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CONTENTS

CULTUROLOGY

MEDICAL SCIENCES

TECHNICAL SCIENCE

ARCHITECTURE

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THE TASKS OF RUSSIA IN THE FRAMEWORK OF ENSURING FOOD SECURITY. FOREIGN EXPERIENCE

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Abstract. *The authors use parallels with the post-COVID global recovery in supply chains and reformatting tasks and participants in food markets and assess the growing threats of hunger, assess their transformation in the global food security agenda, which in some countries determines the poverty line, as well as the acceptable and alarming level required measures for the survival of entire peoples and industries under the influence of corporatocracy retortions and international reprisals and restrictions. The authors also take into account the consequences of climate warming and emerging challenges that complicate the problems of universal access to cheap and healthy food.*

Keywords: *globalization, climate agenda, NWO, Russia, USA, China, WTO, Ukraine, sanctions, digital transformation, dicoupling, retorsion, reprisal, autarky, national security, food self-sufficiency, AI, Big Data, Industry 4.0.*

The document published on December 22, 2022 on the website of the Government of Russia on the Concept for the formation and development of an information security culture of citizens of the Russian Federation identified not

only moral, psychological and reputational damage in the field of ICT, but also infrastructural challenges and threats that could harm our citizens. Information resources, the culture of dealing with them and the required skills should form an emphasis on the seriousness of the tasks of the country's survival during the ongoing national liberation war with the countries of the collective West, which over the past decades have seriously fooled our population in matters of self-sufficiency in many industries, as well as about imaginary benefits Russian accession to the WTO. Russia is not only the richest country in its resources, which restores order after the defeat in the Cold War and leads the denazification and demilitarization of the pro-Nazi regime in Ukraine, but also one of the leading territories of the planet, on which, as in a section of 1/7 of the land of the entire globe, options for solving the problems of global food security. We are not only leaders in the sale of weapons and the creation of weapons based on new physical principles, including hypersound and non-linear response options in space and cyberspace, but we also supply an unprecedented amount of grains and various oilseeds and livestock products for export, however, a system of foreign traders and resellers world TNCs, holding food markets in their hands, still leaves much to be desired in their presence in our fields and in seaports, where ready-made products or semi-finished products from it are brought [1]. According to unofficial data from the WTO and other organizations of control and the organization of "fair trade of equal opportunities for all", it is believed that up to 50% of firms in our agricultural market work through offshore jurisdictions, and 30% of the crop itself is immediately, in the vine, taken by an international layer of brokers and agents of global capital who have invested in our infrastructure and determine the base prices for Russian food. At the same time, another 40% of the crops received when they are delivered to the port are taken by global multinationals as barter and multifunctional intermediary schemes, which set the degree for our trade relations at the sites of regional and continental significance in the distribution of products of the Russian agricultural sector without our visible participation and in the complete absence mechanisms of regulation and the influence of domestic producers on the final prices for the export of our food [2].

The history of the issue is such that the beginning of this was laid when, as a result of structural changes in the Old World from the 15th to the 19th centuries, the intensity and efficiency of cultivated arable land and agricultural land grew in the agricultural sectors, and after the era of the Great Geographical Discoveries, these processes were reflected in the growth of the variety of animal trade exchanges. and plant funds, as well as to the progress of technologies for extracting the maximum values of the value components in the cultivation, processing and extraction of the required product line from raw materials. So, Asian rice began to walk around the world, wheat culture sailed to America and caravans with corn,

tomatoes, potatoes and turnips, as well as a number of exotic fruits in the form of bananas, coffee and cocoa beans from Africa, pulled back from it. Thanks to various industrial revolutions, the plow and hoes were replaced by steam engines, combine harvesters, and tractors. After that, humanity came from understanding reapers or their Russian counterparts, lobo-heaters, to a new level of awareness that agricultural science is not only about the cultivation of the land itself and humic layers of fertility, which ensured maximum efficiency and constant productivity of cultivated crops over time, but also about determining personal plowing depths, the presence of trace elements from appropriate fertilizers (most often mineral ones), which, along with pesticides and insecticides, could withstand natural disasters and maintain the required changes in the selection and evolution of natural grains and tubers. And today the newly industrialized countries involve up to half of their population in the process of food cycles of growing specific crops and cereals, while the countries of the "golden billion" are limited to no more than 7%, replacing the simple labor of "blue-collar workers" with industrial implementations and innovative robotics. These rich countries are mainly focused on animal husbandry, where AI and Big Data data processing algorithms can clearly suggest options for offspring growth, selection and breeding, find more profitable pairs to form more resilient and healthy individuals, and feed rationally and control the most suitable age for this in terms of economic profit from the heads of livestock raised. And, conversely, crop production has already become a solved problem in many developed countries, and therefore fewer people and investments reach this sub-sector, evaluating it from the standpoint of predicting dynamic models that can give their recommendations depending on the weather, seasonality and market volatility [3].

Russia itself is among the top 5 largest suppliers of grain to the global food market (we are third, after China and India before the pandemic, as well as leaders this year with an unprecedented harvest of 150 million tons of grain), and the United States and Canada close our vanguard of exporters. At the same time, in terms of meat and its consumption per capita, we are stable in 8th-9th place, and the leadership of the United States, Australia, Argentina, Israel, Chile is long-term and hardly attainable [4].

Studies by the world's leading food consumption centers show an increase in human calorie consumption by 2050 by 70% compared to today's base, and by the order of government demand for animal feed and feed crops, including GMOs and artificially grown fibers, will reach 200%. Therefore, Asia goes into its "green economy" of crickets, grasshoppers, locusts and other arachnids in advance, increasing the existing arachno-breeding capacities around the world in the form of an annual increase in production by 4 times. At the same time, extensive ways to further expand the areas of crops and arable land are practically exhausted and,

due to the low efficiency of labor resources, will be reduced, switching to collective intensification through digital transformation and further robotization of already used lands attracted within the framework of the "closed cycle" of exploitation of existing fixed assets of production and reducing costs by replacing a person with a cheaper and more trouble-free machine, computer [5].

In Europe, these processes are still being spurred on by product inflation of the ended cheap era of Russian gas pipeline fuel and increasing deindustrialization towards the United States according to the plan to reverse Marshall's ideas about the timely curtailment of aid due to its inefficiency and dead end. And here China, as the undisputed leader in global investment, is trying to solve the issues of "bonuses", taking from the Old World everything that is subject to di-coupling and opposition to American techno-nationalism, including advanced technologies for working with food and nutrition product lines, into its Chinese innovation zones and campuses of the accelerated modernization of the new industrial round of the improving infrastructure of the 7th scientific and technological order [6].

The agricultural technonationalism [7] of protectionist bottling itself began to emerge from the ideas of John Gitkot, who since the 1830s created analogues of the modern tractor and gave rise to the race of the previously mentioned mechanical, steam, electric and diesel devices for better and deeper cultivation of the surface layer of soil. Today, it is the landed American guests and the federal instructions of the states themselves in the agricultural sector that serve as the basis for state subsidies for every type of food produced for farmers. At the same time, their minimal non-compliance (change in the depth of the furrow during arable land, insufficient use of fertilizers and insecticides, substitution of one crop for another without the consent of the state government or the relevant guild of field workers, elevators and processors, for example) leads to the deprivation of all preferences, fines and non-admission to work in the most ancient and conservative sphere of the New World. The market of equipment and farm machinery for farmers in 2021 was 157 billion US dollars, and in 9 years it could reach the level of 236 billion US dollars, because the average annual growth rate of such equipment is not lower than 4.6%. The American states themselves have 97% of the national participation in such a machine agricultural sector of manufacturers and are estimated by their line of equipment in the amount of 35.1 billion US dollars. The global agricultural machinery market itself is distributed among 5 leading global companies and they own 76.7%. The most important of these, Deere & Co. (DE), created back in 1837 by John Deere, in the USA, is the oldest and generates up to 30% of the revenue in its global agricultural sector, while 71% of its activities relate to the American continent. The second giant company, AGCO Corporation (AGCO), is also American and more digitally developed, which helps it to keep its leadership not only in agricultural machinery, but also achieve higher rates

in soil cultivation and in extracting a valuable component from soil-produced products. Its revenue is growing at about 9% per year and serves mainly other countries, especially in recent times the Asia-Pacific region, Africa and the Middle East. The next 2 companies in the top five agricultural machinery companies are Valmont Industries (VMI) (irrigation and bogging of soils and their conversion to agricultural land), Alamo Group AG (ALG) (harvesters, bulldozers and various applications for livestock and farming) and Canadian Growth International (AFN) (silos, grain and vegetable storages and technological complexes for processing products brought from the fields) [3].

The foundations for the success of these leaders in agricultural technology and land management consulting solutions lie in government support and a virtual monopoly position in the US market, stimulating their technology export chains and service in export solutions on all viviparous continents, where crops can be expected and soils can be used according to direct agricultural purpose [8].

Agricultural Innovation in the Age of Marketing 5.0. draw scenarios for the evolution of the food industry in the direction of energy drink trends (stress is growing and the day is still only 24 hours, and therefore energy companies already today have a market in the region of 70 billion US dollars and with an annual growth of at least 7% in ten years the milestone of 100 billion US dollars has been crossed, the leaders are: Red Bull, Monster, Rockstar are the main ones, and their competitors are FRS Healthy Energy, Reign, Bang and Guru, Vital Pharma, TC Pharma) [2], sports nutrition (global market is about 40 billion dollars USA, rates of more than 8% will give a volume of at least 65 billion US dollars by 2030, leaders: Tirlan Co-operative Society (GL9 earlier), PepsiCo (PEP), Coca-Cola Company (KO), Multipower, Clif Bar & Company, Muscle Pharm Corporation (MSLP), Yunnan Baiyao Group, China Traditional Chinese Medicine, Alfresa Holdings, China Sanju, Shandong Buchang Pharmaceuticals, Bayer AG, Herbalife Nutrition, Glanbia, Bausch Health, Ohki Healthcare Holdings) and pet food supplements animals (the global market is about 110 billion US dollars, rates of more than 5.5% will give by 2030 a volume of at least 165 billion US dollars, leaders: General Mills (GIS), Nestle (NESN) and its subsidiary Purina, Mars, Colgate- Palmolive, The J.M. Smucker, Unicharm, Spetrum brends, Thai Union Group, Yantai China Pet, Foods, Freshpet, EBOS Group), which require a large mineral balance to effectively maintain their creative abilities in a programmed life and biological cycle [1].

Just not long ago, Russians were allowed to make their own start-ups in the field of packaging and solve the issues of storing food products in it, which are again given to the world's top 5 global TNCs: Amcor (Switzerland), (revenue 14.5 bn $); Ball Corporation (USA) (revenue 13.81 bn $), Sonoco Products Company (USA) (revenue 5.6 bn $), Plastipak (USA) (2.9 bn $), Graham Packaging Company (USA) (revenue 2, 0 bn $).

There are also growing challenges to create our own grain and crop funds, which are supplied from Pakistan, the Netherlands, the USA, Malaysia and Germany, as well as France and Denmark, food security solutions depend on the breeding supplies of cattle from the UK, USA, Australia, the Netherlands and Ireland, which so far cover most of the domestic demand for them.

Unfortunately, Russian farmers, being leaders in the export of sugar beets, gooseberries, currants, raspberries and barley with buckwheat to the global markets, being one of the world's top three exporters of oats, peas and flax, and also accounting for 5% of the global agro-industrial complex market, still for the time being, they operate in a semi-colonial dependence on equipment (more than 75% of foreign equipment in the fields of Russia) and can hardly count on the decisions of domestic manufacturers, who today fall fragmentarily, personally or personally under sanctions, without having a unified state balanced system of goal-setting and private management under the auspices of various territories and within hidden transnational alliances that are not ready to compromise with us in the conditions of the NWO, while at the same time not refusing to re-export capital previously invested in the domestic transport and processing structure, in storage elevators and in warehouses of a high level of automation for further processing into semi-finished products from raw materials [8].

At the same time, both national projects in agriculture and the creeping reform to oust former Western partners from the agricultural sectors face the inflexibility of state regulation, elements of foreign lobbying and a delay in the required legislative acts that can protect and support domestic producers in the WTO.

Therefore, timely reform and political will can help introduce a mobilization economy on our lands and help in the accelerated modernization of the most important, after defense, Russian survival industry. And this challenge after NWO becomes the main one and has no alternative.

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ESG TRANSFORMATION OF BUSINESS PROCESSES IN THE HOSPITALITY INDUSTRY COMPANY IN THE RUSSIAN FEDERATION

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Abstract. *The article discusses the directions and models of ESG transformation in the activities of hospitality industry enterprises in the context of transforming markets in accordance with the global principles of sustainable development. The study identified the main economic, social and environmental mechanisms and tools for implementing the ESG policy in enterprises and proposed three models for transforming the business processes of enterprises in the tourism industry in accordance with modern socio-economic challenges and strategic government objectives. The cases of innovative enterprises for the development of a sustainable development management system are considered and universal business processes for the implementation of the ESG transformation of enterprises are proposed.*

Keywords: *sustainable development, ESG, business process, sustainable development management system, hotel, tourist destination.*

The current socio-economic situation and the rapid transformation of existing systems form new challenges for the tourism industry. Russian enterprises found themselves in a situation of restrictions in relation to the international structure of managerial interaction, investment, insurance, rating, corporatization and education. Tasks arose to create national management standards, including those in the field of sustainable development.

All enterprises are faced with the task of system optimization, that is, to change the parameters of the controlled system that bring the managed structure closer to the set of desired states of the enterprise [5].

In the Russian Federation, the concept of sustainable development is implemented somewhat differently than in European countries. For example, many companies implement only single projects in the field of charity and sponsorship, while only a small number of companies develop projects that really lead to large-scale, systemic improvements in life in the regions of presence [2, 6].

The development of the tourism industry is set as one of the priorities of the national policy, within the framework of the National project "Tourism and hospitality industry". The framework of the national sustainable development goals of the Russian Federation takes into account the Global Development Goal No. 8 "Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", on the basis of which the national goal was set: "By 2030, ensure the development and implementation of strategies promotion of sustainable tourism that contributes to the creation of jobs, the development of local culture and the production of local products" and statistics are kept on indicator 8.9 "The share of gross value added of the tourism industry in the gross domestic product of the Russian Federation". The figure shows the dynamics of this indicator in the Russian Federation.

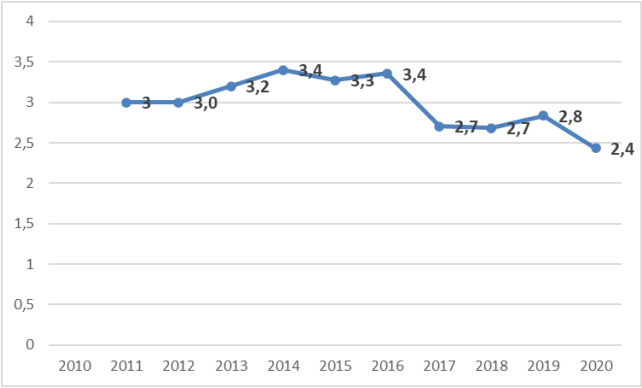

Figure. *Dynamics of the share of gross value added of the tourism industry in the GDP of the Russian Federation* [1]

In the period 2017 - 2020, this indicator decreases under the influence of macroeconomic and geopolitical processes. However, the country has set a task to provide up to 5% of GRP through the development of tourism and the hospitality industry by 2030. Such shifts are possible only if there is a serious systematic optimization of business processes for organizing the activities of hospitality industry enterprises, including through ESG transformation.

1 https://rosstat.gov.ru/sdg/national

In the Russian Federation, only about 2% of companies have the Sustainability Management System. And, basically, these are large production structures integrated into the world market. In the context of changing international relations, the drivers and incentives that stimulated ESG processes have changed significantly. Investors who demanded participation in ESG ratings are leaving the Russian market, transformation leaders are leaving, international rating companies have ceased to operate in the country [10].

The tourism industry faces a new challenge - the formation of ESG infrastructure. At the same time, processes do not have to be absolutely local. In the future, these programs will have to be easily integrated into international processes. The main goal-setting should be consistent with the National Development Goals and National Projects. Rating can also be carried out by Russian organizations. And not only in relation to business, but also to the regions. International standards should continue to be used to ensure uniformity of metrics.

The international community has worked out the criteria and indicators of the Global Sustainable Tourism Council (GSTC)[2] for tourist destinations, hotels and tour operators in order to come to a common understanding of sustainable tourism and are the minimum that businesses should strive for. For the Russian Federation, these criteria have been translated and adapted only for tourist destinations. This is the subject of works, A.I. Seselkina, T.V. Rassokhina, G.A. Karpova and other researchers [4,8]. However, they have not been included in the regulatory framework and are used only in the most innovative regions. Only the destination of the city of Moscow was certified according to the GSTC standard, and then, at the end of 2021.

The GSTC criteria for hotels are organized around four main themes: effective sustainability planning, maximizing social and economic benefits for the local community, enhancing cultural heritage, and reducing negative environmental impacts. There are 42 criteria in these groups of requirements. Based on these criteria, a certification system is being built in the world. There are 4 hotels in the Russian Federation that have passed one of the international sustainability certifications. But in modern conditions, these certificates have lost their validity.

The World Travel and Tourism Council (WTTC) at the Global Summit in April 2022, ratified and recommended the implementation of "Hotel Sustainability Basics"[3]. This Core Sustainability Standard for Shared Accommodations is a globally recognized and coordinated set of minimum metrics that all hotels must implement to ensure responsible tourism and to help each hotel develop effectively and meet the needs of its guests. It is much simpler than the GSTC criteria and is expected to be widely adopted. The twelve criteria of the Core Standard focus on

2 https://www.gstcouncil.org/gstc-criteria/gstc-industry-criteria-for-hotels/

3 https://action.wttc.org/hotel-sustainability-basics

actions that are fundamental to the sustainable development of hotels and address the impact of tourism on the planet across a range of critical issues such as water use, waste generation and resource purchasing. These criteria include actions to measure and reduce energy consumption, measure and reduce water consumption, identify and reduce waste, and measure and reduce carbon emissions. Criteria also include a laundry recycling program, the use of environmentally friendly cleaners, the elimination of plastic straws, stirrers and single-use plastic water bottles, the introduction of bulk dispensers, and community action. The hotel sustainability framework includes various milestones to support hotels that are just starting out as well as those that are more advanced in their sustainability performance. Eight of the twelve criteria are mandatory, while others can be adopted and implemented within the first three years.

It seems to us that in the modern conditions in the Russian Federation, the system optimization of the ESG transformation at tourism enterprises should follow the path of adapting international approaches, rather than localization. This is a widely accepted world practice [14]. In many countries, the system is always oriented towards national interests. The organization, building sustainable development systems, focuses on employees, suppliers, partners and, of course, including future generations of all stakeholder groups. Sustainability is about listening to these stakeholders. Not only investors or clients. According to research in the world and in the Russian Federation, consumer demand for the services of companies that comply with the ESG policy is growing. So in 2010, 5% of consumers declared their commitment to the principles of sustainable development and environmental friendliness, and in 2021 there were already 20% of such respondents [17].

System optimization of processes based on ESG transformation and the implementation of the implementation of sustainable development mechanisms can be carried out in accordance with different models of building business processes. In the study of international and Russian experience, we have identified the following models:

Model 1 - comprehensive implementation of the principles of sustainable development and the transition to social entrepreneurship upon receipt of state support and special non-profit investments in the form of grants and subsidies. Signs of social entrepreneurship: solving a social problem, an entrepreneurial approach to solving a problem, making a profit and financial sustainability, focusing on social impact and systemic changes. Conditions for recognition as a social entrepreneur providing jobs (at least 50% of employees) to specialists belonging to socially vulnerable groups. The profitability of the company's activities is ensured, for example, by a subsidy from the Department of Entrepreneurship and Innovative Development of Moscow - up to 1 million rubles. The regional project of the city of Moscow "Creating conditions for an easy start and comfortable doing business"

involves grants up to 500,000 rubles. Subsidies Department of Investments and Development of SMEs of the Krasnodar Krai - up to 500,000 rubles. The Our Future Foundation is holding a Social Entrepreneur Competition for which it involves an interest-free loan for 10 years from 10 to 40 million rubles.

Model 2 - a hybrid model of sustainable business. Commercial organization (JSC/LLC/IE) continue to carry out the main commercial activities, gradually introducing mechanisms of environmental friendliness and social responsibility. At the same time, the company forms a non-profit organization (NCO/ANCO) through which it implements non-profit projects, reaching the possibility of obtaining grants, subsidies for NCOs, support for social non-profit projects, fundraising, crowdfunding and other modern financial mechanisms.

Model 3 - conducting business in accordance with the principles of sustainable development and increasing business profitability by reducing costs when introducing resource-saving technologies and entering new consumer markets. This model is being actively implemented by the leaders of the tourism market right now. The largest tour operators are actively involved in charity programs. Thus, the FAN&SAN tour operator (TUI Russia), together with other companies belonging to the Severgroup, supported the creation of an audio guide with audio descriptions for blind and visually impaired visitors and other programs of the State Russian Museum in St. Petersburg. The company allocates special subsidies for the development of museums and guest houses in the north of Russia. The ANEX Tour company is implementing the “Rest without Borders” project, which provides for special programs and prices for travel in Russia and abroad for people with disabilities. In this program, the company combines commercial interest, opening up a new consumer niche, and social responsibility.

In the modern ESG system economy, the policy of the tourism industry enterprises should become the corporate embodiment of the sustainable development goals, facilitating the transition to a sustainable economic development model that ensures the conservation of nature, the well-being of society and the long-term prosperity of business within the existing limitations of natural resources, based on the interest, cooperation and partnership of all parties involved. And it is important to understand that the sustainability management system is a process of continuous improvement. It should include business processes, operational procedures, training, consumer scripts, and software that adapt to the transforming metaverse as sustainability issues continue to evolve.

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DESIGN OF ARTIFICIAL INTELLIGENCE SYSTEM TO ASSESS THE STATE OF FINANCIAL STABILITY OF AN ENTERPRISE

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Annotation. *The article discusses the essence and significance of the financial stability of an enterprise as the main criterion for its financial condition, the methodology and approaches to the analysis of this indicator. To assess the state of financial stability of an enterprise, an artificial intelligence system developed by the authors, written in the Prolog language, is used.*

Keywords: *artificial intelligence, expert system, financial analysis, financial stability.*

Financial stability is the main link in the overall sustainability of the enterprise and is formed in the process of all production activities. The problems of determining and analyzing the financial stability of an enterprise were raised in the works of scientists such as: Sheremet A.D., Saifulin R.S., Negashev A.E., Bocharov V.V., Ermolovich L.L., Sivchik L.G., Golovach O.V., Tolkach G.V., Shchitnikova I.V., Kovalev V.V., Volkova O.N., Drury K., Hedderwick K., Holt R.N., Bogdanovskaya L.A. , Vinogradov G. G., Barilenko V. I., Berdnikov V. V., Borodina E. I., Abryutina M. S., Grachev A. V., Kreinina M. N., Artemenko V. G., Bellendir M. V., Rodionova V. M., Fedotova M. A., Selezneva N. N., Ionova A. F., Makarieva V. I., Andreeva L.V., Gilyarovskaya L. T., Vehoreva A. A., Kazakova N. A. and others. Various theoretical concepts of the financial stability of an enterprise are shown in Table 1. The essence of the concept of financial stability G.V. Savitskaya G.V. [1]: «The financial stability of an enterprise is the ability of a business entity to function and develop, to maintain a balance of

its assets and liabilities in a changing internal and external environment, which guarantees its constant solvency and investment attractiveness within the limits of an acceptable level of risk».

Table 1.

