students - it's basketball, volleyball, handball, table tennis, football; badminton, hockey, tennis, and rugby are offered in extracurricular physical culture, sports, and health-improving activities (additionally).

In general, if we consider sports games, we can add that they gained recognition

in all countries of the world and involve people of all ages. Sports games occupy an important place in world competitions, as well as they are included in the Olympic Games. For example: "Football was officially included into the program of the Summer Olympics in 1908, although from 1900 and 1904 at first only the demonstration of football tournaments were held at the Olympics, as at that time the game was not yet very common", "volleyball was first recognized as a kind of Olympic sport in 1957 in Sofia at the 53rd session of the International Olympic Committee with a relevant decision, and it appeared for the first time at the Summer Olympics in 1964, held in Tokyo", "Handball appeared for the first time at the Summer Olympics in 1936 in Berlin, but was included in the program of each subsequent Olympic Games in 1972 in Munich", "basketball was included in the program of the Olympic Games only after the establishment in 1932 of the International Amateur Basketball Federation (FIBA), followed by the International Olympic Committee held in Oslo on February 28, 1935 was recognized as an Olympic kind of sport since 1936. » [3].

In modern society, sports games are means of comprehensive development of physical qualities, in particular: speed, agility, endurance and more. It is also a kind of improving motor skills, character, moral and volitional qualities, they cultivate collectivism, determination, activity, self-discipline, responsibility.

According to the terminology, "sports games are a confrontation between two parties, which takes place within the rules and is aimed at achieving an advantage, which is assessed by the number of achievements of the stipulated goal of the game." [3].

Many sports games are complexes of natural movements, physical exercises, which are performed by the player or in interaction with partners in the fight against an opponent and aimed at creating game situations, which helps win. Thus, there is another definition: "sports games are types of a game competition, which is based on various technical and tactical methods of hitting in the process of confrontation with a specific target sports shell, the content and organization of which are governed by official rules" [6].

There are sports games: team: volleyball, basketball, handball, football, all kinds of hockey; personal: chess, checkers; games that include both personal and team participation: badminton, golf, tennis. Rules for holding sports games are developed by the relevant international federations, which promote the development of games and organize international and national competitions. Most of the world-renowned sports games are developed in Ukraine. The specificity of sports games is that the fight with the opponent requires a quick reaction, changes in the implementation of the game action plan, adequate behavior. The effectiveness of game actions depends on a quick assessment of the game situation and the choice of appropriate game techniques, which implies the presence of highly developed psychophysiological functions (stability, concentration and speed of attention, a wide range of visual analyzer, adequacy and speed of reaction, etc.). One of the features of all sports games is the presence of a large technical arsenal: a variety of passes, driving, throwing, strikes and tactical support of the game in defense and attack.

The multiplicity and variety of sports games determines many existing classifications.

One of them is [4, 6], presented below (table. 1).

Table 1

Classification of sports games

Sports games			
Team games		Personal and team games	
include contact with the opponent	without contact with the opponent	include contact with the opponent	without contact with the opponent
↙ ↘		↙ ↘	
with a ball	without a ball	with a ball	without a ball
↙ ↘		↙ ↘	
Olympic Games	Non-olympic games	Olympic Games	Non-olympic games
↓	↓	↓	↓
Basketball Volleyball Beach volleyball Handball Football Grass hockey Ice hockey Curling Water polo	Rugby Soccer Hall Ball hockey Beach soccer American football Baseball Softball Polo	Badminton Table tennis Tennis	Billiards Golf Towns Checkers Chess

In this classification, sports games are divided into two major groups: team and individual-team (individual). Further, the division according to the classification leads to the division of games without any contact and with direct contact with the opponent. The first group is characterized by the struggle for possession of the ball, puck, etc. with the ability to direct them to the target, in the ring, goal, etc. The second group is characterized by alternate possession of rules-based kinds of sports projectile and the actions of players in certain areas of the field, which are usually separated by a grid.

According to another well-known classification of sports games, the division of games is (detailed) according to the game equipment and ways of owning it. In sports

games, balls or other special items (puck, wheel, etc.) are most often used as equipment, where players interact with these objects directly with their hands, feet, head or indirectly with the help of other devices (stick, bat, racket etc.). In addition, you can use additional methods of movements, such as skates, rollers etc.

According to the program of the Olympic Games, all sports games are divided into Olympic and non-Olympic sports.

In most ball games, the game is phased. There are three stages, or phases, as it is often found in the scientific literature: stage I includes the possession of the ball; stage II includes a selection of the ball; stage III is neutral, when neither team has the ball. Stages of the game in turn are divided into game situations: standard and typical. Standard positions (goal kick, corner kick, ball delivery, etc.) are those situations that are constantly repeated according to the rules of the game. Typical situations are moments during the game that are often repeated and other game situations that do not have exact rules of occurrence.

Table 2

Priority in choosing a kind of sport of the first-year students

Kind of sport	Number of students who determined the 1st rank of the sport	
	the total number of people	in %
Basketball	15	9,4
Volleyball	34	21,3
Handball	6	3,8
Football	30	18,8
Tennis	3	1,9
Table tennis	4	2,5
Badminton	1	0,6
Gorodky	1	0,6
Floorball	1	0,6
Gymnastics	15	9,4
Athletics	11	6,9
Weightlifting	3	1,9
Skiing	1	0,6
Swimming	11	6,9
Tourism	5	3,1
Aerobics	6	3,8
Cheerleading	1	0,6
Fitness	10	6,3
Sumo	2	1,3

According to the Unified Sports Classification of Ukraine, sports games are presented in almost all groups, where they are divided into Olympic (they include team,

individual-team, summer, winter types), non-Olympic (team, individual-team, mixed), for people with disabilities (with visual impairments, with hearing impairments, with mental and physical disabilities, where they are also divided into summer and winter types, as well as team, personal-team and mixed kinds), sports and technical (motoball) and applied (team: football, volleyball, basketball, handball).