Various theoretical concepts of the financial stability of an enterprise

Theoretical concept	Concept authors	Interpretation
Financial stability as an indicator of financial condition assessment	Sheremet A. D., Saifulin R. S. Negashev A. E. [2]	The difference between real equity capital and authorized capital
	Bocharov V. V. [3]	The state of monetary resources providing functioning of the organization by its own sources
	Ermolovich L. L., Sivchik L. G., Golovach O. V., Tolkach G. V., Shchitnikova I. V. [4]	The degree of coverage of non-current assets by capital, reserves and long-term liabilities
Financial stability as a ratio of own and borrowed funds	Kovalev V.V., Volkova O.N., Drury K., Hedderwick K., Holt R.N. [5]	The general financial structure of the organization, the degree of its dependence on creditors
	Bogdanovskaya L. A., Vinogradov G. G. [6]	The ratio of borrowed, equity and total capital from various aspects
Financial stability as guaranteed solvency	Barylenko V. I., Berdnikov V. V., Borodina E. I. [7]	Long-term financial stability of the organization, which consists in guaranteed creditworthiness and solvency, provision with resources, sources of financing
	Abryutina M.S., Grachev A.V., Kreinina M.N. [8]	Guaranteed solvency, independence from market conditions
Financial stability as a state of financial resources	Artemenko V. G., Bellendir M. V., Rodionova V. M., Fedotova M. A. [9]	A stable reflection of the excess of income over expenses, the ability of the enterprise to freely maneuver cash and, through their effective use, ensure an uninterrupted process of product sales
	Selezneva N.N., Ionova A.F. [10]	The state of financial resources (finance, assets and liabilities) of the enterprise, which guarantees solvency at an acceptable level of risk
	Makarieva V.I., Andreeva L.V. [11]	

Functioning organizations under influence of factors business environment and market	Gilyarovskaya L.T. [12], Vehoreva A.A. [13]	Carrying out activities in the conditions of entrepreneurial risk and a changing business environment in order to maximize the wealth of owners and strengthen competitive advantages
	Kazakova N. A. [14]	The state of the financial environment of the subject of the economy, which provides a stable structure of funding sources, the presence of a sufficient margin of financial strength, ensuring the development of its economic potential.

In order to understand how correctly an enterprise manages its resources in the current conditions of economic instability, an analysis of its financial stability is carried out. To solve the problem, it is proposed to use an expert system. The development of an expert system (ES) has significant differences from the development of a conventional software product. Before proceeding directly to the process of creating an ES, it is necessary to design a general scheme of its operation, identify the relationship of modules, form a database and knowledge, taking into account the specifics of use in the enterprise. Imagine the structure of the ES in Figure 1. Among the main properties of the ES, it is worth highlighting:

1) accumulation and organization of knowledge;
2) availability of predictive capabilities;
3) institutional memory;
4) the possibility of learning and training

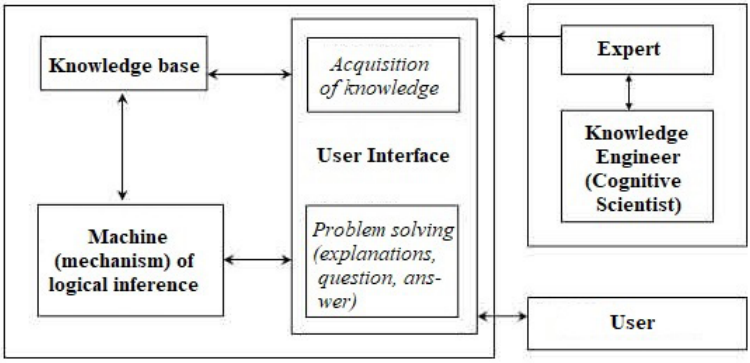

Figure 1. *Structural diagram of an expert system*

There are two modes of operation of the ES: knowledge input mode (an expert together with a cognitive scientist, using the knowledge base editor, enters all the necessary parameters into the knowledge base of the expert area - absolute liquidity ratio, liquidity ratio, coverage ratio, assets (highly liquid, quickly realizable and slowly realizable), own, long-term and medium-term borrowed funds, the total value of the main sources of formation of reserves and costs) and consultation mode (the user provides information about the current task in an interactive mode and receives recommendations from the EC.

The artificial intelligence system is written in Prolog. The information system uses sections: «domains», «predicates», «clauses», «goal». In the «domains» section, we will declare the domains used for predicate arguments. Let's declare s as a text parameter symbol, i as a numeric parameter integer, l=i* as a numeric list. In the «predicates» section, we will describe the main predicates, that is, the rules that provide the main logic of the program. The «rule» predicate has two arguments (string, list). It contains a list of characteristics and the result that will be displayed after we answer the questions contained in the «cond» predicate. The «cond» predicate has two arguments (a number, a string). It contains a question and a value from the list of characteristics and interacts with the «test» predicate. The «test» predicate has two arguments (a number, a list). This predicate contains the given value and the list of characteristics from the «rule» predicate. This predicate works in this way: we get a question on the screen, which has its own meaning inside the program, if the answer to this question is «yes», then the value that this question has is checked in the list of characteristics. Then we move on to the next question, if there is one. And if the answer is «no», we will immediately move on to the next question. The «do_consulting» predicate has no arguments, it is used to run the program and iterate over all the facts. The code of ES software mechanisms is presented in Table 2.

Table 2.

Code of program mechanisms on Prolog

GOAL: do_consulting	
domains s = symbol i = integer l= i* predicates nondeterm rule(s,l) nondeterm cond(i,s) nondeterm test(i,l) nondeterm do_consulting nondeterm start	start:-write(«Greetings from virtual financial expert Julia.»),nl, write(«So that I can analyze the financial condition of your company, please answer the following questions.»), nl, write(«»),nl. do_consulting:-test(1,List),rule(X,List), write(«Your»,X),nl,!. do_consulting:-write(«Not enough data to analyze. I'm sorry I couldn't help you.»), nl.

cond(1, “Absolute liquidity ratio <= 0.2 ?”). cond(2, “Absolute liquidity ratio > 0.2 and <=0.7 ?”). cond(3, “Absolute liquidity ratio > 0.7 and <=1 ?”). cond(4, “Absolute liquidity ratio > 1 ?”). cond(5, “Liquidity ratio <= 0.6 ?”). cond(6, “Liquidity ratio > 0.6 and <= 0.8 ?”). cond(7, “Liquidity ratio > 0.8 and <= 1 ?”). cond(8, “Liquidity ratio > 1 ?”). cond(9, “Coverage <= 1 ?”). cond(10,”Coverage > 1 and <= 2 ?”). cond(11,”Coverage > 2 and <= 3 ?”). cond(12,”Coverage > 3?”). cond(13,”Highly liquid assets > 0 ?”). cond(14,”Highly liquid assets < 0?”). cond(15,”Quickly realizable assets > 0 ?”). cond(16,” Quickly realizable assets < 0 ?»). cond(17,»Slow selling assets > 0 ?»). cond(18,»Slow selling assets < 0 ?»). cond(19,»Do you have a surplus of your own working capital?»). cond(20,»Do you have a shortage of your own working capital?»). cond(21,»Do you have excess equity, long-term, and medium-term debt?»). cond(22,»Do you have a shortage of own, long-term and medium-term borrowed funds?»). cond(23,»Do you have an excess of the total amount of the main sources of inventory and costs?»). cond(24,»Are you short of the total value of the main sources of inventory and costs?»).	
RULE: R1 IF: cond([4,8,12,13,15,17,19,21,23])=true THEN: Your financial condition is absolutely stable	RULE: R37 IF: cond([4,8,12,14,15,18,20,22,24])=true THEN: Your financial condition is unstable
RULE: R2 IF: cond([3,7,11,13,15,17,20,21,23])=true THEN: Your financial condition is absolutely stable	RULE: R38 IF: cond([1,5,9,13,15,17,19,21,23])=true THEN: Your financial condition is good
RULE: R3 IF: cond([2,6,10,13,15,17,19,21,23])=true THEN: Your financial condition is absolutely stable	RULE: R39 IF: cond([1,5,9,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R4 IF: cond([1,5,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R40 IF: cond([1,5,10,14,15,17,20,21,23])=true THEN: Your financial condition is good

RULE: R5 IF: cond([1,5,9,13,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R41 IF: cond([1,5,10,14,15,17,19,21,23])=true THEN: Your financial condition is good
RULE: R6 IF: cond([1,5,10,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R42 IF: cond([1,5,10,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R7 IF: cond([1,5,11,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R43 IF: cond([1,5,10,14,16,18,19,21,23])=true THEN: Your financial condition is good
RULE: R8 IF: cond([1,5,12,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R44 IF: cond([1,6,9,13,15,18,20,21,23])=true THEN: Your financial condition is good
RULE: R9 IF: cond([1,6,10,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R45 IF: cond([1,6,9,13,15,18,20,22,24])=true THEN: Your financial condition is good
RULE: R10 IF: cond([1,6,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R46 IF: cond([1,6,9,13,15,18,20,21,24])=true THEN: Your financial condition is good
RULE: R11 IF: cond([1,7,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R47 IF: cond([1,6,9,13,16,17,20,22,24])=true THEN: Your financial condition is good
RULE: R12 IF: cond([1,8,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R48 IF: cond([1,6,9,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R13 IF: cond([2,5,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R49 IF: cond([2,5,9,14,16,18,19,21,23])=true THEN: Your financial condition is good
RULE: R14 IF: cond([3,5,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R50 IF: cond([2,5,9,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R15 IF: cond([4,5,9,14,16,18,20,22,24])=true THEN: Your financial condition is in crisis	RULE: R51 IF: cond([2,6,9,13,15,18,19,21,23])=true THEN: Your financial condition is good
RULE: R16 IF: cond([1,6,9,13,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R52 IF: cond([2,6,9,13,16,18,19,21,23])=true THEN: Your financial condition is good
RULE: R17 IF: cond([1,6,9,13,16,17,19,21,23])=true THEN: Your financial condition is unstable	RULE: R53 IF: cond([2,6,9,14,15,18,19,21,23])=true THEN: Your financial condition is good
RULE: R18 IF: cond([1,6,9,13,16,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R54 IF: cond([2,6,9,14,16,18,19,21,23])=true THEN: Your financial condition is good
RULE: R19 IF: cond([1,6,9,13,16,18,20,22,24])=true THEN: Your financial condition is unstable	RULE: R55 IF: cond([2,6,10,14,16,18,19,21,23])=true THEN: Your financial condition is good

RULE: R20 IF: cond([1,6,9,13,16,18,19,21,24])=true THEN: Your financial condition is unstable	RULE: R56 IF: cond([3,5,9,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R21 IF: cond([1,6,9,13,16,18,19,21,23])=true THEN: Ваше финансовое состояние неустойчивое	RULE: R57 IF: cond([3,5,10,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R22 IF: cond([2,6,10,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R58 IF: cond([3,5,11,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R23 IF: cond([2,6,11,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R59 IF: cond([3,5,11,14,16,17,19,21,23])=true THEN: Your financial condition is good
RULE: R24 IF: cond([2,7,10,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R60 IF: cond([3,5,12,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R25 IF: cond([2,7,11,14,15,17,20,22,23])=true THEN: Your financial condition is unstable	RULE: R61 IF: cond([3,6,9,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R26 IF: cond([2,8,9,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R62 IF: cond([3,8,9,13,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R27 IF: cond([2,8,10,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R63 IF: cond([3,8,9,14,15,17,19,22,24])=true THEN: Your financial condition is good
RULE: R28 IF: cond([2,8,10,13,15,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R64 IF: cond([4,5,9,13,15,17,19,21,23])=true THEN: Ваше финансовое состояние хорошее
RULE: R29 IF: cond([2,8,10,13,16,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R65 IF: cond([4,5,10,13,16,18,19,21,23])=true THEN: Your financial condition is good
RULE: R30 IF: cond([2,8,10,13,15,18,20,22,24])=true THEN: Your financial condition is unstable	RULE: R66 IF: cond([4,5,11,14,16,18,20,21,23])=true THEN: Your financial condition is good
RULE: R31 IF: cond([2,8,10,14,16,18,19,21,23])=true THEN: Your financial condition is unstable	RULE: R67 IF: cond([4,5,11,13,15,17,19,21,23])=true THEN: Your financial condition is good
RULE: R32 IF: cond([4,7,11,14,16,18,20,22,24])=true THEN: Your financial condition is unstable	RULE: R68 IF: cond([4,8,12,13,15,17,20,22,24])=true THEN: Your financial condition is good
RULE: R33 IF: cond([4,8,12,14,16,18,20,22,24])=true THEN: Your financial condition is unstable	RULE: R69 IF: cond([4,8,12,13,15,18,20,22,24])=true THEN: Your financial condition is good

RULE: R34 IF: cond([4,8,12,14,16,18,20,22,24])=true THEN: Your financial condition is unstable	RULE: R70 IF: cond([4,8,12,13,16,17,20,22,24])=true THEN: Your financial condition is good
RULE: R35 IF: cond([4,8,12,14,16,17,20,22,24])=true THEN: Your financial condition is unstable	RULE: R71 IF: cond([4,8,12,13,16,18,20,22,24])=true THEN: Your financial condition is good
RULE: R36 IF: cond([4,8,12,14,15,17,20,22,24])=true THEN: Your financial condition is unstable	
END	

The result of the ES operation in the consulting mode is shown in Figure 2.

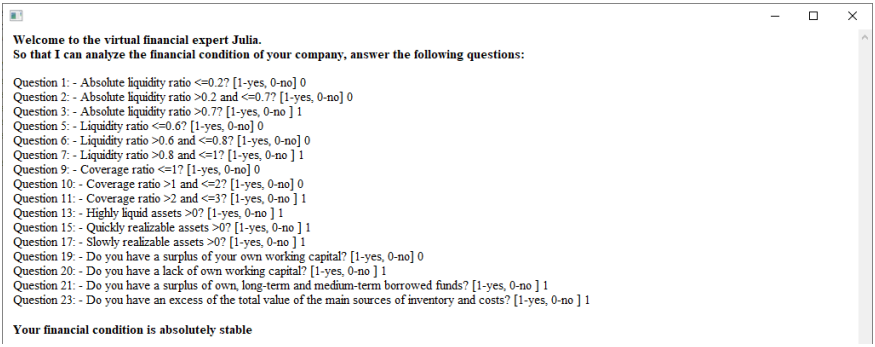

Figure 2. *The result of the ES operation in the consulting mode*

Summing up, it is worth noting that the financial stability of an enterprise is a key indicator and reflects the efficiency of capital use, the level of solvency and liquidity of the enterprise, serves as an information base for management, investors, creditors and other economic counterparties about the ability of a particular organization to meet its own obligations.

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"GREEN" FINANCING, ITS IMPLEMENTATION IN RUSSIA AND EUROPE

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Abstract. *The enormous impact of climate change on the economies of countries is increasingly becoming the focus of attention of governments around the world. The current environmental situation requires a solution in the form of greening the economy, that is, the introduction of "green" economies and the use of "green" financing.*

Keywords: *"green" economy, "green" financing, subsidizing, greenwashing, ESG, carbon quotas.*

Introduction

The rapid development of the world economy in technological and scientific terms is accompanied by the depletion of natural resources, the reduction of wildlife and the disruption of ecosystems. Therefore, in the modern world, taking care of the environment is becoming one of the main tasks not only for the whole of humanity, but also for the economy as a whole. Increasingly, phrases such as "eco-friendly behavior" and "rational consumption" are used in everyday life by people from different countries, and companies around the world, in turn, resort to corporate social responsibility, which contributes to the preservation and protection of the environment. There is a growing number of countries that choose the concept of a "green" economy as a strategic model for the development of the national economy, and also use "green" financing systems.

Next, we will take a closer look at the meanings of these terms and the implementation tools.

Definition of concepts, basic criteria and tools

The concept of a "green" economy is based on the principle of sustainable development and contributes to maintaining a balance between economic development and environmental prosperity. Without the introduction of an effective system of "green" financing, it is impossible to form a sustainable "green" economy.

The term "green" financing means the provision of funds for projects and initiatives aimed at environmental and climate benefits, with the obligatory observance of three main criteria: environmental improvement, rational use of natural resources and reduction of the effects of climate change.

The sector of "green" financing is carried out through such instruments as "green" bonds, lending, funds, grants and technical assistance[1].

The definition of "green" bonds means bonds, the funds from the issue of which will be used for the implementation of environmental projects. This instrument of "green" financing was one of the very first forms of responsible investment and remains effective to this day. According to the Moscow Exchange, the volume of bonds issued for 2021 amounted to 70 billion rubles[2].

Over the past 7 years, active development has also taken place in the "green" lending industry. The purpose of these loans is to finance "green", environmental programs. For example, Sberbank has issued about 75 billion rubles of "green" loans by mid-2021.

In the system of national development banks in many countries there are "green" funds, the funds of which are formed from both public sources and private funds and are directed to the implementation of "green" projects.

Further, the implementation of "green" financing in Russia and countries abroad will be considered in more detail.

How is the policy of "green" financing implemented in Europe

The practice of "green" financing appeared in the West already at the beginning of the XXI century. At first, it was accompanied by a significant degree of skepticism, as the entrepreneur deliberately reduced his profits by introducing more environmentally friendly and expensive methods into production. However, over time, the attitude of society has changed, and now more and more investors prefer to invest in projects that meet the requirements of sustainable development, ESG (Environmental, Social, Governance) criteria. These criteria are used to

1 The World Bank Group. "Green financing in Russia: creating opportunities for green investments. Analytical note. URL: https://documents1.worldbank.org/curated/en/699051540925687477/pdf/131516-RUSSIAN-PN-P168296-P164837-PUBLIC-Green-finance-Note.pdf

2 Website of the Moscow Exchange [Electronic resource] – URL: https://www.moex.com/n34281/?nt=106 (date of application: 11.12.2022)

evaluate the activities of companies in the social, environmental and economic spheres.

Abroad, enterprises that use more environmentally friendly methods in production have a high ESG rating, can count on a low loan rate and even tax benefits. Carbon quota trading is also very popular in the West. Companies that have managed to exceed the plan to reduce their carbon footprint are selling the surplus to other companies that have not made such progress in their production at the moment. It is impossible to give an unambiguous positive assessment of this practice, since in some cases it suppresses the desire of entrepreneurs to improve and modernize their production process. Nevertheless, the cost of quotas is quite high, so firms that have implemented eco-friendly methods in production receive a good source of additional financing. In addition, large investors, such as pension and investment funds, refused to finance oil and coal mining enterprises. Sometimes such responsible financing can go against the economic interests of the country. Thus, the Norwegian Pension Fund has been following a similar policy of sustainable development for the past few years, although Norway is one of the main suppliers of petroleum fuel to Europe.

Green bonds, also called climate bonds, are an indication that investors are interested in sustainability. Environmental degradation and climate change pose serious physical and transitional risks to financial stability, such as business disruption, asset destruction, lower value of stranded assets, and increase in insurance costs. Whether to identify opportunities, mitigate risk, or align values, investors are recognizing the potential of sustainable finance by launching new and restructuring old finance products. In Europe, the most common type of issuer of green bonds were financial corporate issuers, accounting for more than one third of the total green bonds issued in Europe in 2021.

Based on the Figure 1 below, we can say that the energy sector in the field of green bonds benefits the most.

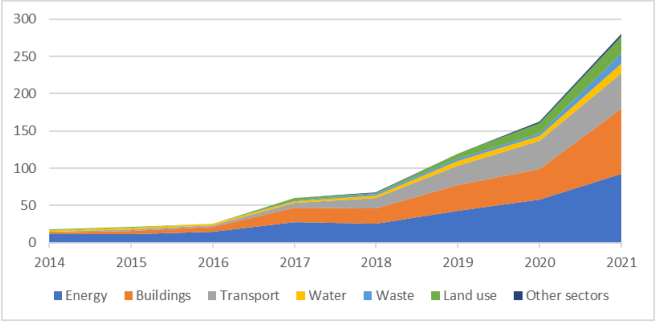

Figure 1. *Use of proceeds from green bonds in Europe 2014-2021, by industry*

(in billion U.S. dollars)[3]

In order to prevent greenwashing, that is, deliberate deception of investors regarding the priority goals of the organization or the degree of environmental friendliness of products or services, the EU Taxonomy was created, which defines the criteria for projects that have the opportunity to receive "green" financing.

What are the problems of "green" financing in Russia

One of the first problems associated with green financing is subsidizing Russian enterprises that pollute the environment the most. This program belongs to the Ministry of Industry and Trade[44], it is based on the issuance of "green" loans and bonds, which are able to cover from 70% to 90% of the costs associated with the payment of coupon income on bonds to those companies that are engaged in the introduction of BAT (the best available technologies) in their production. The main reference point of this program is 300 largest domestic enterprises. The contradiction is caused by the fact that in the international arena, the areas in which they work cause such significant harm to the environment that there are currently no technologies that could even compensate for the damage in a minimal amount. The report on the state of the environment in the capital prepared by the Department of Nature Management and Environmental Protection of the City of Moscow in 2019 can serve as a clear example of the low efficiency of the use of NTD. According to the department, 60% of enterprises that have a negative effect on the ecology of the capital used NTD in their production[5].

The second important problem, the solution of which was taken up by VEB. RF[6], it became greenwashing. Despite the rather rapid reaction of the state corporation to the problem, the selection criteria created to identify deliberate misrepresentation turned out to be significantly stricter than abroad. In an effort to present a reference version of the selection methodology, the state deprived the regions that can rightfully be classified as "green" of adequate funding. Thus, sustainable agriculture in Russia, which uses significantly fewer harmful chemicals in production than abroad, has dispensed with the possibility of green financing. Nuclear power is in a similar situation. Domestic projects that are significantly ahead of foreign ones in terms of development cannot receive green financing, whereas in other countries, with the proper level of production safety,

3 Website Statista [Electronic resource] – URL: https://www.statista.com/topics/6233/green-bonds-in-europe/#topicOverview

4 Website of the Ministry of Industry and Trade of Russia [Electronic resource] – URL: https://minpromtorg.gov.ru/ (date of application: 11.12.2022)

5 Scientific journal "Problems of the National Strategy No. 5 (50) 2018". Bazhenov I.N. "Green financing: global trends and Russian practice": URL: https://riss.ru/documents/734/cb5101e0c621429da43cf2f7de4bf803.pdf#page=172

6 Website VEB.RF [Electronic resource] – URL: https://veb.ru/ustojchivoe-razvitie/zeljonoe-finansirovanie / (date of application: 11.12.2022)

this is possible.

Let's consider our green agenda in the context of the release of green obliagtions. For Russia, this direction is also new and not yet fully explored, so most Russian large companies do not yet have such involvement in the process of their release as it is widespread in the West.

In the West, securities with an ESG component tend to have lower yields than broad-based funds, but a Western investor still buys green bonds and units "because he wants to make the world a better place." The Russian investor now has more important problems, and he is mainly focused on the highest profitability. In Russia, the yield of green and non-green bonds is about the same. For example, the yield of three-year ESG bonds "MTS Issue 18" maturing on March 22, 2024 is 9.32%, and the yield of two-year bonds "MTS Issue 7" maturing on January 23, 2024 will be 9.5%.

If an investor can safely choose the option to invest in sustainable development for his wallet, then the issuer, by choosing the issue of green bonds, receives the same yield plus a number of additional conditions that he must fulfill. There are fewer and fewer incentives and more obstacles. The issuer should implement exactly the project that it stated, spend money on accounting, auditing and rating, so that from an economic point of view, "green bonds do not bring advantages to the investor, but create even more tasks for the issuer, so only goodwill and benefits of the state can move this sector forward.

State support can become an incentive for the development of the market of green financial instruments, at the same time without any significant costs from the state. We can talk about regulatory benefits for green financial instruments in the form of reduced capital adequacy requirements for investing or tax breaks in relation to income received from green bonds. In addition, Asian platforms, where green instruments are also popular, can become an alternative to Western capital markets. However, in this case, in addition to solving the problem of secondary sanctions against investors investing in Russian securities, it will be necessary to solve the issue of foreign recognition of green ratings assigned by domestic verifiers.

As can be seen in the figure below, issuers of green bonds are quite large Russian companies, which for the most part are state-owned. Thus, state support is provided to them directly. The absolute record holder in terms of placement is Russian Railways. The amount of bonds placed by him is equal to 101 billion.

Next, coupon payments of the largest Russian companies will be considered (Figure 2).

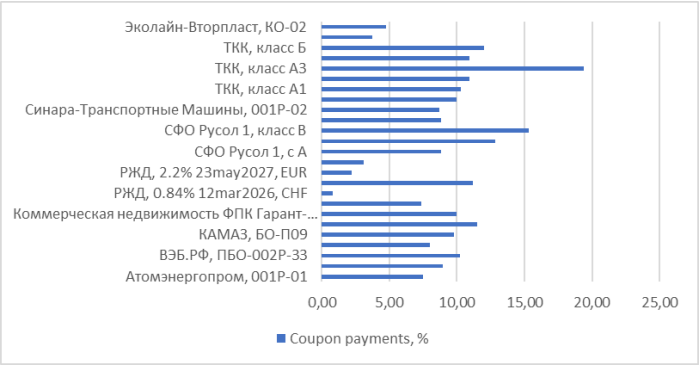

Figure 2. *Range of coupon payments of green bonds of Russian companies*[7]

Next, the first green bond of the Russian issuer (RZD) will be considered.