Thus, it gives us the opportunity to say that sports games occupy one of the first places in popularity in the world of sports, they involve people of all ages and they are the most popular.

Analysis of the results of student surveys shows that the majority of them have a positive attitude to sports and prefer traditional world-famous sports, including, of course, sports games.

Especially, a number of students who preferred sports games is 59.5%, the 1st rank received such kinds of games as: volleyball - 21.3%, football - 18.8%, basketball - 9.4%, handball - 3.8% . The results of the survey of first-year students are presented in table 2.

According to the results presented in table 2, a significant number of students prefer such sports as: gymnastics - 9.4%, athletics - 6.9%, swimming - 6.9%, fitness - 6.3%), aerobics - 3.8%. There were also such sports, which due to the ranking of students did not get the first, second and third place: fencing, etc.

Discussion. Nowadays, sports games are among the most popular and popular sports, which are spread throughout the world and take part in modern classifications of sports in general. Sports games in the field of physical education and sports have a key place, because they are widely represented in physical education curricula for secondary schools, in programs of groups of sportsmanship and elective classes in higher education institutions, in plans of sports events and competition programs.

Such scientists as Horobei M.P., Chalyi O.S., Deriabkina T.V., Samiilenko V.P. practice the usage of sports games during their physical education classes (volleyball, football, basketball and table tennis) and according to their opinion, it gives young people an opportunity to receive the necessary physical activity and emotional satisfaction, which contributes to the formation of a healthy lifestyle, that promotes a healthy lifestyle [6].

Zh. L. Kozina and co-authors emphasize that one of the most important factors in students' interest during classes are sports games, as it is the main activity since childhood and direct preparation for their life in society. In their opinion, one of the features of sports games is a specific competition, which distinguishes them from other sports [5].

Zubchenko L. V., Havrylin V.O. in their works consider in details the existing system of education and upbringing of youth, analyze, determine the features of sports games (football, volleyball, basketball, handball and their educational value for the comprehensive development of a man) [6].

Volodymyr Naumchuk [7] studies in his research the importance of sports games in the system of professional training of physical education teachers and believes that sports games help improve the professional and personal qualities of students, including patriotic, volitional, moral, legal, aesthetic aspects of their future professional activity.

Thus, the development of classifications, determining the characteristics of different types of sports games attracts the attention of many scientists and today remains very interesting and requires even more detailed study, because the social significance of sports games is extremely important.

Conclusions and prospects for further research. The analysis of literary, scientific, methodological sources made it possible to outline the existing of classifications of sports and in particular sports games; determine the features and significance of sports games.

With the help of a survey conducted with students of Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynskyi, we investigated the attitude of student youth to the suggested kinds of sports, as well as to determine their priorities for these kinds. It was found that 59.5% of students prefer to play various kinds of sports.

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LITERARY STUDIES

THE VERBALIZATION OF BACH'S MYSTIFIED ORATORIO IN ROBERT SCHNEIDER'S "REVELATION"

Ivan Megela,

*Doctor of Sciences in Philology, Professor,
Taras Shevchenko National University of Kyiv, Ukraine*

Annotation. *The article considers alteration of consciousness of Jacob Kemper novel's main hero under the influence of the unknown mystified score of Johann Sebastian Bach's "Revelation" oratorio. In the search for worldview reference points within the range of tasks solved by modern humanitarianism, a special role is legitimately played by musical art, since music penetrates all spheres of human activity, contributing to the creation of universal values. The description of the figurative sphere of music is also a space where literature narrates not so much about music as about the human inner world, actualizing the feelings, emotions evoked in the listener or another musical composition. Hence the definition – "music of the soul" (music of human). The true referent of reproduction is not the musical text itself, but the state of mind of the hero of the novel, who "reads" this music.*

Keywords: *verbalization, mystification, score, musical sense, intersemiotic translation, polyphony, oratory, Revelation, dialogism, representation, semiotic adventure.*

Introduction. In the search for worldview reference points within the range of tasks solved by modern humanitarianism, a special role is legitimately played by musical art, since music penetrates all spheres of human activity, contributing to the creation of universal values. Promising in this regard, first of all, philosophical and semiotic approach to music as "a typical example of the artistic message" (A.N Sokhor). This approach allows to see in the language of music communicative system, which has the specific content and possibilities to transfer the reflection of the world in the consciousness by means of musical images [4].

Literature review. A striking example of the dialogical nature of music and literature can be found in the novel "Revelation" (2007) by the Austrian writer Robert Schneider. The conception of this work arose from the idea of the probable existence of the unknown oratorio "Revelation" by Johann Sebastian Bach. Where and when might the oratorio on the Apocalypse of John the Evangelist have been written? There is documentary evidence that Bach came to Naumburg in 1746 for the purpose of inspecting the organ at St. Wenzel Church.

Results. For Schneider, however, the starting point was not so much Bach himself, but rather the composer's theoretical considerations as an opportunity to look at his music from the perspective of the present. In one of his interviews, Schneider stated, "Bach for me is not so much a musical phenomenon as a thinking one. I really consider him to be the greatest thinker that Germany has produced. It's just fascinating

how he could come up with a dozen counterpoint combinations from a simple melody that doesn't actually produce anything, which also end up producing wonderful music. In other words: he elevated paradox to a higher form of reality and showed that even with contradictions it is possible to think, to make music, to live" [17]. The novel "Revelation" was published in 2008 by the Berlin publisher Aufbau. Schneider called this work a musical joke [14], because in it the writer returns to the problems of the "novel about the artist", known from his previous work *Sister of Sleep*. This time, however, we are not talking about a fictitious musical genius, but about the real face of an organist, a musicologist who dreams of becoming a famous composer. The forty-five-year-old organist of the local church, Jacob Kemper, lives alone in an old house near the church of St. Wenzel. His tyrant father, who has not yet shed his National Socialist views, despite the new socio-political realities of the modern world. He despises his musically gifted son and regards the baroque church music he plays on the organ as a relic of feudalism. He hurts his son most when he marries Eva, Jacob's first love. From this marriage was born a boy, Leo, with whom Jacob develops a friendship and whom he teaches to play the organ. On Christmas Eve 1992, in between music exercises, Leo found an old briefcase in the case of the church organ. When his mentor opened the folder, he nearly fainted from what he saw: there was a score of an unknown work by Johann Sebastian Bach. Reading the sheet music, it was as if Jacob could hear its fantastic sound and he shuddered with emotional excitement as he was holding a large work that would take seven hours to play! Moreover, the unknown oratorio contains musical elements that were hitherto thought impossible to combine. In the process of a detailed acquaintance with the mysterious find, amazing things begin to happen to the hero. The score gives birth to memories of the past, voices the displaced present and foreshadows the future. It seems to the hero that Johann Sebastian Bach discovered some cosmic law at the end of his life and translated it into music that can heal the human soul or generate deep despair and disappointment. Jacob lives out amazing phantasmagories in his soul: at times he falls into euphoria, at times he is seized by terrifying hallucinations. He is in love with Lucia Lubke, who, after the German reunification, moved to the GDR and opened her own travel agency there. But things at the travel agency were not going well and the woman had no luck in love. Lucia is the only person to whom Jacob tells about his mystical find: "It's not music at all. At any rate, it's not music as I understood it before, sounds, rhythms. There is something more hidden in these notes. Something that I can't understand. I think that in this piece Bach has crossed a boundary that leads to an unknown space where past, present, and future are an inseparable whole. It sounds crazy, but this score knows how to foreshadow. The musical is only on the surface here. There's a message of some kind hidden underneath. The leaves smell sweet. Do you know the smell of a corpse? Music has awakened a dead child to life" [16, p.181]. The dead child Jacob mentions is his brother Karl. The relationship to his brother is a dark page in the character's life. Karl was his parents' favorite child. "How I envied Karl for his mother's tenderness! He was better and more successful in everything. Even in singing. Even in music. He was my idol. I wanted to be like him. I hated him for that. I really hated my

brother. Deeply - to the abyss. Because next to him I dared not exist" [16, p.254]. The score gives rise to the hero's guilt over his brother's death. His mother is dead, his father stubbornly silent, the villagers do not remember that tragic event or claim that Karl drowned as a result of an accident. The guilt and nightmares keep Jacob awake. Lucia advises him to hand over the discovery to the competent authorities, but the hero has another plan. He sees himself as a renowned musicologist, crowned with high awards and prizes, and meanwhile a group of respected Bach scholars arrives in Naumburg with the aim of inspecting the antique organ, which according to legend was played by Johann Sebastian Bach himself. To get rid of the mystical score somehow, Jakob secretly slips it to Dr. Zinser of Leipzig, who wants to exalt himself in this way and brings the manuscript back. The Japanese Yoshida Koyatake, the only Bach scholar who listens to Kemper's words, believes that it really could have been a work by J.S. Bach, of which the music world knew nothing until now. When he reads the sheet music, he feels the same emotion as Kemper and asks him to burn the ill-fated score. Jakob carefully "listens" to the score once more and this time embraces a different experience: the amazing music restores the connection with his brother Karl and soothes his conscience. Jakob realizes his guilt, his outsiderism, he redefines his whole life and finds an understanding with his father. Then he puts the ill-fated score in his briefcase and takes it to the same place where it was found. "Let someone else find it, or she find him. It may take another 246 long years for that to happen" [16, p. 265]. The last chapter of the novel is perceived as an antique game of satire, transporting the reader to 1746. The linguistic texture of the previous chapters is replaced by a stylization of the Baroque. To this end, excerpts from the letters of Johann Sebastian Bach, his sons and contemporaries are interwoven into the novel text. In the pages of this chapter, the misanthropic old Bach himself appears, confessing to the organist Gottfried Silbermann that all his life he despised musicology, even hated him [16, p.274]. On the one hand it is a detective work, the theme of which is a musical hoax, on the other hand it is a chronicle of German social life after the unification of the country in 1992, and on the other hand it is a love story, in the end it is purely a "musical" novel. The work is addressed, however, not to musicologists, but to the general reading public. When Schneider reproduces the sound of Johann Sebastian Bach's score - not yet played by an orchestra - its transcription occurs only in the mind of the hero of his work, so that the verbal description does indeed sound like live music. Schneider's "Revelation" is read as a "novel about Bach" and addresses modernity. What interests us in this relationship is primarily the following aspect: the mystery of Johann Sebastian Bach's creative genius, the philosophical understanding of his music, and the verbal presentation of his unknown oratorio, its inter-semiotic translation. Music also plays an important function in the work. it influences the form; it is present in many passages as a quotation to express emotional experiences, as an accompaniment to the narrative or as a means of synchronizing the verbal and aural [14].