Russian Railways ("RZD") is the state-owned company that owns and operates Russia's railway network and infrastructure. The 85,500 km rail network is the third longest in the world. RZD became a member of the UN Global Compact in 2007, and is increasingly focusing on sustainability issues in recent years[8].

The rolling stock which is financed by this bond is named Lastochka – "Swallow" and is built by a joint venture between Siemens and Ural Locomotives. First introduced in Russia in 2013, these trains operate on many commuter and intercity routes. It is currently the most common high speed train model operating in Russia. Depending on the mode of operation, the trains have capacities of 400 or 800 seated passengers and maximum speeds of 160 km per hour (100 miles per hour).

Table 1.

The first certified climate bond from Russia

DATE OF ISSUE	TYPE OF INSTRUMENT	SIZE	TENOR	COUNTRY OF ISSUE	CLIMATE BONDS SECTOR CRITERIA

7 Website Cbonds [Electronic resource] – URL: https://cbonds.ru/?show_main

8 Website Russian Railways [Electronic resource] – URL: https://eng.rzd.ru/en/9653 (date of application: 11.12.2022)

May 2019	Use of Proceeds	EUR 500 million (USD 585 million)	8 years	Russia (through RZD Capital subsidiary based in Ireland)	Low Carbon Land Transport
March 2020	Use of Proceeds	CHF 250 million (USD 264 million)	6 years	Russia (through RZD Capital subsidiary based in Ireland)	Low Carbon Land Transport
March 2021	Use of Proceeds	CHF 250 million (USD 254.6 million)	perpetual	Russia (through RZD Capital subsidiary based in Ireland)	Low Carbon Land Transport

The process of implementing ESG standards in some Russian companies has already been launched, and issuers are gradually becoming "greener" one way or another, so they are unlikely to refuse to assign their instruments a green status.

He adheres to this opinion, - says Nikolay Ryaskov, head of the department for working with bonds of the Ingosstrakh-Investments Management Company. As for new players in this market, a lot depends on the level of stability of the economy, because companies do not even know what the key rate will be by the end of the year and in such conditions they hardly prioritize the issue of ESG bonds.

Conclusion

In conclusion, we would like to note the growing importance of being responsible financing both in Europe and in Russia. Due to the increase in production rates, the appearance of "green" financing has become inevitable. Despite the fact that the implementation of this system of the concept of a "green" economy is observed on a full scale in Europe, Russia has enough economic potential and accumulated environmental problems to continue improving the practice of this financing. With the greatest probability in the future, we can expect the introduction of methods used by Western countries adapted to domestic realities.

A significant role in creating a green bond market lies with investors, in particular pension funds and management companies, which are the largest players in the debt market with a long investment horizon. By paying more attention to environmental, social and managerial risks, such investors can ensure the implementation of programs of the Russian Federation to modernize industry

and reduce emissions of pollutants into the atmosphere by upgrading production facilities. Thus, a culture of responsible investment can be formed among Russian investors, as well as motives for directing investments in such projects.

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THE PUNISHMENT SYSTEM IN INDIA

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Annotation. *The article contains a brief overview of the system of punishments enshrined in the Criminal Code of India in 1860, which became the first experience of official codification of criminal legislation. Noting the originality of this system, as well as the peculiarities of legal technique, the author draws attention to the positive changes in the correctional and educational process of the functioning of penitentiary institutions in India.*

Keywords*: Indian criminal law, penal system, English legal system, penitentiaries, Gandhi Principles.*

The latest trends in the integration of the criminal legislation of the BRICS countries set the task of a deep and meaningful study of the relevant regulations of the participating States.

The mixed and varied legal system of India has always attracted the attention of researchers and practitioners. The original English legal policy of religious neutrality eventually came to the need for a secular pan-Indian penal code based on the "progressive" principles of English common law. "Natural and spiritual distinctions between East and West have been obliterated by special advances in science, commercial relations, and the introduction of the spirit of English law and education. And this position of English liberalism in the period of its obvious and unshakable heyday was most vividly defended both in England and in India by Lord Macaulay.An eminent British statist historian, a brilliant parliamentary orator, appointed Legislative Secretary of the East India Company, it was he who became the first head of the Law Commission in British India. Upon his arrival in Calcutta, Macaulay was faced with the important task of studying the intricate local ritual and criminal practices and codifying the rules on criminal liability in the shortest possible time by developing a theoretical draft of the Criminal Code of India. Macaulay's project was based on the ideology of the criminal law of Great Britain, the doctrines of prominent English forensic lawyers and utilitarian philosophers (the influence of J. Bentham (1748–1832), an English lawyer, the

founder of the "science of legislation" and a supporter of "universal codification", was especially pronounced. deservedly called the "dead legislator of British India", meaning that even after his death, which occurred on the eve of T. Macaulay's departure to India, he continued to inspire the codification of colonial law). The Indian Criminal Code was a creative reworking of numerous English statutes and precedents, stripped of archaic norms and obsolete "common law" institutions. The originality of this source of criminal law also consisted in the fact that it contained features not only of Anglo-Saxon law and partly even of the continental legal family, but also of traditional Hindu legal culture and Muslim law.

Adopted back in 1860. The Criminal Code was the first experience of official codification of criminal legislation. According to the form and content of the Criminal Code of 1860- an original criminal law act that has no analogues in history. The publication of the Criminal Code of 1860 as a whole represented a progressive step in the history of the development of the criminal law of the English colonies in comparison with the uncodified law of Great Britain itself.

However, the system of punishments in the Criminal Code of India is also sadly not diverse, as in the metropolis itself - Great Britain. In accordance with Art. 53 of the Indian Criminal Code, the system of punishments includes:

1. Death penalty;
2 Life imprisonment;
3 Imprisonment:
(1) severe, that is, with hard labor;
(2) simple;
4. Confiscation of property;
5. Fine.

The criminal law does not contain any detailed explanations regarding the death penalty and life imprisonment. However, there is no doubt that an interesting provision is enshrined in Art. 54 of the Criminal Code: "In each case of a death sentence, the "relevant Government" may, without the consent of the offender, replace the punishment with any other punishment provided for by this Code."

A similar substitution is also provided for life imprisonment: "the relevant Government" may, without the consent of the offender, mitigate the punishment by deprivation of liberty of any category for up to fourteen years" (Article 55 of the Criminal Code).

The term "relevant Government" is explained by the legislator in Art. 55a of the Criminal Code:

"(a) in cases where the sentence is death or in violation of any law relating to a matter to which the executive power of the Union extends, the Central Government;

(b) in cases where a sentence (death or not) is imposed for the violation of any law relating to a matter to which the executive power of the state extends, the government of the state within which the offender is sentenced"

With regard to imprisonment, the court is entitled to indicate in the sentence that the detention must be completely strict, or that such imprisonment must be completely simple, or that any part of such imprisonment must be strict, and the rest simple (Article 60 of the Criminal Code).

The Indian legislator regulates issues related to the imposition of a fine in the most detailed way.

The amount of the fine is not limited, but cannot be excessive (Article 63 of the Criminal Code).

In case of non-payment of the fine, the perpetrator is punished with imprisonment for a certain period, which cannot exceed one quarter of the term of imprisonment, which is the maximum established for the crime (Article 64 of the Criminal Code).

Interesting provisions are contained in Art. 69 of the Criminal Code. We are talking about the termination of deprivation of liberty upon payment of a proportional part of the fine: if, before the expiration of the period of deprivation of liberty established for non-payment, such a part of the fine is paid that is proportional to the part of the fine that has not yet been paid, the deprivation of liberty is terminated.

Articles of the Criminal Code of India have certain structural features.Many of them, along with the main provisions, include explanations, reservations, exceptions, illustrations that form an integral part of the norm. Some tribute to the complexity and casuistry of English law.

The provisions of Art. 69 CC of India is explained in the law as follows:

A. is sentenced to a fine of one hundred rupees and four months in prison for non-payment.

If he pays seventy-five rupees before the expiration of one month of imprisonment, A will be released as soon as the first month has expired. If seventy-five rupees are paid at the end of the first month, or any thereafter, while A. continues to be imprisoned, A will be immediately released.

If the fifty rupees fine is paid before the expiration of two months' imprisonment, A will be released as soon as two months have elapsed. If fifty rupees is paid after the expiration of these two months or at any later time while A is still in detention, A will be immediately released.

According to Art. 70 of the Criminal Code, the death of a convicted person does not release from liability any property that, after his death, would legally be liable for his debts.

Provisions that are completely different from the Russian legal system are contained in Art. 72 of the Criminal Code, which regulates the sentencing of a person guilty of several offenses. In cases where a sentence is pronounced that a person has committed several of the offenses specified in the sentence, but it is

doubtful which of these offenses he is guilty of, the offender shall be punished for the offense for which the lowest punishment is provided.India's current penological policy emphasizes the application of so-called intermediate sanctions: intensive probation and community service as a transitional stage from imprisonment to traditional probation, as well as, alternatively, large fines.

In conclusion, it should be noted that no, even the most progressive, system of punishments (including those inspired by the genius of Bentham himself!) Will work effectively if the state does not ensure the achievement of the goals of punishment. Entered into force on February 14, 2002, the Delhi Prisons Act ("The Delhi Prisons Act") outlined significant positive changes in the entire correctional and educational process of the functioning of correctional institutions in India. This legislative act was adopted in accordance with modern international concepts of the correction of convicts, as well as taking into account the European penitentiary rules. The special significance of this document is the approval of new social projects and rehabilitation programs that effectively improve the process of correction of convicts.

The results of the introduction of the Gandhi Principles course (eliminating illiteracy among convicts, organizing a labor correctional process, providing legal support, as well as a variety of cultural, mass and sports activities aimed at preventing post-penitentiary relapse) are unambiguously positive. It is unlikely that yoga and meditation will ever become highly effective means of corrective and educational influence on Russian convicts, but the study of the correctional system of penitentiary institutions in India is of indisputable theoretical and practical interest.

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TRANSFORMATION OF THE HIGHER EDUCATION SYSTEM: KEY GUIDELINES

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Abstract. *This article is devoted to the issues of transformation of the higher education system and the identification of key guidelines that contribute to the understanding of priority tasks related to the identification of the main directions in the process of improving the quality system of education of future specialists in the field of the humanities. The dominant factors that have a significant impact on the transformation of education include the establishment of a mission, the definition of university priorities and further collaboration of the entire teaching staff and the student community in order to form a higher level of corporate culture.*

Keywords: *transformation of the higher education system, improvement of the quality of education, mission, priorities, corporate culture.*

The key to the effectiveness and success of the university community at the present stage of development is the active integration of the higher education system to meet the demands of the digital economy, which certainly requires updating the content of the main professional educational programs, and, therefore, the transformation of the education system at the university. For these reasons, the mission, priority tasks of the university and corporate culture are among the most relevant landmarks of the modern classical university.

1. MISSION OF THE UNIVERSITY

The need to formulate the mission of any university is due both to the formal requirements of the quality management system in education and to ensuring the

implementation of the "usefulness" factor of a higher education institution for the state as a whole and its citizens. The mission of LUNN should be considered the formation of the human capital of the country; training of highly qualified professional personnel with international competencies, capable of solving the problems of Russia's global leadership and working at the forefront of research and technology; training personnel for new professions and functions in education [Program, 2019: 27]. The meaning of the mission fits into the formed image of the university, which is actually ensured by the maximum correspondence of the results obtained to the postulated mission, on the one hand, and on the other hand, the mission contributes to the unity of the university community, the formation of a corporate spirit. In addition, the mission creates favorable opportunities for the effective management of the development of the university, because it defines priorities, values and a general approach to organizing the functioning of the university as an integral self-developing system [Akinfeeva: https://www.sgu.ru/sites/default/files/textdocsfiles/2013/07/15/akinfieva_2.pdf?ysclid=lc1t41t4cu84006299]. Obviously, in order for Russian universities to meet global trends, "investment in reputation" is necessary, since it is the reputation of a university that is often the basis for choosing a place, form and content of education.

2. PRIORITIES OF UNIVERSITY ACTIVITIES

The highest standards of intellectual and cognitive activity are formed in the academic environment of the university. The main feature of this environment is the democratic spirit, the education of "Aspiring Leaders", as a result, the key tasks include the following:

1) defending the interests of a person in the space of the university, i.e. the priority is given to the interests of the main participants in the learning process: students, employees, partners);

2) preservation of the traditions, history and specifics of the university in the implementation of strategic and innovative tasks;

3) ensuring maximum productivity of employees;

4) compliance by all participants in the learning process with the requirements of generally accepted professional and ethical standards).

5) accompanying a person at all stages of obtaining knowledge: an applicant - a student - a graduate [Program, 2019: 33].

Taking into account the main functionality of university education, priority is given to teaching, research, sociocultural and educational functions. The mission, culture and priorities of the university determine the formulation and solution of the following tasks:

- selection of a sustainable model of university development;
- improvement of the content of university education;

- positive dynamics of the LUNN rating in the educational system of the Russian Federation;
- improving the quality of education;
- optimization of personnel policy;
- growth in the number of scientific researches;
- strengthening educational work;
- improvement of the material and technical base.

In the last decade, the phrase "improving the quality of education" is used more often than others. Monitoring the quality of education is necessary for educational institutions to preserve the core values and ideals of education for the free search for truth and the disinterested dissemination of knowledge. Education can be considered qualitative if not only students, but also teachers as participants in the educational process have certain achievements.

The components of the education quality system include:

- level of formation of universal, general professional and professional competencies of students in the relevant educational field;
- level of personality development of students;
- level of social adaptation (ability to find one's "niche" in society);
- level of upbringing of students.

The unifying force that makes it possible to talk about the quality of university education has been and remains the interaction of all participants in the educational process: teachers, students, and all university staff, since the collaboration of all representatives of the university community can help achieve those indicated results that could indicate the implementation of the most bold priorities to achieve the lofty goal.

Ensuring the highest quality standards of education is facilitated by the use of unique technologies and methods introduced into the educational process at the university and patented by the Chamber of Commerce and Industry of the Russian Federation:

- technology of personality-oriented education;
- level differentiation technology;
- visualization and gamification technologies;
- system-activity approach technology (problem-based learning);
- project activities;
- health-saving technologies;
- pedagogical design technology (allows to simplify learning procedures and include elements of cooperation and reflection, rapid prototyping technologies, waterfall model and other techniques).

The following samples are recognized as the most effective forms of work to improve the quality of education:

- model of personalized learning track for students;
- formulation of a portfolio of individual achievements of students;
- project activities;
- regular use of EIEI as the most effective form of organizing students' independent work;
- individual work with students to eliminate knowledge gaps;
- small training groups;
- extracurricular activities in full-time format for the purpose of informal personal communication.

As can be seen, the trichotomy of the following aspects plays an important role in the practice of improving the quality of education: components of the quality system - technologies and methods - forms of work. These parameters actually set the coordinate system within which the efficiency should be evaluated. Additionally that in a real practical plane at the present stage, the quality of education includes not only the quality of educational results, namely the acquisition of professional and supraprofessional competencies, but also the price of their achievement (expenditure of effort, time, health, funds) and the conditions of training (organizational and pedagogical, financial and economic, material and technical and a number of others).

Thus, the quality of education in the 21st century higher education is defined as the ratio of the goal, the result and the tools used, showing the qualitative ratio of the results of the educational process and the practical training of future graduates in the totality of the processes of education, upbringing, development and their further professionalization.

All of these parameters are interconnected and mutually complement each other. But to date, the concept of the quality of student learning has been and remains the first and main in assessing the effectiveness of the activities of the entire higher school.

3. CORPORATE CULTURE

In connection with a variety of active processes in modern society, qualitative changes are taking place, and at the moment the academic environment is distinguished by "dual unity and continuous interaction between traditional professorial and modern corporate cultures." The professorial culture "underlies the value dominants", and the corporate culture "serves the market, increasing competitiveness" [Resolution of the X Congress of the Russian Union of Rectors, 2014: 5].

In the corporate culture of the university, the format of the corporate culture of teachers is clearly traced. The most accurate definition of this phenomenon should be recognized as the interpretation of E.V. Kharchenko, "the corporate culture of professionals is understood as a culture formed by specialists in any

field of activity for a long time and transmitted along with specific knowledge" [Kharchenko, 2009: 211].

The corporate culture of a university teacher includes various regulatory elements, namely: ideals, norms, traditions, customs, etc., since they, first of all, form a unique way of social behavior of representatives of a particular subculture. To designate these norms, one can refer to the code of professional ethics of the teacher, adopted at the third international congress of the World Organization of Teachers and Educators [Education International. July 25-29, 2001 in Jomtien (Thailand)]. The duties of a teacher and teacher in relation to the profession and students are defined as follows.

I. Workers in the field of education in relation to the profession:

- justify public trust and society's respect for the teaching profession;
- make efforts to increase the prestige of the profession, providing quality education for all students;
- provide regular updating and development of professional knowledge and skills;
- determine the nature, form and timing of their personal plan for continuing education as an expression of their professionalism;
- publicly use all information related to their competence and qualifications;
- taking an active part in the activities of trade unions, they try to attract more and more highly qualified people to the profession;
- support all efforts to promote democracy and human rights through education.

II. Employees in the field of education in relation to students:

- respect the right of all children to benefit from the points written in the UN Convention on the rights of the child and especially rights relating to education;
- recognize the uniqueness, individuality and specific personal needs of each student, trying to provide support to each for the best disclosure and use of their potential;
- maintain a professional relationship with students;
- protect the interests and welfare of students and make every effort to protect them from violence, from physical or psychological abuse;
- take all possible measures to protect students from sexual abuse and harassment;
- exercise due diligence and maintain confidentiality in all matters affecting the well-being of their students;
- instill in students values consonant with international human rights standards;
- instill in their students the feeling that they are part of a mutually dedicated society, where there is a place for everyone;

- apply their authority with justice and compassion" [Code of professional ethics for teachers [http://www.hm.ee/yandex.php?249159].

The formation of a corporate culture in the academic community of university teachers is a complex social and pedagogical problem. For this period of time, each university has accumulated a large and valuable experience in the formation of the principles of corporate culture. As a result of constant work to improve the principles of corporate culture and the result of quality control of teaching activities, a competency model for a teacher at LUNN was formed, the key points of which are reflected in the following table.

Table 1.

LUNN teacher competency model

№	Table of content
I. Teacher - researcher and developer of new scientific directions	
	Possession of research abilities, manifested in research activities at all stages of scientific work (motivation, goal-setting, planning, actual scientific actions, summing up, reflection)
	Readiness for personal participation in scientific research projects and readiness to include students in research work
	Ability to carry out oral and written scientific communication, to conduct a scientific discussion
II. Lecturer - author and developer of MPAP	
	Professional readiness
	Ability to work with information
	Customer focus
III. Teacher - organizer of the educational process	
	Orientation to the applied nature of knowledge
	Possession of modern educational strategies and tactics
	Ability to apply digital technologies
IV. The teacher is the creator of an innovative and dynamically developing educational environment	
	Focus on the development and improvement of the educational process
	Striving for self-development and self-improvement
	Innovation and creativity
V. The teacher is a partner in effective communication	
	Understanding and respect in interpersonal and cross-cultural aspects
	team building
	Development of professional contacts

This model convincingly shows that the pedagogical conditions that ensure the implementation of the principle of positive corporatism are of undeniable

importance, which leads to ensuring the formation of a corporate culture both among representatives of the teaching staff and the formation of knowledge, skills and abilities necessary from the point of view of the practical activities of future specialists.

The transformation of education and the improvement of the quality of education are the most pressing topics discussed by representatives of all professional communities at all levels: federal, regional, municipal.

The reforms in the field of education, carried out in our country since 1997, have received different vectors of development, including in the direction of ensuring its quality, accessibility and efficiency. Since the transformation of education was associated, first of all, with the renewal of the content of education, the introduction of new federal state educational standards, advanced training of teachers in higher education, the emergence of a professional standard for assessing educational results.

Since the transformation of education is a socio-economic concept, the definition of a mission, the setting of priority tasks and the improvement of the norms and rules of corporate culture, all these key guidelines are a strategic factor in solving state problems in the field of education. The transformation of the higher education system is the most important task in the conditions of a market economy and the demographic transformation of society, and therefore only purposeful and systematic work can give a significant result for the effective solution of the tasks set for an educational organization.

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THE ROLE OF PARENTS IN THE FORMATION OF SELF-ESTEEM OF A CHILD OF SENIOR PRESCHOOL AGE

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Abstract. *The article presents the results of a study of the influence of parents on the formation of self-esteem of a child of senior preschool age. The characteristic of theoretical approaches to the study of self-esteem in preschool children is given. The problems of the influence of family education on the self-assessment of the personality of the child are determined. Recommendations for the formation of an adequate self-esteem of children of senior preschool age are proposed. The purpose of the study is to identify, on the basis of the studied materials, the problems of the formation of children's self-esteem, due to the style of family education. Objectives of the study: to study the works devoted to the self-esteem of children and family education; identify the most significant aspects of the study; to analyze the existing scientific positions, on the basis of which to draw their own conclusions and make proposals for solving the identified problems. The novelty of the study lies in the formation of the author's position on the controversial issues of self-esteem of children and family education, in the proposal of a model of a psychological and pedagogical program for the formation of an adequate self-esteem of children of older preschool age, which can serve as the basis for the development of such programs in preschool institutions.*

Keywords*: self-esteem, preschool children, types of self-esteem, level of self-esteem, adequacy of self-esteem, self-esteem formation, parents, styles of family education, problems of family education, psychological and pedagogical program.*

The relevance of the research topic lies in the fact that the senior preschool age has a special role in the mental development of the child. In this life period, the formation of new psychological mechanisms of activity and behavior takes place. At this age, the foundations of the future personality are laid, there is an awareness of the possibilities of one's actions, i.e. the beginning of the formation of self-esteem. Parents have the most significant influence on the formation of children's

self-esteem, but parents do not always take the right position in raising their children, which can affect the entire future life of the child. Since the formation of self-esteem is important for the success of a person's life, both professionally and personally, and its foundations are laid in childhood, it is necessary to study the existing problematic issues in order to improve activities in this area.

Theoretical approaches to the study of self-esteem in preschool children

In the psychological and pedagogical literature devoted to the study of the issue of self-esteem, different definitions of its concept and factors of its formation and development are given.

Based on the analysis of scientific papers on this topic, it is possible to identify the main approaches in this area:

- the dual nature of self-esteem, since it reflects the ability of a person to form a need to match the level of his own personal assessments, as well as the level of requirements of others for this person (A.N. Leontiev) [10];
- the influence on self-esteem of the values accepted by the personality, which determine the mechanism of self-regulation of its behavior at the internal personal level (S.L. Rubinshtein) [16];
- self-esteem is represented by a personal attitude to one's own value, shown in the attitudes characteristic of the individual (V.A. Slastenin) [19].
- the value of self-esteem for maintaining the stability of the individual, despite changes in the situation (R.S. Nemov) [13];
- the importance of children's awareness of their abilities and inclinations, therefore, it is necessary to be based on their conscious preferences and self-reports (V.G. Kamenskaya) [6].
- the development of self-esteem is associated with the active participation of the individual himself, which shows the originality of the personal inner world (R. Burns, D.Ya. Raigorodsky) [2].
- the manifestation of self-esteem, both positively and negatively, is associated with the individual's conviction of his significance and self-worth (V.G. Kazakov) [5];
- overestimated or underestimated self-esteem leads to various psychological difficulties (R.A. Safaralieva) [18];
- the dependence of the child's self-esteem on the success that he has with his peers, therefore, increasing the success in activities of inactive children helps to radically change their position in the team, normalize relations with other children, and as a result of all this, such children will have increased self-confidence (Z. Z. Magomedova, V. M. Minazova) [11].