The key to this relationship is Gerhard Gauer's assertion that the messages conveyed through melodies are often more transparent than words. "In the novel, music is placed above language; it is, so to speak, the most natural and effective way of expressing

itself. Literature is attracted to music by a special gravity - music is universal, whereas a literary text is limited by the framework of the language in which it is created. The dialog between music and writing lies, according to T. Havryliv, “in the desire to comprehend the “other” of sound art, to turn language into the indescribable, as well as the reverse process - to render the indescribable” [3]. An appeal to the work of J.S. Bach is a fertile topic because it brings us into contact with the universal, the timeless, and evokes a quick response, awakening in us unknowable moral forces. The writer's appeal to the works of Johann Sebastian Bach can be explained by the so-called “Bach universality” - a cultural phenomenon, which acts as a reflection of culture itself, “a schematized embodiment of its spiritual and mental states dispersed in time” [9, p.144]. In his music, Johann Sebastian Bach reflects on the most important, eternal questions of human life, the purpose of man, his moral duty, life, and death. These reflections are often connected with religious themes, because Bach served all his life in the church, wrote for the church, was a deeply religious man, and knew the Holy Scriptures well. “Revelation” brings us into communion with the Absolute, reveals His will, and directs us to the path of sanctification, the knowledge of truth. Just as the particle cannot know the whole, so man cannot know the whole. It cannot know by itself, by its own reason, the root cause of all that exists in the world, nor the meaning of its own and the world's life, nor the purpose of the universe. The only possible way to solve these and many other spiritual inquiries is through revelation. To whom, then, does God give revelation? The answer is unequivocal: Babies. What is meant, however, is not physical age. Babies are people who do not trust in their reasonableness and wisdom, but simply trust in God. We adults can only trust God completely when we are convinced of our own failure, when we lose faith in ourselves. Then we will childishly turn to God and hope in Him, gaining the ability to receive revelation. It is no accident that the hero of Schneider's novel is an outsider. It is as if he illustrates the well-known contradiction: “what I want I do not get, and what I have I do not want”. And who would not, under such circumstances, want to become a famous man, taking advantage of the find of the century? J.S. Bach's score could have helped the novel's hero to realize his dreams; it could have radically changed his suffering life. “But Bach's heavenly music brings no joy to Kemper. It reminds him of his unsuccessful life, although he can in no way understand why he has it so” [16, p.162]. And yet the hero can no longer remain as he has been until now. After a series of disappointments and remorse, he changes his attitude toward the world. However, the revelation is not up to him. “He simply has not matured to this task. Already bodily, with his sixty-four pounds. He was not strong enough for this” [16, p.188]. What attracted Schneider to the genius of J.S. Bach in particular was the fact that the divine revelation is refracted through human nature, manifesting perfection both in terms of musical technique and in emotional and spiritual terms. For all its rationality, Bach's music can display the full range of human emotions - joy, triumph, grief, remorse, consolation. What kind of person was Johann Sebastian Bach? How much did his face match the genius of his divine gift? This is a great mystery! It is well known that Bach did not keep a diary, he did not write any fiery messages to his friends. Researchers still cannot understand how a modest organist,

who had understanding with the leadership, was not easy character, was sharp, stingy man, who led an outwardly unremarkable life, managed to create such brilliant works. Johann Sebastian Bach's music is inseparable from the word its perception changes completely if you remove everything that is related to God and leave only the emotional beginning. Then it is impossible to understand the meaning that the composer put into it. Life is a testing ground where man is put to the test. This is a very profound truth, as J.S. Bach seems to have understood from personal experience as well. The fact that Kemper found J.S. Bach's score exactly on Christmas Eve 1992, his birthday, is no coincidence. Finding it on "holy memory" evokes a real catharsis for the hero, authenticating a "sense of awakening". The verbal voiceover of the mystical oratorio "Revelation" becomes a decisive turning point in the hero's life. The reader is assured of the great potential of the eccentric Kemper, who is so unfairly perceived by his surroundings. The event in the novel is not the finding of the score itself, but the reproduction of the emotions that their music generates. A. E. Mahov in his thorough monograph "Musika literaria: The idea of verbal music in European poetics" introduces the category of "transmusical", aesthetic fiction that exists in the sphere of symbolic exchange between the musical and the verbal, highlighting such topoi as "musika mundane" (the classical hypostasis of "music of the spheres") and "musika humana". This topos, "music of the soul", is the most important for our analysis, allowing us to conceptualize musical concepts as allegories of the inner world [6, p.27]. The work is divided into 22 chapters. Each of them is served with a branch from the score of J.S. Bach. The reader is like a live tracing the path of the main character. The figure of Jacob Kemper is present on almost every page of the work, except for the last 22 chapters, in which Bach's writing of the oratorio is reproduced. Incidentally, the Apocalypse of John the Evangelist is also divided into 22 chapters. The hero of Schneider's novel is an outsider. In fact, the writer himself keeps away from the literary life, lives recently quite isolated. He is close to the image of the outsider, above all - an internal outsider. The narrator in the novel testifies to the extraordinary case of life, a rare example of creative penetration of the essence of the phenomena and all the same hard-to-reach message. In this context, Schneider's aesthetics can be described as an "aesthetics of reconstruction", which is based not so much on skepticism about the form of presentation as on a gesture of reciprocity and trust - not on the uniqueness of the sign, but on the ability of the reader to reconstruct the explicit and essentially fragmentary ambiguous texts of his own subjective experience [7, p. 406]. The idea of the representative of the French "new novel", literary theorist Michel Bũthor about the text as a score is fruitful from the point of view of intersemiotic translation. In particular, determining here is the structural correspondence of musical and literary works, the expression of the boundary spheres of individual art forms, the links between the linguistic and non-verbal forms of representation [11]. Bũthor perceives the score as a translation of musical structures into visual, optical perception which makes it easier for the reader to listen to it, that is, the score, while preserving the basic musical parameters, embodies a certain structural image of the work, which includes a "repertoire" of techniques for perceiving it, which suggests active co-creation by the recipient, indicating the correlation of parts and whole, as well

as horizontal and vertical maintenance of the “theme” of the work, which emphasizes its dialogical nature.

At the same time, the score encourages the reader to analyze connections in the text, intertextuality, and intermediality, generating a “musical listening” to the novel. According to M. Büthor music precedes articulated speech “music carves out a channel for the text, forms a space in which it can perform and increasingly present itself” [12, p. 74]. Music, however, cannot establish signs without connections. It must remain between the fluid and the fixed. From the history of music, however, it is known that “composers of different periods secretly inscribed many things into their lines that were more for the eye than for the ear”, as “the optical image of the score is more suitable for” to form an exhaustive opinion of the spirit and value of a composition [7, p. 168].

Developing further her assertion, concretizing it on the example of the analysis of the novel “Malina” by the Austrian writer Ingeborg Bachmann, Ukrainian researcher S. Matsenko convincingly proves that musical examples definitely provoke vertical acoustic reading by the “spiritual ear”, providing the musical text with semantic potential, that is, offering music for the mind that “hears and sees”. Therefore, one can speak of a kind of “mental recitative”, and consequently literature itself appears as a proverbial chant [7, p. 168]. Schneider's novel “Revelation” is a vivid example of “reading music, modern dialogue of music and literature, playing with the differences in the interpretation of the concepts of polyphony, counterpoint, baroque and postmodern cultural ciphers, generates a new type of postmodern communication, ironic play on tragic drama. In J.S. Bach's “Revelation” correlates with the aesthetic catharsis of the creative act of reconstruction of the rubble, revealing the relationship between the “subject-reconstructor”, “subject-reconstruct”, “subject-prototype”, “the representation of music in words”, and “the representation of music in words”, “the representation of music by word”, “verbal music”, “verbal music”, and “the presentation of music by word”. In Schneider's novel we have different levels of representation of “Bach's text” (compositional, narrative, metaphorical), the modality of the “composer's text” is defined through the prism of musical parallels, which allows us to identify the axiological constants of modern prose [8].

The transitivity of the composer's musical thinking (from baroque to classicism) determines the actualization in the fiction about Bach of those or other aspects of the musical style of his works in different historical and literary eras. In R. Schneider's novel, in particular, the dynamic aspects of Johann Sebastian Bach's polyphonic form are actualized. In aesthetic reflection, J.S. Bach is thought of, on the one hand, as an extraordinary, creative, renewing, and creative figure. In addition, the music of the famous composer serves as a unique measure of apocalypticism, “the will to death” and the decline of culture. In the music of Johann Sebastian Bach, the polyphonic form of the fugue acquired great development, built on changes to the repeated imitative wiring of the main musical theme through interludes, i.e., inserted novellas. The interludes form not only a syntagmatic commonality with the thematic movements, but also, in paradigmatic terms, with the preceding interludes. The fate is repeatedly conducted in the text in different “voices”, receiving parallel development in the interludes. Motivated

and quite convincing in this respect is N. Bragina's statement about the possibility of analyzing a literary text using the method accepted in musicology, in particular, in connection with the genre content of polyphony, which is not only polyphony, but also expressive spiritual and moralizing content [1]. A.E. Mahov, based on the point of view of J. Wynne, argues that polyphony in music had a literary theological genesis, since it is associated with the theological teaching "about the mystical simultaneity of the Old and New Testament events" and originally represented "a metaphor, an attempt to create a musical equivalent of theological technique of allegory", and "the simultaneity of voices was related to the simultaneity of meanings" [6, p.107, 108, 117].

4. Discussion. "Bach's text" is formed both at the most superficial levels of the literary text (the title text) and at the deep levels (lexico-thematic, symbolic). The way in which motifs related to the personality and musical legacy of the famous composer are introduced correlates with simulative tendencies in contemporary artistic thinking. In the case of Robert Schneider's novel, the inclusion of these motifs signifies a moment of philosophical and musical reflection of the character, which indicates the Austrian writer's attempt to connect to the "text of "high culture" in order to legitimize his own aesthetic status in a dispersed cultural continuum" [8]. The verbalization of music is a kind of semiotic incident. Roman Jakobson's definition of intersemiotic translation by the "alchemical" term: the transmutation of signs is indicative in this respect, [10] because in the process of experiments of transformation of some elements into other elements, the observer only sees data at the "input" and "output" but the transformation process itself remains a mystery. Music, although it has its own specific language, a syntax as a sequence of signs, it still does not have the semantics of individual signs. Behind the sounds it articulates there is certainly something semantic, that is, "human" meaningful. In other words, music only iconically reflects human emotions, symbolizes mental processes and ideas about the universe. In fact, music expresses pure form, essence; there is no trace of "any scene, any object, any fact", "any literal content". That is, music is pure existence[5]. However, no language (or text) of culture can exist in a "preserved" form if it is not explained by other languages (texts), not mediated first of all verbally, by verbal language. Thus, from the semiotic point of view, the word acts as a tool for the actualization of music. Sounds in their combination create music, giving rise to an imaginative and emotional response, that is, they themselves become signs of images and feelings. In human consciousness, species live already in a verbal shell. Thus, there is a transformational transformation of the sound medium into a verbal one, i.e. the transition of music into the artistic word. We focus on the art text that has emerged as a descriptor of its musical referent, because it is here that the intersemiotic translation of music (its meaning, character of sound, composition, etc.) into verbal language occurs. The description of the figurative sphere of music is also a space where literature narrates not so much about music as about the human inner world, actualizing the feelings, emotions evoked in the listener or another musical composition. Hence the definition – "music of the soul" (music of human). The true referent of reproduction is not the musical text itself, but the state of mind of the hero of the novel, who "reads"

this music.