There are many works devoted to family education and its influence on the child's self-esteem. When studying such works, the following important aspects were identified:

- the formation of self-esteem depends on the type of parent-child relationship in the family, since here there is an influence on the personality of the child, his behavioral characteristics and character (E.V. Sorokina) [20];

- a solid foundation for the formation of a positive self-esteem of the child is parental love (E.A. Kovalerova) [7];

- inadequate self-esteem of the child is associated with a lack of love on the part of parents, which causes self-doubt, disappointment, selfishness and bad behavior (R.A. Safaralieva) [18];

- any changes and deviations in family relations have a negative impact on the formation of various psychological qualities of the child, including his self-esteem (I. Kh. Ryabova) [17];

In general, among scientists it is already generally recognized that the family is recognized as an important place for the formation of a child's self-esteem. Many authors turn to the problems of family education that affect the self-esteem of the child's personality. However, in the literature on this issue there are different positions, which requires their critical analysis and the formation of their own author's position on the role of parents in shaping the self-esteem of preschool children.

Problems of the influence of family education on the self-esteem of the child's personality

The child evaluates himself/herself in the same way as those around him, and above all, parents evaluate him. It is on the parents that the formation of certain personal values, ideals, standards in the child, which should be equal, depends. If the goals and plans are unrealistic, the standards and requirements are too high, then failure leads to a loss of faith in oneself, the formation of low self-esteem and a negative image of the "I" [4, p. 49].

In determining the various types of self-esteem of older preschool children, three main types are noted: 1) children with positive self-esteem, which is characterized by self-esteem, a positive attitude towards everything that is included in the circle of ideas about oneself; 2) children with negative self-esteem, which finds expression in self-rejection, self-denial, a bad attitude towards their own personality; 3) children with inadequately high self-esteem, who are not inclined to analyze the results of their actions and deeds, are not aware of their failures, are prone to demonstrativeness and dominance [3, p. 322].

Most scientists agree that adequate (positive) self-esteem gives children the opportunity to reveal their abilities, strive for success, while preschoolers with low self-esteem in behavior are most often indecisive, have little initiative, choose simple tasks in advance in order to avoid failures [3; twenty]. As for children with high self-esteem, here scientists express different opinions.

So, for example, T.N. Kochetkova believes that high self-esteem, like adequate self-esteem, is the most favorable for the development of an older preschooler,

since the child feels his importance in the family, while low self-esteem is formed in a situation of emotional detachment, a difficult psychological climate in the family [8, p. 96].

The opposite point of view is also expressed that with an overestimated self-esteem, a child cannot find a common language with peers, because he considers himself superior and better than others. In communicating with adults, such a child also cannot find a compromise, because he believes that everyone around should push their desires to the last plan and take care of his person. Scientists who adhere to this position believe that an egoist grows out of such a child, who will never take into account the opinions of other people, will always act only in his own interests [14, p. 162].

Some authors, in general, being critical of the child's high self-esteem, admit that in practice, when the child receives only negative assessments of his actions, unnecessarily high claims are made against him by adults, then the high self-esteem can perform a protective function [3, p. 323].

After evaluating the various opinions, it should be recognized that both the lack of criticism from the parents and excessive severity, when the comments of the parents are exclusively negative, are harmful to the child. In the first case, the formation of inadequately overestimated, and in the second case, underestimation of self-esteem occurs. In both examples, the child does not develop the ability to analyze, evaluate and control his actions and deeds. That speaks about the importance of forming an adequate positive self-esteem.

Since a child's self-esteem largely depends on the style of family education, it is necessary to characterize the various types of this style and their influence on children's self-esteem. The most commonly used classification is D. Baumrind [1], which includes the following types:

1. Authoritarian style, which is characterized by the presence of constant control by parents over their children. Since in such families children are not given independence in making decisions, they develop low self-esteem.

2. Liberal style, in which the child is given complete freedom of action. Parents provide an opportunity for self-expression of the child, the creative disclosure of his individuality. The disadvantage of this type of education is that the use of soft methods of influence can lead to the formation of inadequate self-esteem, most likely overestimated.

3. Democratic style, in some studies referred to as authoritative style [15, p. 19]. This style of parenting is the most desirable, because it contains love and mutual respect for all family members. Here there is support for the independence and initiative of the child, but at the same time there is a firm consistency and justice in the process of education. This leads to the education in children of responsibility, independence, goodwill, sociability, the formation of adequate self-esteem.

This classification was supplemented by such scientists as E. Maccoby and J. Martin, who singled out another type of family education style - indifferent [9, p. 17]. The introduction of this style of education in the classification should be recognized as appropriate, since it characterizes the most unfavorable behavior of parents, when there is completely no control on the part of parents, parental alienation is manifested in relation to the child, and not love. In families with a similar style of upbringing, the parents mainly meet the primary needs of the child (food, clothing, a roof over their heads). Since parents do not take part in the life of the child, they learn about his/her problems from strangers (teachers, juvenile inspectors).

At the same time, in the course of studying the styles of family education of parents of older preschoolers, this style of family education was not revealed [12, p. 156]. It seems that this does not indicate the absence of this style of education, since its negative consequences will manifest themselves later, to a greater extent in adolescence, although the preschool age will be the beginning of the influence on the personality of the child. The danger of this style of upbringing is that the child develops low self-esteem, excessive emotionality or, conversely, coldness, and prerequisites for antisocial behavior appear.

This classification, based on the works of foreign authors, can be supplemented by another style of family education - overparenting, in which parents are overly focused on their children, they take on a significant part of the responsibility for the experience of their children, in particular, for their successes and failures. Such parents are overprotective of their children and try too hard to make them and their lives better [15, p. 16].

According to foreign studies, the phenomenon of parental involvement is primarily assessed positively due to the favorable impact on the cognitive and psychosocial indicators of a child's development [25, p. 396]. Psychologists emphasize the value of supporting children's learning by parents, but they agree that not all parental involvement has a positive effect on the psychological state of the child.

In recent years, the phenomenon of "overparenting" has been subjected to repeated analysis, while the composition of its characteristics has not been fully defined. Despite the fact that most of the research is devoted to the study of this phenomenon among American parents, we can talk about its global nature. «Overparenting» is a broad term that has analogues in different languages, and differences in terms are due to local cultural characteristics. In English-speaking countries, "helicopter parenting" is most often used to describe the super-inclusive style of parenting. Like helicopters, such parents "hover" over their children, at any moment they are ready to rush to their aid and solve any problem that their child may encounter [15, p. 17].

The study of this phenomenon, conducted by a group of foreign researchers, showed that when parents show increased participation in the lives of children, when using inappropriate and low-adaptive upbringing tactics, the degree of children's autonomy, which is legitimate for a particular age, is not taken into account [24, p. 251]. Most researchers have come to the conclusion that increased inclusion can be beneficial and adaptive in small doses, but in large doses it can be destructive to child development, hence the term "overparenting" (excessive parenting) [21; 22].

Some researchers note that over-inclusive parenting is similar to each of the three styles listed: authoritarian (strict restrictions and rules; lack of autonomy; parents pursue their own goals), authoritative (expression of love and support; pride in the success of children) and liberal (low level of demand , but a sensitive response to the needs of the child (according to the parents) [23, p.14].Despite the fact that the over-included type has common features with each parenting style separately, it still remains a unique phenomenon.

After analyzing the research materials on this style of family upbringing, we can conclude that parents of the over-included type pursue noble goals, try to choose an appropriate upbringing strategy, however, this upbringing style can lead to the formation of inadequate self-esteem of the child, both underestimated and overestimated. It seems that in this case, which of the styles will prevail in over-inclusion parenting will play a decisive role. So, if, despite the excessive involvement in the lives of children, parents nevertheless adhere to a greater extent to the democratic style of upbringing, then the chances of raising a child with adequate self-esteem increase.

Recommendations for the formation of adequate self-esteem of children of senior preschool age

At the present stage, the actual tasks of the activities of teachers, psychologists of preschool institutions include work with parents, which implies a differentiated approach to families of different types.

It should be noted that in real life it is not easy to meet a family that adheres to only one parenting style. Depending on the characteristics of the parents themselves, on the situation, each of the parents applies one or another style of education (for example, a mother uses a democratic style, and a father uses an authoritarian one). Therefore, for a deeper understanding of the issue of the influence of the style of family upbringing on the self-esteem of the child's personality, it is important to consider in detail all the nuances: how relationships develop in the family, who is the leader in the family, how many children are in the family, what methods of punishment and encouragement are used, how much time the family spends together and how productive their communication is, and many others [18, p. 167].

Therefore, the program for correcting the child's inadequate self-esteem should include classes with parents that allow changing the ineffective parenting style. Parents should be recommended literature to improve their psychological and pedagogical literacy.

To solve the identified problems, it is possible to offer a layout of the psychological and pedagogical program «Development of adequate self-esteem of older preschoolers», which will include the following tasks:

- assistance in the process of acquiring by older preschoolers the experience of evaluating the actions and deeds of peers;
- the formation of children's trust in the children's team and a positive attitude towards peers;
- facilitating the use by senior preschoolers of the experience of evaluating the actions and deeds of peers to assess their own actions and deeds;
- creation of psychological and pedagogical conditions conducive to the knowledge of themselves by older preschoolers in various situations;
- creation of situations of success for the formation of self-esteem of older preschoolers with low self-esteem and increase their self-confidence;
- creating situations of objectification of the level of claims of older preschoolers with high self-esteem.

In such a program, it is necessary to include author's games and exercises in order to harmonize the assessment and self-assessment of older preschoolers for a more effective knowledge of the child himself and his abilities. The application of such programs in practice within preschool institutions can have a positive impact on reducing the inappropriately high level of self-esteem, as well as increasing the inadequate low level to an adequate one.

The analysis of scientists' positions on the essence of self-assessment of a child's personality allows us to conclude that most authors note the importance of an individual's assessment of his actions, his behavior, as well as their correlation with the actions and behavior of others. The formation of self-esteem is largely influenced from outside, where a special role belongs to parents.

Among scientists, it is generally recognized that the family is an important place for the formation of a child's self-esteem, however, opposite opinions are expressed on some issues. So, if, when considering positive and low self-esteem, all authors show similar points of view, then there is no consensus on such a type of self-esteem as the overestimated self-esteem of a child. It is concluded that both the lack of criticism from parents and excessive severity are harmful for the child, since in both cases inadequate self-esteem is formed.

The analysis of various styles of family education has shown that it has a significant impact on the child's self-esteem and personality in general. The article paid attention to the super-inclusive style of family education, which was recently studied by foreign scientists. When considering this style of upbringing, it was

concluded that the decisive role here belongs to which of the styles (authoritarian, democratic or liberal) will prevail in super-inclusive parenting. Today, the topic of over-involvement of parents in the lives of children occupies a special place in foreign studies. It can be assumed that there will be an increase in research interest in this topic, both on the part of foreign and Russian scientists. A promising direction may be the study of those aspects that have not yet been sufficiently studied: paternal involvement; the impact of overparenting on young children; comparative analysis of types of parental involvement, taking into account cultural and socio-economic aspects.

To improve the formation of an adequate self-esteem of children of older preschool age, joint activities of parents and employees of preschool institutions are necessary. A psychological and pedagogical program is proposed that can be used by educational psychologists if it is necessary to solve the problem of developing the adequacy of self-esteem of older preschoolers.

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FEATURES OF TEACHING MATHEMATICS AT A TECHNICAL UNIVERSITY AFTER A LONG PERIOD OF ON-LINE TRAINING

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Abstract. *The article deals with the problems that arise when teaching mathematics to junior students at a technical university, due to a long period of distance learning at school. The author, using one of the examples, shows the reason for the misunderstanding of the theoretical material and the way to eliminate the difficulties that have arisen in the development of the section of analytical geometry. The paper gives recommendations that ensure the formation of the skills of educational work among junior students.*

Keywords: *mathematics teaching methodology, mathematical education, learning activities, higher education.*

One of the things that leave the professional training of students in technical specialties is the mastery of the mathematical apparatus, which allows them to solve real practical problems in the future. Obviously, in the initial period, the success of the process of teaching higher mathematics is largely determined by the level of mathematical training that the student received at school. An important distinguishing feature of recent years is that students who have been studying the basics of the mathematical apparatus in a distance format for a significant period of time while studying at school for the past two years have entered the Higher Technical School. This had a negative impact not only on the quality of mathematical knowledge, but also on the formation of general educational skills. Such skills include: planning one's own educational activities (educational and organizational), the ability to work with textbooks, reference books and other sources of information (educational and informational), and skills that ensure the understanding and mastering of educational material (educational and intellectual) [1]. We add that in the analysis of the results of the final certification in 2022, the Federal Institute of Pedagogical Measurements also draws attention to the fact that a significant part of those who passed the profile exam in mathematics are poorly trained in mathematical speech, and one of the likely reasons for this situation is the

practice of conducting exclusively written work or excessive use of short answer tests, etc. [2].

The practice and analysis of conducting classes allow us to briefly characterize the learning situation in one of the streams of first-year students (119 people) as follows. During contact work in the first semester, in the amount of two hours of practice per week and one hour of lectures (two hours per two weeks): 36% of students (43 people) have poor mathematical training, most of them 81% (39 people) did not show signs general educational skills to organize their own educational work on the development of new mathematical concepts; 29% of students have satisfactory mathematical training corresponding to the basic level [2]), of which about 63% (22 people) do not have sufficient knowledge of the skills of educational work; 28% (33 people) of students have a satisfactory mathematical background, close to high, but at the same time 36% of them (12 people) also lack the skills of educational work. Approximately 4% of students (9 people) were not included in the express analysis due to lack of data. In total, the total number of students who did not show sufficient ability to organize their educational work was about 60% (71 people). The main criterion, on the basis of which the corresponding conclusions were made about the formation of general educational skills, is the systematic performance of educational tasks, the work to correct mistakes made, the systematic work with educational literature in the classroom. In addition, the performance of additional tasks in contact work with the teacher was taken into account. It should be noted that the acuteness of the problem of the formation of educational skills is highlighted in many works that consider the features of the implementation of distance learning [3, 4, 5].

Thus, we can single out two important areas on which it is necessary to focus the work of the teacher in organizing the educational and cognitive activities of students during the transition from a long period of distance learning. Firstly, this is the adaptation of the methods of introducing a new conceptual mathematical apparatus to the situation due to the poor mathematical preparation of a large number of undergraduate students. At the same time, it is necessary that new concepts be stated in a scientific language, using fairly clear scientific definitions. Secondly, the organization of classes in such a way that, in the process of implementing educational tasks, it contributes to the formation of students' general learning skills (Figure 1.).

Practice shows that one of the most effective methods for introducing mathematical concepts and patterns is the actualization of practical experience, existing mathematical knowledge or the use of explanatory examples as a justification for the theoretical positions being studied [6].

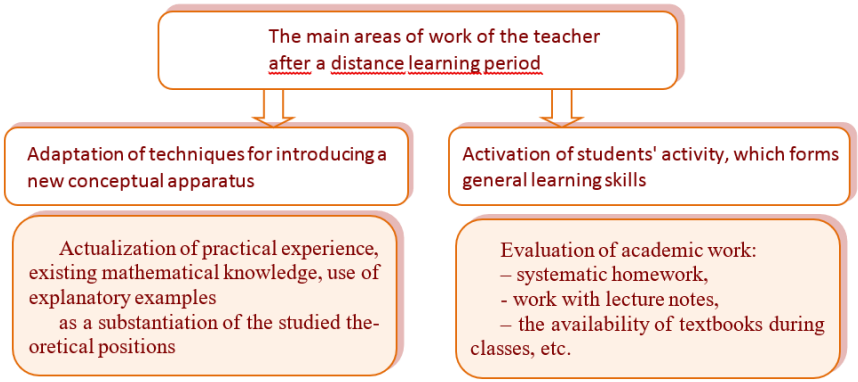


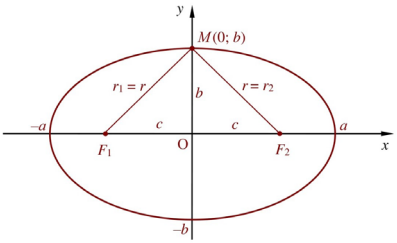
Figure 1. *Scheme of the main areas of work of the teacher with students after the transition from distance learning to contact work*

Let us give an explanatory example from the section «Analytical geometry», which allows us to justify the theoretical relation for one of the second-order lines.

It is known that in the canonical equation of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, the parameters a and b are the lengths of the major and minor semiaxes. At the same time, the value of b in the educational literature is usually introduced formally - when deriving the canonical equation, the resulting relation $a^2 - c^2$ is simply denoted as $b^2 = a^2 - c^2$ to simplify the notation [7].

The problem is that many students do not understand why the formally introduced parameter is equal to the length of the minor semiaxis of the ellipse. As a result, students cannot remember this ratio correctly, and when solving problems they show uncertainty and doubts about the correctness of its use. Therefore, it is important to show students that this expression is a consequence of the line construction rule.

Consider one of the options for justifying the relation $b2 = a2 - c2$ for an ellipse using a standard drawing.



Since the main relation for constructing an ellipse is the sum of focal lengths $r_1 + r_2 = 2a$, where a is the length of the major semi-axis of the ellipse, is valid for any points of the line, then we can take a special case for the current point M, located on the minor semi-axis of the ellipse and having coordinates M (0; b). Then for convenience we denote $r_1 = r_2 = r$, hence $r_1 + r_2 = 2r = 2a$, whence it follows that $r_1 = r_2 = r = a$. For one of the right triangles, for example ΔF_2OM, $r2 = c^2 + b^2$, where c is the focal length, or $a^2 = c^2 + b^2$. Whence follows the relation $b^2 = a^2 – c^2$.

Thus, students are convinced that the formally introduced parameter b is equal to the length of the minor semiaxis of the ellipse. In this case, one does not have to violate the strictness of algebraic and geometric laws.

It is important to note that the use of such techniques becomes systematically necessary and should not be episodic, which requires the teacher to have extensive experience, a high level of mathematical culture, as well as fairly thorough preparatory work for lectures.

The second direction in the organization of educational work, associated with the formation and development of general educational skills among junior students, unfortunately, at the initial stage, is far from the interaction of the teacher and students as two subjects of the educational process. The fact is that the basis for the formation of the skills of systematic educational work is a personal attitude to the acquisition of knowledge. In the presence of such an attitude, the teacher basically supports the student's activities, if necessary, helps to solve emerging issues. However, with the distance learning, a significant problem is the lack of formation of the ability to organize one's own independent work to master the new material being studied [8, 9]. The consequence of this is an incorrect subjective perception and own assessment of current educational problems. For example, junior students often do not consider it necessary to repeat previously studied material, even school material. In the event of unsatisfactory grades, students can repeatedly try to "randomly" correct them, without making efforts to master the problematic material. After receiving a satisfactory mark, the activity of educational work often decreases sharply, since students have an erroneous judgment about the qualitative assimilation of the material.

One of the ways to change this situation is to introduce additional evaluation of academic work at the initial stage of studying higher mathematics. These can be assessments: homework, work with lecture notes, availability of textbooks during class, and so on.

Unfortunately, we have to state the fact that the number of hours of contact joint work of the subjects of the educational process - the teacher and students, is critically small for reasons beyond their control. Obviously, this has a negative effect on prepared students. This is especially evident in the second year of study,

and sometimes even in the second semester, when the number of classroom hours decreases sharply and this leads to an increase in the time interval between previously mastered knowledge and knowledge being studied at the moment. Here it is no longer possible to exclude the factor of forgetting the mastered conceptual apparatus.

findings

1. The distance learning format is not a full-fledged analogue of educational and cognitive activity for students and does not contribute to the qualitative formation of general educational skills among students.

2. The course of study in higher mathematics is the longest in time and the corresponding long-term absence of direct interaction with the teacher has deeper negative consequences not only on the development of basic mathematical concepts, but also on the formation of general educational activities, compared with disciplines that are studied during one or two semesters.

3. To successfully correct the negative consequences of a long stage of distance learning in mathematics, much more time of contact collaboration with the teacher is needed.

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FEATURES OF THE RHYTHMIC STRUCTURE OF TRACK AND FIELD RUNNING IN A SPRINT

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Abstract. *Through the use of synchronized biomechanical techniques (video motion capture and electromyography), the analysis of the kinematic and physiological characteristics of the high-intensity running technique performed by a qualified sprinter was carried out. The specification of the durations of the phases of the running step and the indicators of the electrical activity of the main muscle groups made it possible to identify the features of the rhythmic structure of running and intermuscular coordination. In the process of correlation analysis, a conclusion was made about the possibility of increasing the effectiveness of sprinting based on improving its rhythmic structure.*

Keywords: *running technique in a straight line, rhythmic structure, symmetry of movements, electrical activity of muscles, intermuscular coordination, efficiency.*

Introduction

At the present stage of the development of athletics, the high achievements of athletes are based on the integration of science and pedagogical practice. The significance of biomechanical studies of movements is especially high in the types of athletics, which place high demands not only on the development of physical qualities, but also on the demonstration of effective technique, in particular, in sprinting. In this regard, the formation of the optimal technique of running at

various distances among athletes is impossible without a deep understanding of the specifics of the manifestation of its tempo, rhythm, spatial, temporal and spatio-temporal characteristics.

Based on the analysis of the literature, an increase in the effectiveness of running is achieved in the process of improving the motor rhythm of the technique, which is formed in various physical exercises and must be consciously regulated by the athlete in the process of running, in accordance with the set motor task [1,2,3,4]. Therefore, only the concretization of the rhythmic structure of the technique allows us to design a model of a system of rational movements and determine the conditions for achieving sportsmanship in track and field athletics.

Taking into account that the main way to specify the running rhythm over a distance is to divide it into simpler elements, as well as the leading phases of the running cycle, it was assumed that in the process of biomechanical analysis, conditions that limit the growth of an athlete's result can be determined.

Thus, the purpose of the study was formulated: on the basis of taking into account the objective characteristics of the athlete's running technique, to specify the features of the rhythmic structure of the effective running in a straight line.

Research objectives: 1) to determine the features of the rhythmic structure of the running step of a qualified athlete; 2) to identify the specifics of the influence of muscle reciprocity on the rhythm of the running step.

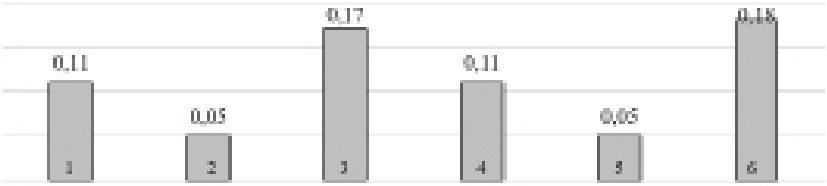
Research methodology

The program of the laboratory experiment involved the analysis of the running of a qualified sprinter on a treadmill (Cosmos Venus, Germany) with the registration of the kinematic characteristics of lower limb movements using the Qualisys 3D video motion capture system (Sweden). Reflective markers were attached skin to anthropometric points of the body, coinciding with the axes of movement in the shoulder, hip, knee and ankle joints. The video motion capture system was synchronized with surface electromyography, which makes it possible to record the bioelectrical activity of the main muscle groups using a ME-6000 16-channel electroneuromyograph (Finland). The obtained data were processed using the MegaWin program [2]. The biomechanical analysis of the technique assumed the division of the running cycle into 2 steps, each of which included: the phase of putting the foot on the support and depreciation; the phase of active repulsion by the foot; flight phase.

Results of the study and their discussion

The biomechanical analysis of the running kinematics of a qualified athlete made it possible to establish that the durations of the phases of the running steps of the left and right legs, characterizing the rhythmic structure of the full cycle of movements, do not have significant differences ($p>0.05$) and are low-variable (9.6%-15.4%), which indicates the stability of the high-speed running technique (Figure 1).

The total indicators of the duration of the phases of setting the foot and repulsion were lower than the unsupported phase. Moreover, the higher the running speed, the greater the difference in the duration of the support and unsupported positions.



Note. Phases of the running step cycle: 1 - setting the left leg on the support and depreciation; 2 - repulsion with the left foot; 3 - flight; 4 - setting the right leg on a support and depreciation; 5 - repulsion with the right foot; 6 - flight.

Figure 1. *The duration of the phases of the running steps of a qualified athlete in a sprint in a straight line (N=12; s)*

Automation of the running technique of a qualified athlete was confirmed by the analysis of the asymmetry of movements in the joints of the right and left sides of the body (Table 1).