Conclusions. Thus, the verbalization of music is more like a translation - annotation process, in which there is no consistent representation of the source text in the signs of another language but only a “semantic compression” of the source. As a consequence, the verbal description of music is certainly a way of actualizing and understanding it, an opportunity to get closer to the semantic essence of the musical text. According to Brazgovskaja E. “literary and artistic reflection of music becomes a kind of epiphany (manifestation of hidden meanings) or exhrasis as a way of visualization in the word of the transmitted musical images” [2]. However, it should not be forgotten that any verbalization is only a kind of semiotic adventure - and therefore its result, as Robert Schneider's novel *Revelations* vividly demonstrates, is only probabilistic. Literary and musical intermediality serves in Schneider's novel to experiment with linguistic means, an autoreferential illumination of the syntheticity of word and sound art. The realization of the writer's creative idea is greatly facilitated by the versatile style, subtle humor, and the play of meanings, which allows the borders between languages of different semiotic nature (verbal and non-verbal) to be blurred, making them quite conventional, thereby expanding the semiotic potential of the artistic word.

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TECHNICAL SCIENCES

SOLVING SYSTEM IDENTIFICATION PROBLEMS IN MULTIDIMENSIONAL SPACE ON THE BASIS DIRECT OPTIMIZATION METHODS

Yaroslav Kryvolapov,

*Assistant of the Department of Applied Information Systems,
Taras Shevchenko National University of Kyiv, Ukraine*

Annotation. *The article proposes an algorithm of the modified simplex method for solving optimization problems in the presence of restrictions on the parameters of the objective function without modifying the mathematical description of the model. The carried out practical studies prove, in general, the satisfactory performance of the method and the expediency of its application for solving practical problems.*

Keywords: *identification, mathematical model, algorithm, optimization, simplex method, parameter constraints, accelerated convergence.*

The development of electronic computing, the creation of algorithmic programming languages and a large mathematical support of computers allows the widespread use of methods of computational mathematics in solving various applications in science, technology, production. Particular attention should be paid to issues related to optimization, because the creation of structures that have one or another optimal properties, ultimately is the main task of engineering design. Design begins with a careful study of possible solutions. Then information is collected that allows you to build a model of the product or process to evaluate and verify the correctness of the decision. The need for this stage is due to economic considerations, as the practical verification of the solution is almost always very expensive, time consuming and requires too much material and energy costs. As a rule, having built a mathematical model, begin to study its properties, seeking to determine the extent to which the developed product meets its purpose. The stages of building a model and studying its properties are repeated until there is confidence that the best possible solution has been found.

Solving the problem of building mathematical models of dynamical systems based on observations of their behavior is the subject of identification theory. Methods of system identification are a flexible means of solving many problems of science and technology. Models of dynamic objects are an auxiliary (tool) tool for solving many problems: prediction, control, simulation, filter design, restoration of observations and more. The system identification procedure generates the following natural logic of actions:

- collect experimental data;
- choose many suitable models;
- choose the "best" in this set model.

Assessment of model quality is usually associated with the study of the behavior

of models in the process of using them to reproduce measurement data. Often, to determine the "best" model of complex objects due to the impossibility of applying gradient methods to the optimization procedure, it is necessary to create a computational algorithm to solve the problem without modifying its mathematical description, ie on the basis of direct optimization methods.

Optimization methods allow you to choose the best option from all possible. The term "optimization" refers to the process or sequence of operations that allow you to get the best solution. Although the ultimate goal of optimization is to find the best or optimal solution, you usually have to be satisfied with improving known solutions, rather than bringing them to perfection. The task is to determine the maximum or minimum value of the objective function of the form:

$$F(\mathbf{x}) = F(x_1, x_2, \dots, x_n),$$

describing some n-dimensional surface, where x_i – are the optimization parameters; $i = 1, 2, \dots, n$; n – number of optimization parameters. The topological properties of the surface of the objective function play an important role in the optimization process, as they determine the choice of the most efficient algorithm.

The target function, in turn, in some cases can take the most unexpected forms. For example, it is not always possible to represent it in a closed mathematical form, in other cases it may be a piecewise smooth function. A task table may sometimes require a technical data table or an experiment may be required. However, in whatever form the objective function is presented, it must be an unambiguous function of the optimized parameters.

Some optimization algorithms are adapted to find the maximum, others - to find the minimum. However, regardless of the type of problem to be solved to the extreme, you can use the same algorithm, as the minimization problem can be easily converted into a task to find the maximum by changing the sign of the objective function to the inverse.

The design area of the objective function, which is determined by all the optimizable parameters, is not as large as it may seem, because it is usually limited by a number of conditions associated with the physical nature of the task. It should be noted that very often due to limitations, the optimal value of the objective function is not achieved where its surface has a zero gradient. Often the best solution corresponds to one of the boundaries of the design area.

The point in the design space at which the objective function has the greatest value compared to its values at all other points in its immediate vicinity is the local optimum. Often the design space contains many local optimums and care should be taken not to take the first of them as the optimal solution to the problem. The global optimum is the optimal solution for the entire design space. It is better than all other solutions corresponding to local optimums, and it is necessary to find it.

Optimization methods in multidimensional space can be divided into two large groups - direct and indirect. Direct methods are based on the comparison of the calculated values of the objective function at different points, and indirect - on the use of necessary and sufficient conditions for the mathematical determination of the maximum and minimum of the function. The strategy of direct methods is a gradual approach to the optimum.