Table 1

The degree of manifestation of asymmetry of movements in the joints of the body of a qualified athlete in sprinting (%; N=12)

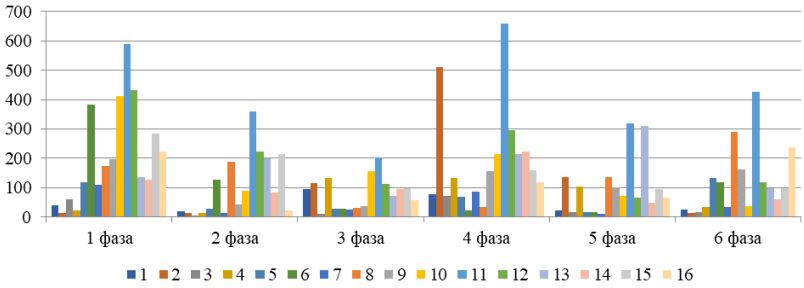
leg	Phases	Interlink angles in the joints				
		brachial	cubital	hip	genual	talocrural
free	1;4	0%	4%	2%	6%	5%
	2;5	0%	13%	4%	7%	6%
	3;6	0%	13%	4%	1%	4%
support	1;4	0%	21%	6%	0%	4%
	2;5	0%	18%	2%	0%	7%
	3;6	1%	15%	3%	0%	3%

Note. Phases of the running step cycle: 1 - setting the left leg on the support and depreciation; 2 - repulsion with the left foot; 3 - flight; 4 - setting the right leg on a support and depreciation; 5 - repulsion with the right foot; 6 - flight.

Thus, it was found that in running in a straight line at high speed, performed by a qualified athlete, there were no differences in the indices of interlink angles in the phases of the cycle of movements ($p>0.05$). That is, the equivalence of the amplitudes in the joints of the right and left sides of the body and the maximum straightness of movements by the free links of the body minimized the deviations of the CCGB from the main trajectory of the athlete's movement, creating conditions

for the cyclicity of the rhythmic structure, the stability of performing movements and maintaining the pace of running [3].

In the process of analyzing the results of electromyography, it was found that in each phase of the running step, the muscles are activated differently. However, all phases were characterized by a general trend: the task of placing the foot on the support and repulsion is provided by the same muscles, the degree of activation of which depends on the motor tasks being solved [4] (Figure 2).



Note. Muscles: 1- anterior tibial rec., 2-calf medial rec., 3- straight thigh rec., 4-biceps femur rec., 5-anterior tibial left, 6-calf medial left, 7-straight thigh left., 8-two-headed thighs left., 9-deltoid rec., 10-deltoid left., 11-straightening spine rec., 12-straightening spine left., 13-straight abdomen rec., 14-gluteal rec., 15-straight belly left., 16-gluteal left.

Figure 2. *Electrical activity of the muscles of a qualified athlete running in a straight line with high intensity (N=12; μV)*

It has been established that the greatest activity is characteristic of the first and fourth phases of running steps performed from the left and right legs. The effectiveness of foot placement was ensured by the work of the gastrocnemius medial muscle, the deltoid muscle of the shoulder of the opposite arm, which straightens the spine, the rectus abdominis muscle, and the gluteal muscle. However, when setting both the right and left legs, the amplitude of the turns of the electrical activity of the right spinal erector muscle is expressed. This confirms the presence of asymmetry in the control of motor actions and the need for additional muscle activation during a running step to maintain speed.

To reveal the dependence of the duration of the phases of the running step, which determines the rhythmic structure of running, on the electrical activity of the muscles (the average amplitude of the turns), a correlation analysis was performed. It followed from the analysis that the increase and maintenance of the running pace was provided by adequate muscle activation (Table 2). It has been established that the duration of the phases of the running step is largely due to the activation of muscles in the 2nd and 5th phases of the cycle (43.8% and 37.5% of the main muscles, respectively), that is, in repulsion [4].

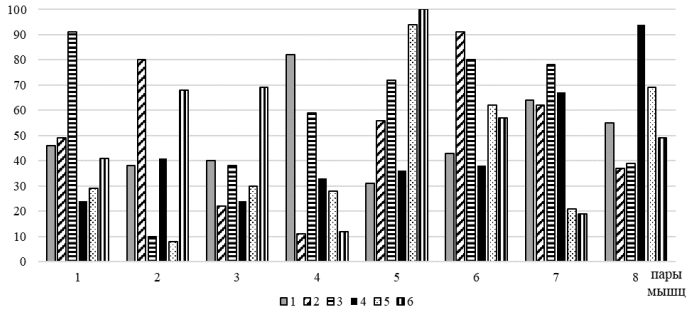
Table 2

Influence of the electrical activity of the muscles on the duration of the phases of the running step of a qualified athlete (r; N=12)

phase	Muscles															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	0,5	-0,1	-0,4	0,4	-0,3	-0,3	-0,4	-0,3	-0,3	0,1	0,3	-0,2	0,1	-0,2	0,1	-0,6
2	0,1	0,6	0,1	0,2	0,1	0,5	0,1	0,7	-0,6	-0,5	-0,1	-0,7	-0,1	-0,5	-0,1	-0,1
3	0,2	-0,6	0,1	-0,5	-0,3	0,1	-0,6	0,3	-0,2	-0,5	-0,1	-0,1	-0,3	0,1	-0,3	-0,4
4	-0,4	-0,2	-0,4	-0,2	-0,1	-0,1	0,1	0,6	0,2	0,2	-0,3	-0,6	0,1	0,1	-0,1	-0,6
5	0,1	0,8	-0,5	0,4	-0,3	-0,8	0,4	-0,5	0,3	0,3	0,2	0,2	-0,6	-0,1	0,1	-0,8
6	-0,7	0,1	-0,6	0,1	-0,2	-0,6	-0,4	-0,6	0,4	-0,1	-0,1	0,3	0,7	0,1	0,1	0,1

Note. Muscles: 1- anterior tibial rec., 2-calf medial rec., 3- straight thigh rec., 4-biceps femur rec., 5-anterior tibial left, 6-calf medial left, 7-straight thigh left., 8-two-headed thighs left., 9-deltoid rec., 10-deltoid left., 11-straightening spine rec., 12-straightening spine left., 13-straight abdomen rec., 14-gluteal rec., 15-straight belly left., 16-gluteal left.

Given that the most accurate and independent indicator for assessing intermuscular coordination of technical actions is muscle reciprocity, which characterizes the consistency of their work in the "agonist-antagonist" system, the calculation and analysis of these indicators for the main pairs of sprinter muscles was carried out (Figure 3).



Note. Phases of the running step cycle: 1 - setting the left leg on the support and depreciation; 2 - repulsion with the left foot; 3 - flight; 4 - setting the right leg on a support and depreciation; 5 - repulsion with the right foot; 6 - flight.

Pairs of muscles: 1 - anterior tibial rec. - calf medial rec.; 2 - straight thighs rec.. - bicipital thigh rec.; 3 - anterior tibial left - gastrocnemius medial left; 4 - straight thigh lion. - bicipital thigh left; 5 - straightening the spine, etc. - straight abdomen, etc.; 6 - straightening the spine left - straight abdomen left .; 7 - straight abdominal rec. - gluteal rec.; 8 - straight abdominal left. - gluteal left.

Figure 3. *Reciprocity of the muscles of a qualified athlete when running in a straight line with high intensity (%)*

It was established that, depending on the motor tasks of the phases of the running step, muscle reciprocity was different: high reciprocity provided fixation of the body links and rigidity of the biomechanical system, and low reciprocity ensured rapid repulsion and movement of the links and the body of the athlete as a whole. So, before contact with the support, the reciprocity of the pair of muscles "left anterior tibial - left gastrocnemius medial" was significantly higher (69%) than when it was set up (44%), which provided cushioning, and the pair of muscles "left rectus femoris - left biceps femoris" when in contact with the support, it corresponded to 82%, characterizing the rigidity of the biomechanical system necessary for a short repulsion. At the same time, the established inverse correlation relationships of the analyzed characteristics testified to the dependence of the reduction in the duration of the setting phase and repulsion by the left leg with an increase in the reciprocity of the muscles of the right leg. And, conversely, a decrease in the reciprocity of the muscles of the right side of the body indicated the importance of amplitude movements in the running step from the left leg. That is, during the entire cycle of the running step, the duration of the phases was provided by the intermuscular coordination of the athlete, and the timely activation and relaxation of the muscles created conditions for the effective solution of motor tasks, taking into account the movement structure and achieving high running speed.

Conclusion

Based on the data obtained, it was concluded that the improvement of the rhythmic structure of sprinting determines its effectiveness and is inextricably linked with the optimization of the dynamic characteristics of running, due to intermuscular coordination, including the reciprocity of the main muscle groups that ensure the implementation of motor programs of the phases of the running step.

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ON THE NORMATIVE ASSESSMENT OF THE LEVEL OF PHYSICAL FITNESS OF STUDENTS OF MEDICAL UNIVERSITIES OF THE RUSSIAN FAR EAST

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Abstract. *The article presents the results of the tests of the RLD complex for first-year students of medical universities of the Far Eastern Federal District. In the course of data processing (arithmetic mean of test indicators), it was revealed that first-year students of some medical universities of the district do not cope with the standards requiring the manifestation of general and strength endurance, speed and "explosive strength". The average values for the region indicate that students cope with tests at the level of silver and bronze signs of the RLD.*

The purpose of the study is to analyze the results of the test tests of the All-Russian physical culture and sports complex "Ready for Labor and Defense" of medical students of the Far Eastern Federal District, to assess the level of general physical fitness and to outline promising directions for solving this problem.

Keywords: *medical universities, students, test standards, physical fitness.*

INTRODUCTION

The life and study of modern students is becoming more intense every year, requiring the rational use of time and effort. In recent years, there has been a steady downward trend in the health of students. This is connected, first of all, with the

problems of moral, spiritual education, the negative attitude of young people to physical culture [4, 8]. There is no doubt that periods of restriction (self-isolation) caused by a new coronavirus infection (COVID-19) also had a negative impact on the level of physical and mental health of students [7, 17, 20]. And "information addiction" had a negative impact on young people, primarily on the formation of their moral qualities, upbringing and worldview in general. Moreover, their ideological orientations and life purposes have not been transformed for the better, primarily at the mental level [9].

The students of medical universities in Russia did not remain aloof from the aforementioned problem. In the process of many years of study at a university, medical students often face physical and mental stresses that require them to have a high level of voluntary attention, physical endurance and psycho-emotional stability (endurance, patience, will). It is well known that 30% of applicants entering the medical universities of the country have various deviations from the side of health, which worsens with subsequent training. By the time of graduation from the university, the majority of students have a low level of physical development and physical fitness, 20% have 2-3 chronic diseases [4-6, 11]. Moreover, in the scientific works of P.V. Glybochko et al. (2017) found that the actual prevalence of functional deviations in first-year students is 2 times higher than the official statistics. The number of pupils and students assigned to a special medical group for health reasons is increasing, in some universities it reaches more than 40%. One of the main risk factors for the development of diseases is the low physical activity of young people. Hypodynamia is noted in 36% of students and 70.9% of students who occasionally go in for physical education and sports [12].

In the scientific works of V.B. Mandrikova (2002), S.A. Moiseenko (2006), E.N. Selyuzhitskaya (2008), A.V. Baklykova (2010), P.V. Borodina with co-authors (2014, 2017, 2020, 2021, 2022), V.O. Aristakesyan et al. (2015), R.M. Berdieva et al. (2017), A.V. Dorontseva et al. (2017), Kaerova et al. (2019), A.A. Svetlichina et al. (2020) and N.N. Tsareva (2020) notes that the majority of first-year medical students in Russia often fail to pass control standards (tests). As the authors of the studies note, the low level of physical fitness and motivation for active physical culture and sports of students is the main reason for the above problem [1-11, 13-16, 18, 19, 21, 22].

Among students, there is an opinion that while studying at a medical university, there is no free time. We believe that this is their erroneous, subjective opinion. We believe that students simply cannot correctly distribute their day and rest regimen, and spend all their free time from study, being in the "open spaces of the information environment". Most students lack elementary knowledge in the field of physical culture and sports and the importance of active motor activity in their life. As future doctors, they must be on guard of health, they must promote

a healthy lifestyle through physical education and sports, hardening, balanced nutrition, etc. But for this they, first of all, must start with themselves.

Under these conditions, physical education can become one of the means of increasing mental and physical performance. Therefore, the purpose of physical education in universities is to promote the comprehensive development of the individual, the training of highly qualified specialists. Modern students represent the main labor and population potential of our state, on the "quality" of which the future depends, both for an individual and for the country as a whole. At present, the educated and intellectual population of the country is increasingly classified as national wealth, and physical, psychological and spiritual health is becoming the main factor in the progress of the state [4, 8].

There are many examples of outstanding athletes who, while studying at a medical school, became outstanding athletes. Here are some examples of domestic medical athletes. Maria Timofeevna Shubina, graduated from the Kazan Medical Institute, Olympic champion in 1960 in kayaking; Natalya Alexandrovna Pechenkina-Chistyakova (Burda), graduated from the Saratov Medical Institute, bronze medalist of the 1968 Olympic Games in athletics in the 400 m run; Vasily Alexandrovich Mosin, graduated from Kazan Medical University, bronze medalist of the 2012 Olympic Games in shooting; Ali Zurkarnaevich Aliev, graduated from the Dagestan Medical Institute, five-time world champion in freestyle wrestling (1959, 1961, 1962, 1966, 1967), participant in three Olympiads (1960, 1964, 1968); Lyudmila Nikolaevna Porubaiko, graduated from the Kuban Medical Institute, silver medalist of the European Cup (1973) and the World Summer Universiade (1973), participant in the 1972 Olympic Games. The above names are evidence that while studying at a medical university, you can safely combine studies with sports. And how many ordinary amateur athletes who successfully graduated from medical school? We are convinced that there are enough of them. The foregoing tells us that physical education and sports in no way harm the learning process at a medical university.

Further, the authors of the article analyzed the results of the test tests of the all-Russian physical culture and sports complex "Ready for Labor and Defense" of first-year students of medical universities of the Far Eastern Federal District, assessed the level of general physical fitness and outlined promising directions for solving this problem.

METHODOLOGY

In the period from September 19 to October 29, 2022, first-year male and female students of medical universities of the Far Eastern Federal District were tested. The study involved 853 students (366 boys and 487 girls) from the following universities in the region, which are under the jurisdiction of the Ministry of Health of the Russian Federation: Pacific and Far Eastern State Medical

Universities (TSMU Vladivostok and Far Eastern State Medical University Khabarovsk, respectively), Amur and Chita State Medical Academies (ASMA in Blagoveshchensk and CSMA in Chita, respectively). The average age of boys was 19.6 years, girls - 18.4 years.

To identify the level of general physical fitness of students, the method of pedagogical testing was used. All test tests were carried out in accordance with the methodological recommendations of the complex of the All-Russian physical culture and sports complex "Ready for Labor and Defense" for the organization and implementation of tests. Testing was carried out according to the following tests: long jump from a place, lifting the torso forward from a supine position for 1 minute, running 100 meters, angle body. In addition to the above tests, the young men also performed pull-ups on the bar and a 3000-meter run, the girls performed the bend and unbending of the arms in a lying position and a 2000-meter run. To analyze the results of performing test tests by students of medical universities in the Far East region, the arithmetic mean value ($\overline{X}$) was calculated. Further, $\overline{X}$ test indicators were compared between the universities of the region and in general with the standards of the VI stage of the RLD.

RESULTS OF THE STUDY

In the course of processing these test indicators, it was revealed that the best results among young men look like students of the Medical University of Vladivostok. Thus, the students performed the forward torso lift from the supine position 48 times on average, ran 100 m with a result of 11.9 s. and angle body from a standing position, students of this university showed 14.2 cm. Comparing with the data of the standards of the VI level of the RLD, we can state that students in these tests showed a result equal to the gold mark. Tests that determine explosive strength (long jump from a place) and strength endurance (pull-ups on the crossbar) for freshmen of TSMU were awarded silver and bronze badges, respectively. Only the test for general endurance (running 3000 m) students of the Pacific State Medical University failed. The first-year students of the Far Eastern State Medical University coped with all the tests, passing for silver and bronze badges. So, in the standards, lifting the torso forward from a supine position (42 times), running 100 and 3000 m (13.5 s and 13.13 min., s., respectively) and angle body forward from a standing position (9.0 cm) passed to the silver signs, and in the tests pull-ups on the crossbar (11.5 times) and long jump from a place (223.5 cm) - to the bronze signs. Students of the Amur State Medical Academy passed the RLD gold badge only in the flexibility test (15.6 cm), while lifting the torso, running 100 m and running 3000 m, long jump from a place to silver and bronze badges, respectively. The AGMA youths failed only in the strength endurance test. The students of the Chita Medical Academy were only able to lift the torso to the front from the supine position (41.7 times), the flexibility test (11.7 cm) and

the standing long jump (219.4 cm), which are equal to the results of gold, silver and bronze badges, respectively (Table 1).

Comparing the overall results of the test standards of four medical universities in the Far East, we can say that, in general, students coped mainly with the silver signs of the RLD. The students passed tests for strength and general endurance for bronze badges.

Table 1

The final indicators of physical fitness of first-year students of medical universities of the FEFD

Universities	Types of tests					
	Pull-ups on the crossbar, (number of times)	**Lifting the torso forward from a supine position, (number of times in 1 min.)**	**Run 100 m, (s.)**	**Run 3000 m, (min., s.)**	**Angle body from a standing position, (cm)**	**Standing long jump (cm)**
TSMU (Vladivostok), n=87	12,2	48,0	11,9	14,50	14,2	236,0
FESMU (Khabarovsk), n=88	11,5	42,0	13,5	13,13	9,0	223,5
ASMA (Blagoveshchensk), n=92	9,2	40,8	14,1	13,44	15,6	221,5
CSMA (Chita), n=99	8,8	41,7	15,1	15,16	11,7	219,4
M according to the Far Eastern Federal District, ∑n	10,4	43,1	13,6	14,05	12,6	225,1
Regulatory tests ALPSC RLD VI level (from 18 to 24 years old)						
gold badge	15	48	13,1	12,00	+13	240
silver badge	12	37	14,1	13,40	+8	225
bronze badge	10	33	14,4	14,30	+6	210

Among the girls, students of the Far Eastern State Medical University coped with all the test standards. The girls showed the best result in the speed test (100 m), which was equal to 15.6 s, which is equal to the golden sign of the RLD. In tests for flexibility (15.6 cm), general (12.09 min., sec.) and strength endurance (14.3 times), in lifting the body forward from a supine position (36.1 times), the freshmen of the FESMU passed to "silver". Only in the test for "explosive" strength (178.6 cm) did the students of a medical university in Khabarovsk pass for a bronze badge. The girls of the Amur State Medical Academy failed the long

jump from a place (152.5 cm), and with the rest of the tests they coped with the silver and bronze badges of the RLD. Thus, the 2000-meter run (11.58 min., sec.) and angle body (12.5 cm) of the students of the indicated university passed the "silver", and the bend and unbend of the arms in the lying position (11.5 times), lifting the torso forward from the supine position (34.2 times) and 100 m run (17.5 s.) - to the "bronze". Students of medical universities from Vladivostok and Chita did not cope with tests for strength endurance, speed and general endurance. Moreover, the girls of the Chita State Medical Academy also failed the "explosive strength" test. With the remaining tests (long jump from a place and lifting the body forward from a supine position), the representatives of the weaker sex of TSMU and CSMA coped with gold, silver and bronze RLD badges. The students of the Vladivostok medical university also passed the flexibility test for a silver badge (Table 2).

Table 2

The final indicators of physical fitness of first-year female students of medical universities of the FEFD

Universities	**Types of tests**					
	Bend and unbend of the arms in plank position, (number of times)	**Lifting the torso forward from a supine position, (number of times in 1 min.)**	**Run 100 m, (s.)**	**Run 2000 m, (min., s.)**	**Torso tilt forward from a standing position, (cm)**	**Standing long jump (cm)**
TSMU (Vladivostok), n=103	8,0	34,0	17,9	13,25	22,0	181,0
FESMU (Khabarovsk), n=147	14,3	36,1	15,6	12,09	15,6	178,6
ASMA (Blagoveshchensk), n=112	11,5	34,2	17,5	11,58	12,5	152,5
CSMA (Chita), n=125	8,2	33,0	18,8	14,38	12,4	160,0
M according to the Far Eastern Federal District, ∑n=487	10,5	34,3	17,4	12,82	12,5	168,0
Regulatory tests ALPSC RLD VI level (from 18 to 24 years old)						
gold badge	17	43	16,4	10,50	+16	195
silver badge	12	35	17,4	12,30	+11	180
bronze badge	10	32	17,8	13,10	+8	170

The average values of four medical universities in the region indicate to us that the girls passed mainly on the bronze badges of the RLD. So, in tests for strength and general endurance and lifting the body from a supine position, they passed the bronze medal, and in tests for speed and flexibility - silver. Only the test for "explosive strength" of the students could not achieve the desired result.

CONCLUSION

The analysis of physical readiness of first-year students of medical universities of the Far East showed that in some tests students of certain universities do not cope with the standards. So among boys, students of TSMU did not cope with the standard in the 3000 m run, students of the ASMA - in pull-ups, and first-year students of the CSMA - in the run for 100 and 3000 m. Among the girls, students of TSMU and CSMA did not cope in tests for speed, strength and general endurance, and ASMA freshmen - in the flexibility test. Students of the Far Eastern State Medical University were able to pass all the tests for various RLD badges, both among girls and among boys. In general, in the region, students pass control standards only for silver and bronze RLD badges, with the exception of the standing long jump test standard for girls.

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UDC 37

SELF-EDUCATION OF STUDENTS IN EDUCATIONAL ACTIVITIES

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Abstract. *In various fields of activity, under the influence of the processes of globalization, mediatization, integration, changes are taking place in the field of education. This article analyzes educational processes through self-education of students, raises the problems of self-education as a type of educational activity, as a direction of self-education and purposeful cognitive activity. If someone wants to achieve professional success, he tries to develop the habit of self-education. We touch upon the main issues of organizing self-education and the factors for achieving success as a productive advantage in educational activities.*

Keywords: *educational activities, educational environment, students, development, self-education, self-education, students, digital transformation and technology.*

The processes of globalization have contributed to the reform of education, the emergence of various innovative teaching methods, the creation of networks and digital systems. In the context of the rapid development of information and communication technologies, electronics and the introduction of digital environments and resources, there have been gigantic changes in the global education system. Close attention of scientists began to be paid to the self-education of people, not only because an understanding of the need for education "throughout life" appeared in society, but also because the mass media (media), open and accessible resources should be subjected to selection of the quality of the knowledge received by students. People learn, learn on their own – "everything, everywhere and from time to time." A large number of talented young people are being nurtured and brought up. And this is an important task facing humanity. After all, self-education is a typical way of integrating education into the system

of universal knowledge, where development is embedded in present and future innovations. Therefore, the huge potential of self-education is understood and realized both in the management of education and in educational institutions.

Self-education is the most important type of active educational activity of people. It exists as a form of education. In a large thematic dictionary on education and pedagogy by prof. V.M. Polonsky, it means that self-education is "a form of obtaining a general secondary education independently, through systematic and purposeful assimilation of the material necessary for study and work <…>" [9, p. 178]. This is consistent with the fact that "general education in accordance with Articles 17 and 63 of the Federal Law of the Russian Federation of December 29, 2012 N 273-FZ "On Education in the Russian Federation" can be obtained outside educational organizations in the form of family education and self-education: primary general and basic general education – in the form of family education, secondary general education – in the form of self-education" [12]. Or self-education is a necessary, constant component of the life of a cultured, enlightened person, an occupation that always accompanies him [1]. In modern pedagogical literature, self-education is interpreted "... as a personally and professionally significant process of purposeful activity of an individual for continuous self-change, conscious control of one's development, choice of goals, ways and means of self-improvement, contributing to the understanding of one's own independent activity, which is a means of self-knowledge and self-improvement" [10].

For us, in our context, self-education is something that is acquired, studied by a person that is necessary for him/her from his/her point of view of knowledge, skills and abilities through constant independent studies outside of any educational institution and without the help / or with the help of teachers and teachers. It should be noted that the presence of a teacher in self-education is quite acceptable. The main thing here is that the person himself wants to learn something, to master something, to learn something through something or someone. And how he will do it, with the help of what or whom – it becomes not so important. From ancient times, a person engaged in self-education was called self-taught, i.e. one who gains knowledge from the independent study of individual subjects of science and reading books. According to V.A. Sukhomlinsky reading books is not only a source of knowledge for the student, but also the most important means of shaping his personality, which should become a need and a habit. Self-education is, first of all, self-education and purposeful work to expand and deepen one's knowledge, acquire new skills, and move towards self-improvement. And it is impossible to make education educative if self-education does not gain the necessary weight in the life of a child. "Without self-education, without tension of mental and volitional forces, without cognition and self-knowledge, education and training cannot become educative" [2, p.159].

It should be noted that self-education of modern schoolchildren and students

is two subjective: the student takes the role of both the object of education and the subject of the educational process. Students set themselves learning objectives in accordance with certain external standards, independently performing educational activities and thereby comprehensively improve the quality of their education. Scientists argue that self-education contributes to the support and development of the most important mental processes, such as attention, memory, and "an individual style of mental work is developed in a person" [6]. In this connection, critical and analytical thinking is being improved, which is a necessary condition for a successful increase in the level of personal qualifications.

With the intensive development of modern society, the self-awareness of students is also growing, students are becoming aware of the urgent need for self-education. However, the existing three main problems remain unresolved: – lack of understanding of the importance of self-education; – insufficient ability to self-education; – insufficiently comfortable educational environment for self-education. Here it should be noted that the significance of the effectiveness of self-education is not widespread enough among students, but constant work on improving oneself should become a need for every student.

V.A. Sukhomlinsky once remarked that "self-education is self-education for the development and improvement of oneself." After all, this is an individual education in order to adapt to the needs of the social experience of survival and self-development, the ability to stimulate, promote, regulate, manage, support and transform various types of self-education activities – by learning and working in practice. Sukhomlinsky considered it necessary to turn education into the most important life value. In this regard, in his system of educating a comprehensively developed personality, he constantly worked on the formation in schoolchildren of an insatiable curiosity of the desire for self-education" [13].

The success of self-education depends "on a number of components of human cognitive activity, among which the primary ones are: – a person's awareness of the personal need to acquire additional knowledge; – a person's possession of the necessary mental development, the ability to see problems, formulate them, plan successive steps to find an answer; – the ability to update knowledge, methods of activity, to select the necessary ones to solve the problem that has arisen; – the desire to solve the problem <...> and in the light of this task, the knowledge of the new" [11].

In the context of the era of comprehensive propaganda of the revival of the educational system, China's outstanding traditional culture, the analects (introspection) of Confucius are increasingly regarded as an important cultural resource for the self-education of the people. Accustoming modern students to self-education, of course, will increase the effectiveness of the knowledge they receive. The view of Confucius in his treatise to this day is of paramount importance for

the self-education of modern people. Here are some of his opinions:

1. Confucius believed that the review of educational material is a way of opportunities for self-education. In the era of Confucius, most people with knowledge acquired knowledge and improved their social status through self-education.

2. Confucius said: "When you review old knowledge and at the same time you have a new experience of knowing and discovering something new, then you can be a teacher" [4, 5].

The teacher, according to A. Diesterweg, "only until then is able to actually educate and educate, while he himself works on his own upbringing and education" [3; 8, p. 74]. After all, the main component of professional self-improvement and self-education of teachers is self-education, which consists in "a purposeful and specific way of implementing the cognitive activity of teachers in order to master universal experience, methods and special knowledge, professional skills and abilities necessary to improve the learning process" [7, p. 6.] And one of the outstanding scientists of our time, Academician D.S. Likhachev, addressing the youth, wrote: "You must always learn. Until the end of his/her life, not only taught, but also studied all the major scientists. If you stop learning, you won't be able to teach. For knowledge is growing and becoming more complex" [7, p. 7].

Combined with the useful content of various concepts, the existing problems of three levels are solved: how to improve the self-consciousness of students, how to promote the moral transformation of students, and how to guide students to maintain harmonious interpersonal relationships with others, so as to achieve the goal of improving the effectiveness of self-education in people. In our article, we focused on three points:

1. Wealth of forms of choice of self-education.
2. Activity and interactivity of the subject of self-education.
3. Openness of the self-education environment.

Wealth of forms of choice of self-education. In traditional school education, students mainly rely on knowledge that is transmitted by teachers. However, with the development of 5G technology, intelligent mobile devices and gadgets, resources combined with big data, cloud computing, Internet tools and artificial intelligence, through the continuous improvement of the Internet infrastructure, existing information on various educational resources, traditional ways of transmitting and obtaining knowledge, the forms and means of teaching students are undergoing profound changes. Intellectual media, being developing means of mass transmission of information, are introduced and integrated into social production, spheres of human life. They have already revolutionized the way information is disseminated in traditional media, using smart technologies, websites, portals, educational apps, social software, etc., and there is still much to

be done by leaps and bounds.

In the educational system, multiform and multifunctional means with graphic symbols, audiovisual, animation forms, etc. have arisen. The learning environment has begun to evolve in three dimensions with multiple directions in three dimensions, providing a wide range of convenient, effective and informative platforms for independent learning. In the smart media learning environment, students can use smart technologies to achieve their goals, realize human-computer interaction, use the virtual scene experience to realize "online", as well as in combination with offline learning. At the same time, the rapid dissemination of information, the definition of individual information content, holographic information experience are aimed at ensuring that students not only draw knowledge from textbooks and scientific literature, but also receive external general information, build their cognitive judgments about the world, and be provided with convenient communication channels, enriching their understanding of the environment and exploring social and natural phenomena through self-study.

Activity and interactivity of the subject of self-education. In the educational process, there are active and passive relationships between the subject and the object of education, in contrast to the relationship between subjects, because they are considered interactive and two-way, and can be seen as reciprocal. In "smart" media, the main form of interaction between people is "virtual interaction", this form of interaction differs from real communication, because the object of communication has a certain virtual appearance. On virtual sites, the personal information of the subject of information exchange may be hidden on the network. People are not limited in the presentation of their real identity, status, gender and ethnicity. An open network of regional branches of student educational communities is important and necessary, based on personal interests, opinions, wishes, requirements for the formation of the desire for personal independence of the individual and its propaganda. This kind of free and equal interaction can better meet the needs of the student community.

In the field of smart media, the two-way and interactive nature of information transfer can enable learners to acquire knowledge, interact with information and learn effectively, i.e. self-educate. Therefore, of course, in an open system, feedback, exchange of opinions is important for students in order to have more rights to speak and autonomy. In polemics and discussions, knowledge can be acquired more autonomously, which significantly increases the status of the subject being studied for the student. The openness and equality of intelligent media make students think about problems, and maybe get rid of identity, problems with experience and other educational prerequisites, the skill of growing equal dialogue and active interaction between people with different experiences and ideas is acquired. Learners learn from the experience of others in an atmosphere of mutual

respect and interaction, and acquire skills by gaining knowledge. However, the intellectual dissemination of information in the media is often "decentralized", and the content, characteristics of the subject are much broader and give students more rights to communicate and learn. Students are presented with more perspectives and a variety of forms and methods for research in order to observe and learn, replenish their knowledge of things, freely participate in heated debates of the problems discussed and express their own opinion, i.e., thus, contribute to the promotion and development of critical thinking, forming independent personal qualities.

Openness of the self-education environment. The characteristics of openness, inclusiveness and virtuality of smart media make it possible to aggregate and upload huge amounts of information, as well as maximize the expansion of information, gaining space for its dissemination. Students can overcome the boundaries of time and place of learning, freely use intelligent media to receive all types of educational information with the development of artificial intelligence and energy technologies based on virtual reality (VR is a world created by technical means, transmitted to a person through his senses: sight, hearing, touch and etc.), augmented reality (AR is the result of introducing any sensory data into the visual field in order to supplement information about the environment and change the perception of the environment), mixed reality (MR is a combination of the physical and digital worlds that provides interaction between a person, a computer and the environment) , holograms, embedded devices and other technologies.

The tech-enabled open learning environment provides students with a virtual immersive learning environment with real integration and multi-dimensional interaction, able to comprehensively use vision, sound, touch and other sensory perceptions, and get virtual interaction with intelligent media. Real interaction, such as the "feeling of the scene", created by artificial intelligence technology, at the same time, with the help of intelligent technology, abstract theoretical concepts and specific combinations of learning scenarios, presented in the form of situational stories, simulation experiments, etc. can play an important role in self-learning. Evidence-based content from various fields of knowledge can stimulate interest in learning and help to better understand and accept new information. In addition, smart media, cloud, visualization and mobile convenience make learning easier. Students can independently organize their study time and freely receive educational resources using various sources of information and participate in interactive exchanges of views in study groups. Compared with the traditional educational environment of fixed characteristics of the surrounding space, the integration of intelligent technologies and the media create learning conditions for students' self-education more openly.

In this work, we wanted to show the need to strengthen the self-education

of students and consider the relationship of self-education with the principles of the concepts of Confucius, as well as analyze the current situation of problems and the importance of self-education of modern students. In connection with the foregoing, three main problems are drawn to itself: the lack of work on their educational activities, the undeveloped ability to self-educate, and the unthought-out and insufficient environmental conditions for self-education of students. We also decided to single out three main points in the development of education: 1. The wealth of forms of self-education. 2. Activity and interactivity of the subject of self-education. 3. Openness of the self-education environment.

In China over 2,000 years ago, education was a scarce resource. Ordinary people could only acquire knowledge through self-education and self-study, and then expand their level of knowledge through much practice. However, for example, it is difficult for children from ordinary families to afford teachers in specific specialties for self-study, but they can change their destiny through their own hard work – self-study. Therefore, no matter what era we live in, the importance of self-education is obvious, and people are full of aspirations for this way of learning, and the demand for self-education cannot decrease over time due to global changes.

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UDC 37

LANGUAGE AS A MEANS OF CULTURE DEVELOPING

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Abstract. *The new version of the Constitution of the Russian Federation of 2020 has an article dedicated to the preservation of the native language [Constitutions of the Russian Federation, 2020, p. 25-26]. The modern language has become abundant with various foreign words, and the use of foreign words in everyday life will certainly lead to a break and displacement of the connection with the native culture and history from the human consciousness. The richness of the native language was sung and praised by many: poets, writers, philologists, linguists, scientists, cinematographers and artists, but, unfortunately, the ongoing global processes in the world community have a negative impact on the formation of cultural identity. Society faces a difficult problem – saving the native language through the formation of thinking and speech inherent in the nation. There was a need to understand the values and meanings, to preserve the national heritage and traditions laid down and passed down by our ancestors. The article presents an analysis of the understanding of the means of linguistic expression as a cultural heritage in the form of value significance, leading to an understanding of the moral and moral content of the identity of culture.*

Keywords: *upbringing, culture, cultural traditions, national heritage, education, speech and thinking, identity, values and meanings, language.*

Modern society sets difficult tasks – saving the native language, and therefore cultural identity through the formation of thinking and speech of the younger youth, fixing the values and meanings that make up the mentality, careful cultivation and preservation of national heritage and traditions in the minds of the growing generation, laid down by our ancestors.

The unity of the relationship between speech and thinking is noted by many scientists in various fields of knowledge such as pedagogy, psychology, psychophysiology, linguistics, philology, philosophy, etc. The complexity and ambiguity of approaches to understanding these concepts is confirmed, for example, in the book by L.S. Vygotsky Speech and Thinking. He writes: "Thinking and speech, especially expressed in the unity of human speech thinking, are so similar in their origin and at the same time they are different in their development <...>. Meanwhile, it is the struggle and mutual penetration of opposites, which are human thinking and speech, that serve as the basis of their unity and the source of their development" [Vygotsky, 1934, p. 6-7]. Of course, speech and thinking have mutual influence on each other, being inextricably linked. But how is language related to the developing of culture? Within the framework of this topic, we are trying to answer the question that is connected with the formation of national culture through language, both in written and oral form, in the process of reading literature, communication and building a dialogue. Dialogue is an extremely important aspect of life, and building communication is undoubtedly an important skill. Adhering to a systematic approach in the study of speech and language, the semantic component, which can be traced both in the text and in communication, is of particular importance.

N.D. Pavlova writes about the necessary skill of building a connection between sentences and how the author's intention is revealed: "the text conveys the speaker's intention <...>, the research focuses on the semantic relationship of sentences <...>, allows characterizing: the speaker's intention and its deployment in speech...". Considering language and speech from the standpoint of a communicative approach, she notes the inclusion of speech in life situations and its influence on human behavior. In this regard, the concept of discourse is singled out as purposeful verbal behavior and intention as one of the aspects of communicative activity, which determines the direction and "forms the deep psychological content of speech, which is directly related to the goals of the activity" [Pavlova, 2002, p. 71-76]. Hence, "through speech, interpersonal interaction is carried out, influences are exerted, power is realized, the goals of the communicants are achieved. Many spheres of human activity generally have a predominantly discursive character. Thus, politicians, using language and speech, are able to transform society. Political discourse can inspire, consolidate, sow enmity, inspire optimism or, on the contrary, lead to despair. The study of discourse makes it possible to understand not only the meaning and actual purpose of speech, but also the ongoing social processes" [Pavlova, 2020, p. 20-21]. And social education is a process of purposeful formation of socially significant qualities of a child's personality, which he needs for successful socialization [Gasanova, Markova, 2019, p. 9]. From the moment of birth, we educate and instill culture in

children, using methods and techniques, including all kinds of psychological and pedagogical resources and mechanisms of influence and interaction in everyday life. The stratification of society from the standpoint of nationality and material well-being has left a negative mark on the development of the younger generation. Today, it is necessary to develop new conceptual provisions, directions, methods of work on the upbringing and socialization of young people ... [Markova, Gasanova, 2020, p. 445]. One of these methods is reading literature. Each parent passes on to his children a part of the national culture that he himself received as a child from his parents, adults, family, school, environment.

We, sometimes reading folk tales, poems, literary works of art to children, do not think about conveying true meanings, do not analyze and do not focus on moral values, but most likely perceive at the level of genetic memory. However, it is important to stimulate the generation to think, to highlight value-semantic meanings. And together this, after all, is the transfer of the cultural identity of the problems, defeats and victories of the people in a particular era, with its diversity and beauty. Here it should be noted that the study of foreign history and culture complements and expands the possibilities of interaction, but does not replace the entire value of a single national culture. And, undoubtedly, in world literature we find something that unites people in their universal values, without which the development of mankind is impossible.

Even in ancient Greece, thinkers noted that culture is the work of human hands, and therefore we are responsible for the content, creativity of the society in which we will live. Culture must be comprehended from two positions: the position of values and meanings, but also from the position of activity. In the context of our reflection, these two components are dependent on each other, and here a balance is needed between these aspects. Whether a child will love literature, speak correctly, choose the "correct" literature from the whole variety of printed publications and be able to read it depends on the environment in which he is and is brought up. Moreover, if we consider the issue a little deeper, then it is necessary to pay attention to self-identification with those heroes that the child find on the pages of books. It is there that images and role-playing games of children are built and arise.

In this context, reading books gives us a reason to develop self-awareness and constantly work on ourselves, our thinking. Surrounding ourselves with books that make us think, touch our souls, we are in a state of dynamic reflection and rethinking of our experience and the experience of generations, thereby having the opportunity to grow, develop ourselves and form our own thinking. Ethics is cultivated according to the same principle. Without an ethical sense, it is impossible to understand the events that are taking place, because it is they that give the key to the acceptance of morality and morality. Reading and analyzing

works, we evaluate the environment based on the prevailing worldview. And here there is an opportunity to see that the assessment is offered from the standpoint of life experience, value orientations and attitudes.

Here it is appropriate to cite the Socrates' method of maieutics, where the search for contradictions lies in the opponent's arguments and a new attitude to current events is formed. As noted by a number of scientists: in morality, ultimately, everyone is responsible for himself, this is one of the dimensions of spiritual life, responsibility, one of the necessary ways of self-fulfillment, self-improvement, self-management of a person [Zorina, Rakhmankulova et al., 2007]. And through the language, native word and literature, we are approaching the formation of moral culture and the ways of its regulation, both personal and social.

K.D. Ushinsky, as one of the founders of Russian pedagogical thought, drew attention to the importance of teaching the vernacular. He wrote that it is necessary to learn to understand the meaning of the text read, to highlight cause-and-effect relationships and analyze the relationship of sentences. It is necessary and important to form morality not only through family and social education, but through fiction. Ushinsky believed that moral education is the main task of education [Ushinsky, 1949].

The issues of moral education during the crisis, the transition to the digital age, are also undergoing a change in value orientations and this needs to be paid attention to. It is worth noting that a lot of words, slangs are introduced by young people into everyday language, accepted in chats, such as: "chavo, avatar, ICQ, ban, backup, glitch, google, dvizhok, device, excel, zhzhosh, ban, zzy, ignore, IMHO, klava, crazy people, copy-paste, krasava, cookies, lag, log in, mb, muff, mafon, soap, cut, nya, fire with, osloset, offsight, slander, rarit, share, cut loot, rudders , sysadmin, sisanal, spam, tamper, trolling, flood, hahat, chatla nin, user ..., which in turn extends to the culture of communication in the family, etc. ", which completely destroy the linguistic beauty of speech [Gasanova, 2016, with. 36].

Practicing teachers pay great attention to texts. So, for example, M.A. Lukatsky and V.I. Makarov, Yu.G. Kurovskaya use in their work the method of cognitive-linguistic study of the image of a person, which is contained in school textbooks, cognitive linguistics, discourse analysis, etc.: "the linguistic picture of the world is an integral component of the textbook", ... "the thinking of a student mastering the content of the textbook, is coordinated, coordinated with the linguistic picture of the world, which is implicitly presented in it. <...> provides important information about how the student's mentality is formed, how his cognitive picture of the world is formed" [Lukatsky, Makarov, Kurovskaya, 2018, p. 9-10].

Makarov writes that as a result, "in the mind of the student, when perceiving the materials of the studied texts, the image of a person takes root, who carries information "attached" to him/her that does not coincide with the knowledge

about a person reflected in modern philosophical and anthropological literature" [Makarov, 2014; 2018, p. 23]. Another study shows that a modern textbook does not sufficiently reveal the importance of labor in the context of ethical, creative being [Lukatsky, Makarov, Kurovskaya, 2018]. These findings confirm the idea of the need to comprehend or rethink moral education through linguistic forms.

According to Ushinsky: "The language of the people is the best, never fading, ever-blooming flower of its entire spiritual life, which begins far beyond the boundaries of history. The language spiritualizes the whole nation and all its homeland; it is transformed by the creative power of the people's spirit into a thought, <...> in the bright, transparent depths of the people's language, not only the nature of the native country is reflected, but the whole history of the spiritual life of the people" [Lukatsky, 2012, p. 432]. From the foregoing, we can conclude that learning a language is not a formal reading of the text, but a deep understanding of one's national heritage, culture and history, because any work carries the content essence, meanings, moral laws and values of a particular time. Literature is one of the ways to transfer the accumulated experience, which must be accepted, comprehended and, on the basis of this, developed and improved. And here, undoubtedly, the classic works of F.M. Dostoevsky, N.V. Gogol, A.P. Chekhov and others will be a landmark of linguistic beauty, for example, the Russian language, the formation of moral concepts and categories.

Based on these ideas and philosophical thought, which are growing stronger in close connection with religion and aimed at creation, instilling the spirit and spirituality, we can conclude that the responsible choice of a person for his development falls on him, because he/she is the creator of his/her own life. And help is provided to him/her in that he draws it through the literary native language, the history of the Motherland, which are a means of comprehending and rethinking the experience of generations and shaping his/her own life, leading to a deep penetrating awareness of the moral and moral content of the originality of culture.

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FORMATION OF STUDENTS' VALUE ATTITUDE TO HEALTH

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Abstract: *it is possible to form a value attitude to health among students if conditions are created for the subject to reveal the personal meaning of individual health and realize its role in human life and professional activity.*

Keywords*: students, health, attitude, value, program.*

At the present stage of development of society, the issues of strengthening the health of the population, the formation of a physically, mentally healthy and socially active person are in the field of strategic interests of the state [3].

A special place in these processes is given to the young generation of the country as a guarantor of its sustainable development and social stability. In such state projects as the "National Doctrine of Education in the Russian Federation for the period until 2025" [1], "Forecast of the socio-economic development of the Russian Federation until 2036" [2], it is emphasized that currently among the priority tasks of the system education of our country means the upbringing of a harmoniously developed personality in the spirit of a conscious and responsible attitude towards one's own health and the health of those around him/her as an important social value, the formation of a sufficient level of health of growing children and youth at the mental, physical and social levels [3].

According to experts, at present, in the implementation of the concept of preserving the health of the nation, there is a need to improve the educational aspect in the process of transforming the value-semantic orientations of young students to their own health.

Obviously, under the current circumstances, the most vulnerable group is modern students, whose mental and physical health has been adversely affected by social anti-COVID isolation. In our opinion, students of technical universities, who are characterized by a sedentary lifestyle, due to significant intellectual loads, are in the most critical situation. Against this background, it is necessary to note the extremely low proportion of disciplines in the curriculum of engineering specialties, in contrast to the humanities, aimed at the formation of health-

forming competencies in students. Taking into account the specifics of their future professional activity, which is characterized by the presence of a complex of unfavorable factors of a technogenic, environmental, psychological and industrial nature, there is a special task of giving the student not only knowledge in the field of labor protection and safety, but also the formation of his motivational readiness and skills to conduct a health-oriented life [3].

The problem of students' value attitude to health gained particular importance during the pandemic and continues to worsen in the post-pandemic period, when only a rationally conscious attitude to a healthy lifestyle can help a person to restore health in a comprehensive manner and prevent morbidity.

Understanding by young people of the importance of personal health, unfortunately, is not a fundamental basis for maintaining a healthy lifestyle. This situation, on the one hand, is aggravated by the development of information processes, as young people give priority to the Internet and gadgets, where they get information that is not always useful. On the other hand, modern information and digital technologies have additional potential for the formation of healthy life values [3].

As teachers of higher education note, most modern students are aware of the importance and high role of their own health, but naively relying on their natural potential, they do not adhere to the basic valeological postulates in life [3].

The Russian system of higher education traditionally pays a lot of attention to the physical well-being of students, developing a sports and recreational, material base and providing an opportunity for practicing various types of sports training, organizing recreational activities [3].

However, the formation of a value attitude of students towards their health is restrained by the information and communication resources of the Internet, the content of which forms in young people an idea of the value of the visual attractiveness of a person, thereby reducing the importance of a healthy lifestyle to the utilitarian use of the physical resources of the human body in order to support a fashionable style and lifestyle.

One of the main reasons for the current picture lies in the lack of a formed readiness for a healthy life among modern student youth. In the conditions of the educational environment of the Kazan National Research Technological University, the solution to this problem became possible through the development of a comprehensive program for the formation of a healthy life, aimed at coordinating the efforts of all structures of the university and increasing the efficiency in the application of health-saving technologies, promoting healthy life and countering the drug threat. The comprehensive program has a structural and systemic character and represents an ordered relationship of all the included sections: legal support; goal and tasks; main activities; system of measures and

program implementation algorithm; evaluation of program effectiveness; final results of the program implementation; measures for the implementation of the program for each structural unit. The content of the Comprehensive Program is organically consistent with the content of the programs of the disciplines of the curriculum aimed at the formation of universal competencies of university graduates in the field of health protection and safe life, provided for by the Federal State Educational Standard of Higher Education as mandatory results of mastering the basic educational programs of higher education.

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THE CULTURE OF ETHNIC GROUPS AS A SYSTEM OF CODES

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Abstract. *in this article, the culture of an ethnic group is considered as a system of codes transmitted by an ethnic group from generation to generation through stereotypical forms of behavior.*

Keywords: *ethnos, culture, cultural code, rite, tradition, stereotypical forms of behavior.*

The nature and dynamics of an ethnos have been the subject of research by many specialists in various fields since the 19th century, when the study of the issues of its formation and development was updated by social changes in the Netherlands, France, England and other countries. Today, these same questions have flared up with renewed vigor in connection with the radical political and economic changes in the world.

The outstanding sociologist M. Weber acted as the founder of the theory of ethnos. According to him, an ethnic group is a group of people whose members have a subjective belief in a common origin due to the similarity of physical appearance or customs, or both together, or because of a common memory. The main provisions of M. Weber had a great influence on the further development of the theory of ethnicity and ethnos. It should be noted that the main features of an ethnos indicated by him were also adopted by sociological schools that differed from Weber's school in other matters. [14, p. 24-25]

A more or less extensive discussion of the problems of the ethnos in our country dates back to the post-revolutionary times, when the question of relations between the numerous peoples who inhabited the Russian empire arose sharply. The discussion was started by the book by S.M. Shirokogorov "Ethnos: A Study of the basic principles of changing ethnic and ethnographic phenomena". In it, the author gives his own formulation to the ethnos, indicating that it is "a group of people who speak the same language, recognize their common purpose, have a complex of customs, a way of life, are preserved and sanctified by tradition and differ in action from other groups." [10, p.13]

In modern science, all available theories of ethnos can be divided into three main areas: constructivist, primordialist and instrumentalist (or situationist). Representatives of constructivism consider, as a rule, external functional ties that arise in society regarding the attitude towards ethnicity.