One of the most effective methods in solving multidimensional optimization problems is the simplex method. A simplex is an n -dimensional geometric figure whose edges are straight lines that intersect at the $n+1$ vertex. In the two-dimensional case it is a triangle, in the three-dimensional case it is a tetrahedron. Search schemes using simplexes are based on the observation of changes in the values of the objective function in their vertices. This idea is considered in the method of Spendley, Hext and Himsforth [1]. The main thing in these schemes is the process of reflection - finding the vertex of a new simplex, located symmetrically with respect to the plane passing through one of the sides of the original simplex. The choice of the direction of search of the vertex of the new simplex is determined by the position of the vertex in which the objective function has the worst value. If the value of the objective function is worse in the newly obtained vertex of the new simplex, then the algorithm assumes a return to the starting point - the vertex of the former simplex. Then the transition to the vertex of the former simplex, in which the objective function has the next largest value, and the display point for the new vertex is found. This algorithm provides a systematic shift of the center of the simplex in the direction of the extremum of the objective function.

Nelder and Mead proposed a more complex method [2], in which, in addition to finding the vertices of new simplexes, their edges are compressed or stretched. This algorithm provides a local transformation of the design space, which achieves a minimum of unimodal function.

The idea of the method is to compare the values of the function in $n+1$ vertices of the simplex and move the simplex in the direction of the optimal point using an iterative procedure. In contrast to the simplex method, where regular simplex is used at each stage, in the Nelder-Mead method the deformable polyhedron adapts to the topography of the objective function, extending along "long" inclined planes, changing directions in curved depressions and shrinking around the minimum. Practice shows that this method of direct search is one of the most effective if $n < 7$.

However, it is possible to note the difficulties encountered when trying to use the Nelder-Mead method, such as: the lack of possibility to impose restrictions on the parameters of the objective function, which in turn does not allow to apply this optimization algorithm for some tasks due to the fact that the optimization process becomes divergent.

In 1964, Boxing attempted to overcome this shortcoming. A so-called complex method was developed [3,4], characterized by a complete refusal to work with simplex at many acceptable points, which, however, slightly slows down its convergence and makes it more dependent on the choice of initial approximations.

In connection with the above, the following modification of the Nelder-Mead method is proposed based on the movement of the deformed simplex in the space of admissible parameters of the objective function and allows to take into account explicitly given restrictions.

In this case, in contrast to (1), the problem is to minimize the function $F(x_1, x_2, \dots, x_n)$ with restrictions:

$$L_j \leq x_j \leq P_j, \quad j = 1, 2, \dots, n,$$

L_j and P_j , – respectively the lower and upper limits of the variables.

This algorithm is iterative. The search scheme is based on the observation of the change in the values of the objective function F in the vertices of the simplex, which, in turn, must satisfy the given constraint.

The coordinates of the output simplex in the n -dimensional space of the parameters R are given by a matrix of dimension $n \times n+1$ of the form:

$$F_1 = \begin{matrix} & \mathbf{x}_1 & \mathbf{x}_2 & \mathbf{x}_3 & \dots & \mathbf{x}_n \\ S_{1+} & \mathbf{x}_1 & S_{2+} & \mathbf{x}_2 & S_{2+} & \mathbf{x}_3 & \dots & S_{1+} & \mathbf{x}_n \\ S_{2+} & \mathbf{x}_1 & S_{1+} & \mathbf{x}_2 & S_{2+} & \mathbf{x}_3 & \dots & S_{2+} & \mathbf{x}_n \\ \dots & \dots \\ S_{2+} & \mathbf{x}_1 & S_{2+} & \mathbf{x}_2 & S_{2+} & \mathbf{x}_3 & \dots & S_{1+} & \mathbf{x}_n \end{matrix}$$

in which represent the vertices of the simplex, the columns - their coordinates, S_i , ($i = 1, 2$) – the distance between two vertices (the initial step of optimization), determined by expressions:

$$S_1 = \frac{S}{n\sqrt{2}} (\sqrt{n+1} + n - 1),$$

$$S_2 = \frac{S}{n\sqrt{2}} (\sqrt{n+1} - 1),$$

x_i , ($i = 1, \dots, n$) – initial values of optimization parameters.

If one or more points of the original simplex do not satisfy conditions (2), the initial optimization step is reduced by half, ie

$$S = \frac{S}{2},$$

then the recalculation of the matrix of the problem of coordinates F_1 of the original

simplex. The described procedure is carried out until all points of the original simplex become valid.

The step-by-step procedure of the method can be represented as follows.

1. The values of the function in the vertices of the simplex are determined, among which the first F_{\max} and the second $F_{\max 2}$ maxima and minimum F_{\min} of the function and the corresponding points x_{\max} , $x_{\max 2}$ i x_{\min} are selected.

2. The coordinates of the center of gravity of all vertices of the simplex are determined, excluding x_{\max} according to the expression:

$$X_0 = \frac{1}{n} \left(\sum_{i=1}^{n+1} (X_i) - X_{\max} \right)$$

3. Determine the vertex of the new simplex, located symmetrically with respect to the plane passing through one of the sides of the original simplex. The direction of the search for the vertex of the new simplex is determined by the position of the vertex of the original simplex in which the objective function has the largest value $F_{\max} = F(x_{\max})$. The coordinates of the new point are determined by the formula:

$$X_{\text{ref}} = (1 + \alpha) X_0 - \alpha X_{\max},$$

α – is a positive constant called the reflection coefficient. Nelder and Mead showed [5,6] that the solution of the problem with $\alpha > 1$ requires fewer calculations of the function than for $\alpha < 1$. On the other hand α should not be much larger than one since:

- 1) the deformable polyhedron adapts better to the topology of the response surface at lower values of α , especially when you want to change the direction of the search;
- 2) in the area of the local minimum, the size of the polyhedron should decrease and a large α in these conditions will slow down the convergence.

For the above reasons, the coefficient α is chosen equal to one ($\alpha=1$).