Constructivists (B. Anderson, F. Barth, P. Berger, A. Cohen, M. Gluckman, J. Komaroff, T. Lukman, Russian researcher V.A. Tishkov) consider ethnicity as "... a kind of mental construct created by the individual himself in the process of constructing his cognitive picture of the world due to the targeted impact on him from the outside by elite creators of culture and which is subsequently used as a tool in solving political and economic problems. So, according to V. Tishkov, ethnic groups are artificial constructions created by ethnographers, or the result of elite efforts to construct ethnicity. [13, p.114] The followers of constructivism, emphasizing the importance of social changes, economic and political factors for the formation of ethnic identity, seek to prove that many traditions are deliberately created by the political and intellectual elite. For example, ethnicity in the understanding of A. Cohen is a symbolic tool that allows solving the political and economic problems of social groups. [3, p.62]

Despite the fact that supporters of the constructivist approach rightly emphasize the importance of social change, they are often justly criticized because of the overestimation of the role of the conscious construction of ethnic reality.

Primordialists (primordial - original, original), being opponents of constructivists, consider ethnicity as something natural, some kind of objective given, inherent in the individual. Adherents of primordialism believe that ethnos is "... a special integral community with their inherent features of ethnicity in the form of a territory, language, conscious membership, a common mental make-up." Proponents of the primordialist approach consider ethnos as a natural-geographical or even biological phenomenon.

Attempts to explain the diversity and difference of ethnic groups by the geographical and climatic conditions of their places of residence were made in antiquity (Hippocrates, Aristotle, Posidonius). However, only in the 20th century, thanks to the works of S. Shirokogorov, this idea received a fairly broad justification. According to primordialists, ethnicity is developed in the process of human adaptation to the environment. With this consideration, the ethnos appears as an analogue of the population in animals. However, many researchers do not agree with this statement.

So, L. Gumilyov asserts the irreducibility of the ethnos "... to a purely biological phenomenon." Ethnos, according to L. Gumilyov, is a stable, naturally formed group of people that opposes itself to all similar groups, which is determined by a sense of complementarity, and is distinguished by a peculiar stereotype of behavior that naturally changes in the course of history. Ethnos, according to L. Gumilyov,

is closely connected with the biocenosis of the landscape where it exists: "Ethnos is a geographical phenomenon associated with the surrounding landscape, which feeds the adapted ethnos. And since the landscapes of the Earth are diverse, ethnic groups are also diverse." [4, p.29]

Thus, according to Gumilyov, an ethnos is a natural group of people with a common stereotype of behavior and a peculiar internal structure that opposes itself to all other similar groups. The ethnos becomes a system of fluctuations of a certain field, created by the biogeochemical energy of the living matter of the biosphere. The diversity of natural landscapes also determines the diversity of ethnic groups, since a person, ensuring his life in various natural conditions, interacts with the environment in different ways. In this regard, people develop various stereotypes of behavior, according to which ethnic groups are distinguished.

This theory explains a number of important questions: about the change of one ethnic group by another, the inclusion of people in newly formed ethnic groups, the presence of memory about their ethnicity for several generations. The determining factor is the functioning of an ethnic group as a social organism, and behavior stereotypes are formed during the educational process, which has its own individual characteristics for each ethnic group along with common features.

P. Kushner, dealing with the issues of ethnic identity, wrote: "Ethnic is called a lot of phenomena, which basically come down to the specifics that distinguish the life of one people from the life of another." He proposed to consider language, types of housing, clothing, cooking and other elements of material culture as determining factors. Researchers such as S. Arutyunov and N. Cheboksarov consider ethnic groups as "... spatially limited "clusters" of specific cultural information", and interethnic contacts as an exchange of such information. [1, p.26] In later works, S. Arutyunov emphasized the crucial role of verbal communications in natural language in maintaining any community of people, especially in ethnic tradition.

Another approach within the framework of primordialism considers ethnos as a socially conditioned phenomenon. Y. Bromley opposed the definition of an ethnos as a special population, arguing its dependence on socio-cultural factors. According to the academician, an ethnos arises as a result of a historical process and has the following characteristics: stability and separation from other similar communities. At the same time, ethnicity is a cultural integrity. In addition, representatives of a particular ethnic group have common mental traits. Thus, according to Y. Bromley, an ethnos is "... a stable intergenerational set of people that has historically developed in a certain territory, possessing not only common features, but also relatively stable features of culture (including language) and the psyche, as well as a consciousness of their unity and differences from all other similar formations (self-consciousness), fixed in the self-name. Moreover, the "ethnic" plays a "shaping role" in the process of the formation of an ethnos. [2, p. 14]

The theory of primordialism has been repeatedly criticized for its lack of attention to social change and economic and political factors.

Such different positions of researchers of this problem only once again proves the need for further searches for its solution. Therefore, some researchers have created a kind of synthesis of the above approaches. This is how instrumentalism appeared, the supporters of which are mainly sociologists and political scientists, who are more interested in the problem of ethnicity.

Proponents of instrumentalism drew attention to the variability and situational nature of ethnic identity. For example, the well-known sociologist J. Nigel believes that ethnicity can arise, strengthen or weaken depending on the situation (therefore, this direction has another name - situationism). The American sociologist S. Olzak defines ethnicity as follows: "Ethnicity is a social boundary that divides the population by belonging to a particular group (group members or others). In this case, the specified affiliation is based on one or more of the following criteria:

1) characteristics believed to be based on a common ancestry;

2) cultural traits, including language, religion, dress, customs, and a supposed common history;

3) national or religious origin." [8, p.25]

This definition seems to us very close to the goal of revealing the essence of ethnicity, but the foundations of its functioning are not taken into account.

Anthropologist Fred Riggs defines ethnicity as "a property that belongs to those who are recognized as members of a given society that shares common cultural traits, including common ancestors and a common history; it is a quality that emerges as a result of interaction with members of a wider society that has different cultural traits." A similar position is also held by other modern foreign sociologists, ethnopsychologists and culturologists F. Hsu, J. Clifton, A. Cohen. The Canadian scientist V. Isayiv, identifying ethnos and ethnicity, defines ethnos "as a group of people of common origin, which has a common culture and is aware of its unity." [5, p.118]

The approach of Russian scientists to the term "ethnicity" reflects the main provisions arising from the theory of ethnos. It cannot be said that there is one general approach characteristic of the majority of Russian sociologists, philosophers and ethnologists. But in general, they all agree that ethnic factors objectively exist and have a huge impact on people's lives. A number of scientists believe that ethnicity is an ethnic identity, manifested in faith, a sense of community, norms, values, emotional attachment, etc. The modern Russian researcher V. Tishkov in his work "On the Phenomenon of Ethnicity" (1997) writes: "The communities that exist on the basis of historical and cultural differences are social structures that arise and exist as a result of purposeful efforts on the part of people and the institutions they create". These communities are based on the idea of belonging

to the community, shared by its members, and the group solidarity that arises on this basis. In general, V. Tishkov considers an ethnos as a community "... based on cultural self-identification in relation to other communities with which it is in fundamental ties." [12, p.81]

Some scientists approach ethnicity as a phenomenon resulting from the transformation of the feeling of blood kinship in the experience of social unity based on a single language, lifestyle, common territory and historical destiny - real or mythical.

S. Rybakov writes the following about this: "at a certain stage of his (a person's) social development, when a community based on kinship ties, the process of natural population growth gradually turns into a community, sealed by the awareness of its members of a common origin (both historically and in the biological sense, going to the level of sacredness), their feeling of uniqueness and exclusive selfhood through the customs and rituals inherent only to them ..."

The modern Russian researcher A. Monakov concludes that the ethnic group depends on culture, which is the determining factor in the formation of ethnicity. "Ethnic identity of the individual is formed in the process of socialization within the culture." At the same time, ethnic identity, "an emotionally formed awareness of one's own integration into a relatively large socio-cultural whole," allows the individual to satisfy his needs for security and protection. [7, p.85, 87]

Having completed a brief review of the main views of Russian and foreign researchers on the problem of ethnos and ethnicity, it should be said that ethnos is a social community that implies a special level of integration of individuals, and which has specific cultural models that determine the nature of human activity in the world, and which functions in accordance with special patterns aimed at maintaining a unique for each society correlation of cultural models within society for a long time, including periods of major socio-cultural changes.

An ethnos is a holistic, systemic formation, and culture is one of its components, which is both a condition and a reason for maintaining this integrity. Therefore, understanding the nature of an ethnic group is possible only through understanding its culture.

There are a huge number of definitions of culture, from which one can single out the "sociocode" approach of V.S. Stepin. He believes that the complex historically developing integrity in the organic nature contains within themselves special information structures that ensure the management of the system and its self-regulation. These structures are represented by codes, according to which the organization of the system as a whole and the features of its main reactions to the external environment are reproduced. In biological organisms, this role is performed by DNA and RNA. In society, as an integral social organism, culture acts as an analogue of genetic codes. It turns out that along with the biological,

genetic code, which fixes and transmits biological programs from generation to generation, a person has a sociocode, through which social experience is transmitted from generation to generation.

Thus, according to V. Stepin, culture is "... a system of historically developing supra-biological programs of human life (activity, behavior and communication) that ensure the reproduction and change of social life in all its main manifestations". [11, p.271]

In close connection with this definition is the concept of culture by Yu. Lotman: "Culture is a system of information codes that consolidates life social experience, as well as the means of fixing it." [6, p.14]

In sociology, the concept of "culture" refers to the artificial environment created by people for existence and self-realization: these are customs, beliefs, rituals, values, norms, traditions, symbols that find expression in the objective environment, patterns of behavior that are assimilated by people, transmitted by them from generation to generation, are an important source of regulation of social interaction and behavior. Culture can be viewed as a system of spiritual codes, a kind of information program that makes people perceive and evaluate what is happening in a certain sense, to act this way and not otherwise. The assimilation of the cultural code of an ethnos is largely achieved through ethnic symbols: rites and rituals, patterns of behavior, special moral values.

The American researcher J. Murdoch singled out several fundamental characteristics in culture that are inherent in all ethnic cultures.

First, culture is transmitted through learning. The collective experience of a particular culture is not genetically inherited, so each new generation must master this experience through training. Accordingly, each culture has certain mechanisms for the transmission of culture.

Secondly, culture is instilled by education. The assimilation of culture by new generations involves not only the acquisition of some knowledge and skills, but also the strict discipline of "... the child's animal impulses in order to adapt him to social life."

Thirdly, culture is social, since it always belongs to a certain community and is preserved in time due to the fact that it is transmitted from generation to generation in the process of interaction between people and expresses a collective experience that is unique for each specific community.

Fourth, culture ensures the satisfaction of both biological and social needs. Moreover, culture not only ensures the satisfaction of needs, but also creates them: a person strives for what is considered valuable precisely in his culture.

Fifth, culture is adaptive, since it is the result of adaptation to the natural environment (type of economy, features of housing, life, clothing, etc.) and to the social environment (historical situation, foreign cultural environment).

Sixth, culture is integrative, since the elements of any culture form a certain integrity, and each element of culture can be explained only in connection with culture as a whole.

Modern cultural theorist S. Reshetnikov identifies three main modalities of its organization in the structure of culture:

1) subject-technological, which reflects the whole variety of not only material, spiritual and artistic artifacts, but also the specifics of the aesthetic design of the human body (through sports, fashion, makeup, etc.);

2) semantic, which, being due to the specifics of the interaction of objective and subjective certainty of things and phenomena of reality, determines the understanding of culture as a world of signs (values, knowledge, projects), in their totality forming the spiritual culture of society;

3) functional-institutional, reflecting the purpose of certain elements of culture in the social system, in turn, organizationally formalized in the form of certain social institutions of culture.

Culture, as you know, performs a variety of functions. According to the theory of T. Parsons, "culture has the following main functions: firstly, the function of transferring experience, thereby contributing to the continuity of social tradition; secondly, the function of learning ... thirdly, the function of uniting members of the social collective". [9, p.53] Thus, being, on the one hand, a product of the social system, it, on the other hand, regulates the system of social interaction itself.

The main function of culture - the preservation of the self-identity of the ethnic group - is manifested in common symbols and stereotypes of behavior, which are assimilated and passed down from generation to generation and fixed in traditions, customs, rites and rituals.

Cultural forms include norms and stereotypes of consciousness and behavior in various spheres of life, reference samples that are variably reproduced in various specific situations, and other phenomena of this kind. The assimilation of the cultural forms of an ethnic group is largely achieved through ethnic symbols. Common symbols or traditions ("traditional attitudes") and stereotypes of behavior are acquired and passed down from generation to generation through a common language, common history and common ancestors. Stereotypes of behavior characteristic of a given ethnic group and manifested in the culture of the individual in general and all its components are fixed in traditions, customs, rites and rituals.

Ethnic traditions and customs are rules, norms and stereotypes of behavior, actions, communication of people that have developed on the basis of the practical life of an ethnic group and the past, rooted in everyday life, passed down from generation to generation, the observance of which has become a social need of each individual of an ethnic community. Customs and traditions are a complex

phenomenon of ethnic psychology, which has a dual nature: on the one hand, it is a phenomenon of the psyche (that is, they can be both realized and not realized), on the other hand, they are realized in the actions of people objectively, manifesting themselves in specific things, symbols, clothes, etc. Most of the norms and rules of behavior are acquired by people subconsciously using the mechanism of imitation. Initially, they arise and are introduced into everyday practice by people consciously. However, subsequent generations often lose their ideas about the goals and the need to comply with some rule or norm, only the algorithm of action remains in their minds, and the idea of the expediency of this form of behavior goes into the subconscious. At the level of consciousness, only rituals, customs or traditions are preserved.

Ethnic traditions and habits are manifested not only in actions, deeds, clothing, teaching style, etc., but also in movements, gestures and other subtle manifestations of people's psychology. This circumstance is fundamentally important, because every person has an unconscious mechanism that fixes the relationship "one's own - someone else's" according to the barely noticeable nuances of the manifestation of the psyche. In interethnic contacts, it must be borne in mind that people, as a rule, are sensitive to their traditions, customs, tastes, and therefore it is better not to violate them. The practice of interethnic relations shows that insufficient knowledge of ethnic traditions, customs, habits, tastes often leads to serious conflicts. This trend of awareness and upholding of one's own uniqueness and preservation of cultural tradition once again confirms the general pattern: humanity, becoming more interconnected and united, does not lose its ethnic diversity.

At present, it is practically impossible to find a single ethnic community that has not been influenced by the cultures of other peoples. It is this trend of cultural globalization that particularly exacerbates interest in cultural identity. The cultural diversity of modern peoples is even increasing, but each of them strives to preserve and develop its integrity and cultural appearance.

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INVESTIGATION OF SALIVARY GLAND PARAMETERS AND BLOOD PRESSURE IN JUNIOR ATHLETES AGAINST THE BACKGROUND OF INTENSE PHYSICAL STRESS AND IN THE RECOVERY PHASE

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Abstract. *Blood pressure and saliva indices were studied in 97 junior athletes of both sexes before the start of the competition and 30 minutes after running a 3-kilometer distance. The results showed that athletes after a 30-minute rest have an increased pulse, saliva pH and α-amylase activity, and the rate of saliva secretion is reduced. At the same time, in men, systolic blood pressure and the activity of α-amylase of saliva are higher than in women.*

Keywords: *junior athletes, α-amylase, salivary gland, blood pressure.*

Physical stress caused by intense physical exercise has various effects on the immune system [6,8]. In addition, hormone levels change: cortisol levels rise and testosterone levels decrease [2,4]. Ensuring non-invasive exercise monitoring is a major issue in sports medicine. One of the promising media for achieving this goal is saliva [10]. Saliva contains antibodies, growth factors, proteins, organic non-protein compounds, hormones and specific saliva enzymes [5]. The study of parameters in saliva provides additional advantages for testing athletes in competition conditions. For example, saliva α-amylase is a biomarker of stress experienced by athletes during training and competition [9]. An increase in the activity of this enzyme in saliva may be due to the fact that exercise causes an increase in the activity of the sympathetic system [1,3]. However, it should be noted that psychological stress can also trigger the release of α-amylase [7].

The present study was aimed at a comprehensive assessment of changes in salivary gland parameters due to intense physical stress, as well as the relationship of salivary gland parameters with simultaneous indicators of rheological properties of blood. It has been suggested that the parameters of the rheological properties of blood vessels and the work of the salivary glands will differ significantly between the baseline level and during the recovery phase of the athlete.

The purpose of the to study changes in the parameters of salivary glands and rheological properties of blood vessels in junior athletes against the background of intense physical stress and during the recovery phase.

Materials and methods. The inclusion criteria were participation in competitions, written informed consent, men and women, age 18 and older, absence of cardiovascular diseases, diabetes mellitus and constant medication. All participants took part in the 3000 meters race. 97 junior athletes participated, 59 of them women and 38 men, sports category I-III. The average age of the participants was 18.8 years (±1.1). The total running time and pace were measured during the competition. The average running time was 11.9 minutes, the average speed of the competitors was 4.2 m/sec and 15.1 km/h. The participants' the pulse (beat/minute), blood pressure (BP) systolic (SBP) and diastolic (DBP) in mm.Hg were measured. Saliva samples and blood pressure results were taken from all participants at two time points: before the run and 30 minutes after the run. All saliva samples were transported in a refrigerated container. Unstimulated saliva was collected in plastic measuring tubes for 5 min. Before being placed in the refrigerator (-27°C), saliva samples were centrifuged at 3000× g for 15 minutes, pH (Hanna) and saliva quantity (Vsal, ml/min) were measured. Before the start of the study, saliva samples were slowly thawed at room temperature and the activity of α-amylase (IU/l) was determined in a supernatant on a BioChem SA (USA) analyzer. Statistical evaluation was carried out using the Statistica program (version 10.0). Metric variables were represented as averages and standard deviation (SD). In case of significant differences, Wilcoxon's nonparametric criterion of sign rank was used. Spearmen correlations of all obtained parameters were calculated. All tests were performed bilaterally and with a significance level of $p<0.05$.

Results of a research. As can be seen from the data in Table 1, the blood pressure of junior athletes after a 3-kilometer cross-country race varied depending on the gender of the participants. In women, the upper systolic pressure did not change from the initial values to the cross, and in men it significantly increased ($p<0.05$). At the same time, the lower diastolic pressure after the cross tended to decrease in both female and male athletes. However, the pulse after 30 minutes of rest after a 3-kilometer cross remained significantly ($p<0.05$) high in all study participants.

Table 1.

Parameters of blood pressure in junior athletes before and after competitions (M±m)

Gender (n=97)	Age	Systolic BP mm.Hg		Diastolic BP mm.Hg		Pulse beat/minute	
		before	after	before	after	before	after
Female (n=59)	19,0±0,1	124±1,7	126±2,2	84,0±1,7	81,0±1,5	91,0±2,3	115±4,0*
Male (n=38)	19,1±0,1	126±3,0	131±3,0*	87,0±2,0	83,0±2,0	92,0±4,0	111±4,0*

The differences are significant from the initial level Wilcoxon test *p<0,05

The study of saliva parameters in junior athletes showed that the pH of saliva shifted towards alkaline values, which indicates a change in the buffer capacity of saliva after intense physical exertion in both women and men (Table 2). Simultaneously with saliva alkalinization, a significant ($p<0.05$) decrease in the secretion rate was detected, which did not recover even 30 minutes after rest. The activity of the α-amylase enzyme in saliva after cross-country in athletes had significantly ($p<0.05$) high values, and this increase was more significant in male athletes.

Table 2.

Indicators of mixed saliva in junior athletes before and after competitions (M±m)

Gender (n=97)	Age	pH		Vsal ml/min		α-amylase IU/l	
		before	after	before	after	before	after
Female (n=59)	19,0±0,1	7,06±0,02	7,78±0,03*	0,57±0,05	0,35±0,02*	144±10,3	314±11,9*
Male (n=38)	19,1±0,1	7,08±0,01	7,77±0,01*	0,53±0,01	0,35±0,02*	157±7,68	370±10,0*

The differences are significant from the initial level Wilcoxon test *p<0,05

The correlation analysis showed a direct positive reliable relationship between the final result of the competition from the gender of the athletes ($R=0.76$; $p=0.03$), the age of the athlete and the available sports category ($R=0.59$; $p=0.0008$), the result of the cross and systolic blood pressure after the competition ($R= 0.25$; $p=0.003$). The activity of α-amylase in saliva was directly proportional ($R=0.21$; $p=0.02$) to the gender of athletes and inversely proportional ($R= - 0.20$; $p=0.001$) to the available sports category of participants.

Conclusion. Summing up the results of the study, it was found that the body

of male athletes recovers more slowly after intense physical exertion, which is confirmed by the data of blood pressure and mixed saliva. This should be taken into account when forming a recreation plan for athletes and developing techniques for rapid recovery of athletes.

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PREVENTION OF ONCOLOGICAL OCCUPATION DISEASES

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Abstract. *Of great importance is the professional training of doctors who carry out medical examinations of workers in hazardous working conditions in terms of solving the priority task - protecting the health of working citizens by combating malignant neoplasms and detecting them at an early stage. The particular relevance of oncological diseases among the working population is due to the high prevalence of this pathology, the high mortality of the working population and large economic losses. In this connection, the professional training of medical personnel involved in organizing and conducting periodic medical examinations of the working population, aimed at early diagnosis of oncopathology, is of particular importance as one of the most important components of primary prevention of malignant neoplasms.*

Keywords: *working conditions, medical examination, occupational disease, oncology.*

Currently, there is a steady increase in malignant neoplasms among the working-age population throughout the world, which is explained by a number of reasons, including the influence of production factors [4,6].

Occupational cancer - malignant neoplasms, the cause of which are factors of the working environment and labor activity. Issues of paramount importance are

not only continuous monitoring of the dynamics of the health indicators of the working population, but also the identification of trends in cancer incidence, as well as its early diagnosis.

Occupational malignant neoplasms arise as a result of a person's professional activity with regular and usually prolonged contact with carcinogenic factors that act quite intensively. Malignant neoplasms, as a cause of death, take the second place after diseases of the cardiovascular system [3,5].

According to the International Labor Organization (ILO), cancer is the most common cause of death related to working conditions.

Currently, about 80 substances are classified by the United Nations International Agency for Research on Cancer (IARC) as undoubted or probable occupational carcinogens. According to the WHO, every year 200,000 people die from cancer associated with the conditions in which they work [6,9].

Undoubtedly, the professional training of doctors involved in the organization and conduct of medical examinations working in hazardous working conditions is important, both in the framework of continuous medical education and professional retraining in the specialty "occupational pathology". And for effective joint work with occupational pathologists aimed at reducing occupational oncological pathology, professional training of hygienists in assessing working conditions, conducting a special assessment of working conditions, and organizing labor protection at enterprises at risk for occupational oncopathology is essential.

When questioning doctors (505 people) undergoing advanced training in the specialty "occupational pathology" at the Pacific State Medical University in the period 2018-2022, their low occupational alertness was established. Thus, primary care physicians are not sufficiently trained in oncology and do not have the appropriate level of oncological alertness. The results of the questionnaires showed that more than 32.6% of doctors involved in organizing and conducting medical examinations of the working population are not sufficiently aware of the prevalence of occupational oncological diseases and mortality from this pathology among workers, do not have a clear understanding of the terminology used in oncology. It was noted that 44.3% of doctors are not sufficiently erudite on the issues of occupational hazards that can affect the occurrence of malignant neoplasms. More than 20.1% of respondents do not have a clear idea of the most effective methods for the prevention of occupational malignant neoplasms.

The need to undergo preliminary and periodic medical examinations and the procedure for providing medical care to the adult population in case of oncological diseases is regulated by the following regulatory documents: Art. 213 of the Labor Code of the Russian Federation, art. 34 of the Federal Law of March 30, 1999 No. 52-FZ "On the sanitary and epidemiological welfare of the population", SP 2.2.3670-20 "Sanitary and epidemiological requirements for working conditions".