4. Check of the received point x_{ref} on belonging of area of admissible values.

If x_{ref} is not valid, then:

- 1) if $L_j > x_{\text{ref}j}$, then set

$$x_{\text{ref}j}^h = L_j + \delta_1,$$

and if $x_{\text{ref}j}^h = x_{0j}$, to, then to "not degenerate" the simplex, set

$$x_{\text{ref}j}^{h'} = x_{\text{ref}j}^h - \delta_2,$$

δ_1 and δ_2 – are rather small predetermined values. In the proposed algorithm: $\delta_1 = 10^{-6}$, $\delta_2 = 10^{-7}$;

- 2) if $x_{\text{ref}j} > P_j$, then set:

$$x_{refj}^h = P_j - \delta_1,$$

and if $x_{refj}^h = x_{0j}$, then set:

$$x_{refj}^{h'} = x_{refj}^h + \delta_2.$$

Now, if at least one optimization parameter has been replaced by x_{refj} with x_{refj}^h or $x_{refj}^{h'}$, a new display factor is calculated:

$$\alpha^h = \text{MIN} \left(\text{MIN}_{j=1,n} \left(\frac{|x_{refj} - x_{0j}|}{|x_{0j} - x_{maxj}|} \right), \alpha \right)$$

and the coordinates of the new point are listed:

$$x_{ref} = (1 + \alpha^h) x_0 - \alpha^h x_{max},$$

5. Compare the values of the function at the display point F_{ref} with the smallest value of the function F_{min} .

If $F_{ref} \geq F_{min}$ – the transition to paragraph 8.

If the mapping gives a vertex with the value $F_{ref} < F_{min}$, then the direction from x_0 to x_{ref} is considered the most appropriate to move and it is necessary to stretch the simplex, if possible, in this direction. The coordinates of the next point of the simplex are determined by the formula:

$$x_p = (1 - \gamma) x_0 + \gamma x_{ref},$$

γ is a pre-selected constant called the coefficient of stretching ($\gamma > 1$); in the proposed algorithm $\gamma = 2$.

6. Check of the received point x_p on belonging of area of admissible values. The verification procedure corresponds to the algorithm of paragraph 4, taking into account that in the case of replacing any x_{pj} with x_{pj}^h or $x_{pj}^{h'}$ the coefficient α^h is recalculated according to the formula:

$$\alpha^h = \text{MIN} \left(\text{MIN}_{j=1,n} \left(\frac{|x_{pj} - x_{0j}|}{|x_{0j} - x_{maxj}|} \right), \frac{\gamma}{\alpha} \right),$$

and the coordinates of the new point are defined as follows:

$$x_p = (1 + \alpha^h) x_0 - \alpha^h x_{max},$$

7. Replace the x_{max} point in the initial simplex with the best of the x_{ref} or x_p points.

If $F_p < F_{ref}$, then in the initial simplex x_{max} is replaced by x_p and the condition of convergence of the optimization procedure is checked. If $F_p \geq F_{ref}$, then the point x_{max} is replaced by x_{ref} and the convergence is checked.

8. The value of F_{ref} is compared with the second largest (after the largest) value of the objective function in the vertices of the simplex. If $F_{ref} < F_{max2}$, or $F_{ref} = F_{max2}$ under the condition that $F_{max2} < F_{max}$ – the point x_{max} is replaced by x_{ref} and the convergence condition is checked. Otherwise, F_{ref} is compared to F_{max} . If $F_{ref} > F_{max2}$, then if $F_{ref} \geq F_{max}$, then proceed to paragraph 9. If $F_{ref} < F_{max}$, then the point x_{max} is replaced by x_{ref} .

9. Determine the new point of the simplex x_c using the compression operation:

$$x_c = (1 - \beta) x_0 + \beta x_{max},$$

β – is the compression ratio ($0 < \beta < 1$), which is used to reduce the search vector, if the mapping operation did not lead to a vertex with F_{ref} value less than the second largest value of the objective function F_{max2} , obtained for mapping. In the proposed algorithm $\beta=0.5$.

10. The values of the function at the compression point F_c and F_{max} are compared. If $F_c < F_{max}$, then the point x_{max} is replaced by x_c and the condition of convergence is checked. If $F_c \geq F_{max}$, - the transition to paragraph 11.

11. The reduction operation is performed. A new simplex with twice smaller edges is constructed for the x_{min} point. In other words, there is a shift of all points of the simplex to the point that determines the smallest value of the function. The coordinates of the new vertices are calculated by the formula:

$$x_j = \frac{1}{2}(x_j + x_{min}),$$

where $j = 1, 2, \dots, n$. After constructing a new simplex, the condition of convergence of the optimization procedure is checked.

The criterion for the end of the search in this algorithm is to check the condition:

$$\left(\frac{1}{1+n} \sum_{i=1}^{n+1} (F(x_i) - F(x_0))^2 \right)^{1/2} \leq \varepsilon,$$

where ε – the threshold value of the criterion is selected in a certain way; x_0 – the center of gravity of the simplex. When the condition of convergence of the method, we can conclude that all values of the function are quite close to each other and, therefore, lie near the minimum point x_{min} . If condition (20) is not met, the search (optimization) continues.

The described algorithm has sufficient flexibility to take into account the local

topological properties of the surface of the described objective function. Simplexes are extended in the direction of inclination of planes, their axes turn at a meeting with a depression on a surface of objective function, near an extremum they are compressed. The obtained results show that the proposed modified Nelder-Mead method has good convergence both for the parameters that are within the allowable range and on its boundaries, little depends on the initial approximations of the optimization parameters. The proposed procedure eliminates the degeneracy of the simplex, which accelerates the convergence of the method to a minimum. In general, the modified Nelder-Mead method has demonstrated satisfactory performance and can be described as quite effective and convenient for solving practical problems.

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