The fundamental document regulating the conduct of medical examinations is the Order of the Ministry of Health of the Russian Federation dated January 28, 2021 N 29n "On approval of the procedure for conducting mandatory preliminary and periodic medical examinations of employees, provided for in part four of Article 220 of the Labor Code of the Russian Federation, a list of medical contraindications for the implementation of work with harmful and (or) dangerous production factors, as well as work in the course of which mandatory preliminary and periodic medical examinations are carried out.

Exogenous causes of carcinogenesis are known: chemicals of different classes and types of compounds - some metals and metalloids, their compounds, dusts of organic and inorganic composition of amorphous, crystalline and fibrous structures, acids, alkalis and chemically neutral substances in the form of vapors, gases and liquids; physical factors - radiation and fields - ionizing, non-ionizing (electric and magnetic), ultraviolet; biological agents - viruses, fungi, substances of animal and plant origin [3,5,6,9].

Occupational pathologists participating in periodic medical examinations should be oriented on the issues of biological and clinical indistinguishability of malignant neoplasms caused by exposure to carcinogens at work from tumors that have arisen under the influence of other causes, as occupational exposure to carcinogens and some lifestyle factors (smoking, alcohol abuse) often act synergistically, multiplying the oncological risk, and the etiology of most malignant neoplasms is multifactorial. It is known that a long latent period of development of oncopathology, on average 15-18 years, greatly complicates the establishment of a relationship between malignant neoplasms and the action of occupational factors, especially in people who have left carcinogenic production. It is important to take into account the peculiarities of the action of chemical carcinogens. Thus, chemical carcinogens are characterized by a dose-time-effect relationship, which gives a more solid foundation to the system of hygienic prevention, the desire to minimize the carcinogenic load on the body. The possibility of a kind of sensitization by small doses of chemical carcinogens is substantiated: preliminary exposure of the body to small doses of carcinogens that do not cause tumor formation increases sensitivity to the subsequent carcinogenic effect. It is also necessary to take into account the presence of modifiers of carcinogenesis, i.e. substances that do not themselves cause a tumor, but affect the course of its development, accelerate the development of a tumor or protect against it [2,3,5,6,7,9,10].

In this connection, information about the professional route is of great importance. It is necessary in order to determine the role of a professional factor in the development of a malignant neoplasm, to establish an accurate medical diagnosis (for example, pleural mesothelioma when working with asbestos). Of decisive importance are information about the possible industrial exposure of a

sick person to carcinogens. Ideally, a professional route, even in a short form, should become an integral part of the medical history of any working person.

Information about the occupational route is necessary in order to determine the role of occupational factors in the development of malignant neoplasms; prevent the development of the disease, when the synergistic effect of occupational and behavioral risk factors is known, by persuading the worker to change the attitude of the worker to bad habits; increase the effectiveness of prevention of malignant neoplasms by treating chronic and precancerous diseases, taking into account the greater likelihood of developing malignant neoplasms under the action of carcinogens against the background of these diseases; identify possible, previously unknown, carcinogenic factors in the workplace and new etiological relationships between exposure and the development of malignant neoplasms [1,2,3,5,11].

In order to increase the effectiveness of prevention and early diagnosis of oncological diseases, it is necessary to increase the level of oncological alertness not only of occupational pathologists, but also of primary care physicians, to organize the opening of primary oncological rooms in all healthcare institutions that provide outpatient appointments and participate in periodic medical examinations.

In addition, it is necessary to train doctors as part of continuous medical education involved in the organization and conduct of periodic medical examinations of the working population in accordance with the professional standard of an oncologist in terms of labor function: conducting and monitoring the effectiveness of measures to promote a healthy lifestyle, sanitary and hygienic education of the population in order to prevent oncological diseases, support and supervision of programs aimed at early detection of oncological diseases, organized in medical organizations of primary health care and labor activities: conducting preliminary and periodic medical examinations of workers employed in heavy work and in work with harmful and (or) dangerous working conditions; carrying out medical examination of the population for the purpose of early detection of oncological diseases and the main risk factors for their development; conducting sanitary and educational work on the formation of a healthy lifestyle, prevention [1,2,3,5,8,9].

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SYSTEM ANALYSIS AS A METHODOLOGY FOR THE STUDY OF MEDICAL AND ORGANIZATIONAL ASPECTS OF THE DIAGNOSIS OF MINERAL AND BONE DISORDERS SYNDROME IN ELDERLY PATIENTS

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Abstract. *The article presents a methodology for a systematic analysis of the provision of medical care to elderly patients with bone and mineral disorders. Elements of management schemes are proposed to achieve the practical implementation of the results obtained.*

Keywords: *syndrome of bone and mineral disorders, elderly patients, system analysis.*

The aging of the Earth's population is today a planetary trend, is the most important socio-demographic process, which is given the closest attention in most economically developed countries of the world. In this regard, for the Russian Federation, which entered the era of demographic old age back in the 20th century, it is relevant to solve the problems associated with an increase in the number of elderly people and the proportion of elderly people [Proshchaev K.I. et al., 2012, 2018; Burtsev A.K., Uiba V.V., Stasevich N.Yu., 2018; Sedova E.V., Paleev F.N., Startseva O.N., 2019].

According to the State Statistics Committee of Russia in 2020, pensioners accounted for 27.2% of the country's population, and the need for inpatient treatment of patients in this age group was 4 times higher than for the entire population.

Medical care for elderly and senile patients requiring emergency care is a

set of measures to provide diagnostic, therapeutic, preventive measures and requires appropriate material, technical, personnel, financial, organizational and methodological support.

The aim of the study was to select and substantiate the methodology for a systematic analysis of the quality of medical care for elderly patients with bone and mineral disorders.

Research methods: analytical, statistical, expert

Given the multicomponent nature of this type of assistance, we have chosen system analysis as the research methodology.

The methodology of system analysis involves the study of system indicators at the "input" and at the "output". This makes it possible to study both the change in indicators at the "input" (complaints presented by patients) and the change in indicators at the "output" (the final diagnosis at discharge in elderly and senile patients arriving for urgent indications).

Thus, the use of system analysis in the study of medical technologies used in medical and diagnostic work with elderly patients with urgent indications makes it possible to obtain objective data and identify leading complaints.

The study of complaints, anamnesis data, with which elderly patients were admitted to the emergency surgical department with a fixed syndrome of mineral and bone disorders (SMBS) and who required emergency hospitalization, involves the implementation of the following provisions:

– collection of information about complaints, anamnesis data upon admission of elderly patients to the emergency department and those with indications for emergency hospitalization;

– study of the institution in which assistance was provided;

– conducting an independent highly qualified examination of the information received;

– clarification of the final diagnosis at discharge, which included: main, complication of the main, concomitant diagnosis.

– development of ways to optimize the diagnosis of SMBS at the stage of the admission department for elderly patients, in order to achieve the fastest possible preliminary diagnosis (diagnostic hypothesis) before deciding on an urgent operation.

To accomplish this task, we have developed a "Map for the Study of the Management of an Elderly Surgical Patient with SMBS Coming to the Admissions Department".

Using the continuous sampling method, a statistical population was formed - patients with SMBS, in relation to which emergency care was provided. The unit of observation was each such patient.

A total of 285 patients were included in the study.

In order to study the risk factors for the development of SMBS and osteoporosis in elderly and senile patients, we subsequently conducted a population study of 3143 people attached to the outpatient departments of the basic clinics: SBHI SCOH named after. A.K. Yeramishantseva MDH, SBHI MO LRH No. 2, Lyubertsy.

The results obtained were subjected to expert evaluation and statistical processing, which made it possible to scientifically substantiate the compilation of algorithms for the actions of medical workers upon admission of elderly patients to the emergency department.

Along with the clinical issues of collecting complaints, clarifying anamnesis, studying the prevalence of risk factors for osteoporosis and fractures, as well as the main symptom that led to these disorders, SMBS, the study proposed elements of management schemes that allow for the practical implementation of the results obtained.

Based on improved software technologies for diagnosing CVRY in elderly patients admitted to the emergency department, improved methods for organizing its work, we have proposed a system of measures to improve the effectiveness of managing elderly patients.

In general, we consider the issue of improving the efficiency and management features of an elderly patient entering the admission department, including the use of a computer program, in the clinical and medical-organizational aspects.

The method of a systematic approach makes it possible to form and reorganize groups and subgroups of patients during the study, depending on the tasks of individual stages of the study. These data will be presented in the relevant sections of the dissertation.

Conclusion. The model developed by us for a comprehensive study of elderly patients with surgical SMBS allows us to conduct a detailed collection of material, ensure its adequate statistical processing and obtain reliable, evidence-based results.

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CLASSIFICATION OF FEATURES OF ADDITIVE TECHNOLOGIES IN THE MANUFACTURE OF ENGINE BUILDING PARTS

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Abstract. *The article discusses approaches for classifying the features of selective laser melting technology, main defects, in the organization of high-tech production of industrial gas turbine engines with an intelligent system of design and technological preparation to improve their functional characteristics.*

Developed based on expert assessment, the classifier of features of the technology of selective laser melting parts of industrial gas turbine units is part of the intelligent system for integrated design and technological preparation for the production of parts of industrial gas turbine engines.

Keywords: *additive manufacturing, selective laser melting, heat-resistant alloy, configuration.*

Introduction

Additive technologies make it possible to produce functional parts not only with complex spatial surface geometry, but also with a functional internal structure and geometry of cavities that cannot be obtained by other traditional methods. In this case, functionality of parts is provided as a unique ratio of strength, accuracy, and weight characteristics, as well as the ability to obtain gradient properties in terms of mechanical and thermal characteristics of parts. It caused by the directed action of laser energies and the topology of sintered layers.

However, additive technologies impose a number of limitations and increased requirements for design and technological preproduction and control of technological parameters and conditions for printing parts. The quality of printing is closely related not only to the features of powder metallurgy, but also to the

physical processes occurring in local and remote zones of melting (sintering) metal-powder compositions under the influence of concentrated energy sources (laser, electron beam).

The main requirements for products obtained by additive technologies are to ensure the specified quality parameters of functional products in terms of geometric accuracy, the state of the surface layer, phase composition, structure at micro-macro and mesolevels, as well as the requirements for the absence of defects in the form of non-melting of powders, residual porosity, thermal deviation.

The main limitations of additive technologies implementation are:

- lack of materials with the required characteristics and properties;
- lack of practice and qualifications in the field of design and preparation of product models for manufacturing by additive technologies;
- lack of knowledge and practice of determining the influence of technological parameters on the quality parameters of the product;
- unsatisfactory accuracy and quality: significant leashes (distortion of the shape) from the action of residual stresses, distortion of the product shape depending on the direction and orientation of the part during printing, ensuring the geometry of internal cavities and channels, high surface roughness and the complexity of its processing;
- thickness of the alloyed layer;
- limited values of mechanical properties.

Classification of features of additive technologies

The technology of selective laser melting (SLM) of domestic metal powders is one of the most accurate additive manufacturing technologies designed for products in the rocket and space industry.

One of the main limitations of additive technologies is porosity and cracks.

The pores are formed from the gas available in the building chamber and located between the particles of metal powder, which is obligated in the process of metal evaporation.

Cracks are formed due to the formation of martensite and residual stresses in the synthesized material, which is explained by the thermomechanical and metallurgical effects.

In accordance with the experience of the laboratory of additive technologies in the implementation of the technology of SLM of domestic metal powders in the manufacture of products in the energy, aviation and aerospace industries, the following types of defects are formed:

- non-compliance of roughness with the parameters of the technical specifications;
- porosity (gas, shrinkage) in the product metal;
- non-melting and discontinuities in the metal of the product;

- lack of geometric accuracy due to displacement of layers, warping, shape deformation relative to a given model;
- cracks (laminations) caused by local rupture of the material as a result of residual stresses;
- the presence of inclusions in the metal products;
- heat-stressed states.

In this work main SLM defects that occur during manufacturing process are presented and description.

1. Metal powder shape defects:

- small particles of metal powder combined into larger formations by adhesion, interparticle cohesion, setting, sintering or fusion.
- an agglomerate of two or more particles joined by diffusion sintering in the process of obtaining powders or as a result of an additive manufacturing process.
- an agglomerate of two or more particles joined by fusion in an additive manufacturing process. As a rule, the melt gets into the loading batch of material from the used powder.

2. Surface defects:

- a defect in the form of metal powder particles of fine fractions, diffusion connected with larger particles as a result of the collision of semi-liquid drops during melt spraying.
- a surface defect in the form of a recess from the chipping of foreign inclusions or the opening of a gas bubble, having an elongated or dotted shape.
- surface defect in the form of a longitudinal narrow depression or protrusion.
- delamination: a surface defect in the form of discontinuity in the metal, oriented along the direction of deformation.
- crack: A surface defect that is a break in the metal.

3. Pores:

- a discontinuity in the material of a powder particle, which is a cavity of arbitrary shape and size.

Open pore: a discontinuity in the material of a powder particle that is topologically related to the surface of the particle (having access to the surface of the particle).

Isolated (internal) pore: a discontinuity in the material of a powder particle that is topologically unrelated to the particle surface (has no outlet to the particle surface).

Gas pore: discontinuity formed by gases trapped in a drop of melt during its crystallization.

4. Incompatibility:

- nonconformity of the chemical composition: excess of the content of normalized impurities in the control sample relative to the standards and / or deviation of the main components in excess of the allowable limits specified in the

regulatory or technical documentation.

- inhomogeneous composition: a defect characterized by an uneven distribution of base and alloying elements in the bulk of the material.

- fractional composition discrepancy: deviation of the particle size distribution during the incoming control of the powder, performed by the same control methods that are specified in the manufacturer's regulatory or technical documentation.

- Technological properties discrepancy: deviation of technological properties from the allowable limits specified in the regulatory or technical documentation.

Table 1 shows the types of defects in parts that occur during their SLM production, quantitative and qualitative indicators of defects and the possible causes for their formation.

Table 1

SLM defect classes in parts manufactured

SLM defect classes	Type of SLM defect	Quantitative and qualitative indicators	Possible causes for their formation
I	Material discontinuity - crack (surface, internal, through)	The size of the defect in plan. Depth and direction of the crack. The location of the crack on the part	Crystallization stresses
	Material discontinuity - shell, accumulations of large pores	The size of the defect in plan. Depth	Local non-penetration of the layer, violation of the dosage of the powder
II	Microporosity of the material (local zone or distributed throughout the volume of the part)	Share of volume Vp, %	Shrinkage processes, capture of molecules (nitrogen, argon) during synthesis
III	Increased degree of stress-strain state of the metal	Tensile strength σv, MPa	Residual stresses
IV	Increased surface roughness of the part	Height of profile irregularities by ten points Rz, μm	Narrow range of optimal laser synthesis parameters

Results discussion

The main sources of defects are:

- chemical-physical properties of the material (I1);
- inaccuracies and failures in the installation of additive manufacturing (I2);

- errors in creating digital geometric models (I3);
- software inaccuracies and failures (I4);
- errors in the selection of technological parameters (I5);
- printing strategy selection errors (I6);
- errors in the selection and assignment of supporting structures and heat sinks (I7);
- inaccuracies in the location of the part on the build platform (I8).

Taking into account that the same defect from Table 1 can occur for different reasons, the concept of "probability" was introduced, which is associated with the source of this defect. An expert carries out the determination of the probability. In the work, a database of defects in the technology of selective laser melting of domestic powder materials was created in the manufacture of parts for the energy, aviation and aerospace industries based on Table 2. For each class of defects, the database contains information about the source of occurrence, the probability of occurrence, and a description. Each defect from the corresponding class is assigned its own number and attribute.

Table 2

Base of defects of SLM technology

Name of defects	Identification	Source of defects occurrence	Description	Probability
Surface crack	D01	I5	Surface defect, which is a break in the material along the direction of deformation	0,3
		I1		0,8
		I3		0,7
Crack through	D02	I2	Surface defect, which is a break in the material	0,95
		I1		0,8
Sink	D03	I1	Surface defect in the form of an indentation from foreign inclusions or opening of a gas bubble	0,9
		I5		0,3
Accumulation of large pores	D04	I1	Powder particle material discontinuity associated with particle surface	0,7
		I7		0,4
		I5		0,5
Material microporosity	D05	I1	Discontinuity of the material of the powder particle, not associated with the surface of the particle (has no exit to the surface of the particle	0,7
		I5		0,5

Increased degree of stress-strain state of the metal	D06	I3	Residual stress, shape deformation and buckling	0,9
		I5		0,5
		I7		0,6
		I8		0,6
Increased surface roughness of the part	D07	I5	Height of profile irregularities	0,8
		I6		0,7
		I1		0,3

Based on the results of assessing the quality of blanks for products made from the heat-resistant alloy by the method of selective laser melting, obtained during research, preliminary tests, it can be concluded that the characteristic defects of the SLM technology in the implementation of a complex standard technology for the additive production of parts and assemblies of the hot part of industrial gas turbine engines are the following defects:

- 1st class: surface crack;
- 3rd class: microporosity distributed throughout the entire volume of the material;
- 4th class: increased roughness.

Conclusion

The article discusses approaches to classifying the features of selective laser melting technology in the form of defects in the organization of high-tech production of industrial gas turbine engines with an intelligent system of design and technological preparation to improve their functional characteristics.

Developed based on expert assessment, the classifier of defects in the technology of selective laser fusion of parts of industrial gas turbine units is part of the intelligent system for the integrated design and technological preparation for the production of parts for industrial gas turbine engines.

Acknowledges

The work was financially supported by the Ministry of Education and Science of Russia as part of a comprehensive project to create high-tech production on the topic: “Organization of high-tech production of industrial gas turbine engines with an intelligent system of design and technological preparation to improve functional characteristics” (Grant Agreement No. 075-11-2021-042 dated June 24, 2021).

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CLASSIFICATION OF THE GEOMETRIC COMPLEXITY OF PRODUCTS MANUFACTURED BY SELECTIVE LASER MELTING TECHNOLOGY

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Abstract. *The article describes approaches to the classification of products that manufactured by the technology of selective laser melting during the organization of high-tech production of industrial gas turbine engines with an intelligent system of design and technological preparation to improve their functional characteristics.*

The classifier of the geometric complexity of products, developed based on an expert assessment, is part of the intelligent system for the integrated design and technological preparation of the production of parts for industrial gas turbine engines.

Keywords: *additive manufacturing, selective laser melting, heat-resistant alloy, configuration.*

Introduction

The development of additive technologies in the production of industrial gas turbine products is focused on three main areas:

for obtaining innovative products: products with new properties and behaviors, increased functional properties, expansion of applicability, increase in resource and reliability, durability;

- manufacturing optimization: reduction of the technological chain, production time and energy consumption;

- production of equipment and tools: printing of master models, casting molds, tools.

The criteria for making decisions on the possibility of manufacturing a product using selective laser melting are:

- weight reduction for large parts;
- combination of parts (joint parts), reduction of assembly restrictions;
- achievement of specific characteristics (in comparison with castings);
- the possibility of bionic forms (effective use of the material).

To organize a quality management system for the additive manufacturing of industrial gas turbine products, it is necessary to determine the complexity of structures and design by categorizing and classifying the geometric complexity, functional purpose of aerospace products according to several parameters: material, properties, service life (resource). This database as classifier should be included in the intellectual system of integrated design and technological preparation for the production of parts for industrial gas turbine engines.

To define a constructive complexity is considered the expert method. The main task of the design and technological preproduction of additive manufacturing is to determine the criteria for the complexity of the geometry of the product for making decisions on the choice of technological parameters, determining the labor intensity and cost of manufacturing.

In this work, the object of design and technological preparation of additive manufacturing is the assembly unit "Burner device". Figure 1 shows the technology of selective laser melting (SLM) of metal powder of high-temperature alloy. This design consists of four main parts: housing, swirler, nozzle bushing, nozzle.

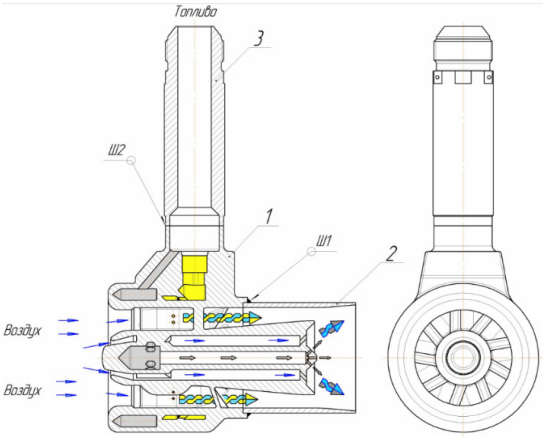

Figure 1. *The design of the assembly unit "Burner device", optimized for the SLM method*

Classifier description

The assignment of parts to a particular group of complexity can be performed according to the following criteria:

- the first group - elongated parts such as bodies of revolution. The ratio of length to diameter of such parts is greater than one;
- the second group - details like gas turbine disks;
- the third group - simple in configuration box-shaped flat parts;
- fourth group - closed box-type body parts;
- fifth group - large and heavy box-shaped parts (bearing structures).

To determine the complexity factor of a product, it is necessary to determine and evaluate its configuration, namely the number of structural elements that ensure the complexity of the design itself.

To determine the criteria for the complexity of aerospace products manufactured by selective laser melting technology, the following parameters in the Classifier are used:

- *images* of the structure (views, sections, sections, remote elements). So a detail of a complex configuration has many different construction elements: stepped surfaces, holes, grooves, rounding radii, chamfers, stiffeners, etc., which, in turn, increases the number of views, cuts and sections, remote elements;

dimensions for the manufacture and control of the product. Precise seating surfaces, precise guide surfaces, etc. cause the application of a large number of sizes;

tolerances of the shape and location of surfaces, the basis for the manufacture and control of the product. Simple designs of assembly units and parts do not have exact tolerances for the shape and location of surfaces, and for complex ones, it is necessary to apply a large number of bases, tolerances for the shape and location of surfaces;

surface roughness. For assembly units with a large number of machined surfaces, it is necessary to apply a large number of surface roughness designations.

Four groups (classes) of complexity of aviation and aerospace products manufactured by additive technologies were determined by the expert method based on the analysis of the above parameters. The description of the complexity groups and the value of the complexity coefficients are presented in Table 1.

The main indicators of the complexity of the geometry of the product is the complexity of the design and execution of design documentation, which depends on the number of dimensions that are controlled and thereby determine the configuration of the product.

Table 1

Categories of complexity of products manufactured by additive technologies

Group (class) of complexity	**Description**	**Indicator of complexity**
1	2	3
I	Details of simple shapes that do not require complex CAD / CAE calculations, auxiliary elements in the design of the product. The specification contains a small number of items. For example, bushings, simple levers and brackets, housings, etc. Material: stainless, tool steels	1,0
II	Details of simple shapes, having several working surfaces, protrusions or depressions that do not require special CAD / CAE calculations. The specification contains a small amount positions, the presence of notes indicating the selection, permissible replacement of components. For example: flanges, brackets, housings, etc. Material: aluminum alloys	1,2
III	Details of complex shapes with a combination of straight and curved working surfaces that require CAD / CAE calculations for their design. Assembly units, including cast and welded hull and non-hull parts with a straight and curved surface, assembly units operating under pressure, high temperatures. Assembly units, the design of which is associated with design calculations, but does not require search work. The specification contains a large number of positions, an indication of the zones, the presence of notes indicating the selection, the permissible replacement of components. For example: flame tube, swirler Material: high temperature alloys, materials with special properties	1,5
IV	Details of complex shapes with a large number of measurements and mating surfaces that require special CAD / CAE calculations, taking into account increased requirements in determining tolerances. Assembly units containing complex surfaces and structural elements that require calculations of a large number of mating dimensions, having cast and welded elements of complex configuration. Assembly units, the design of which requires partial search work with test work.	2,0

	The specification contains a large number of positions, an indication of the zones, the presence of notes indicating the selection, the permissible replacement of components. For example: assembly unit «Burner device», topologically optimized bracket Material: high temperature alloys, titanium alloys	

In general, the complexity criterion for a product manufactured by additive technologies can be represented as a one-dimensional matrix 1:

$$Q(x) = \{\alpha_1 q_1(x), \alpha_2 q_2(x), \ \ldots \ \alpha_n q_n(x)\} \quad (1)$$

where q_n – local criteria characterizing the configuration of the product: the criterion of elementary surfaces; criterion of straight lines, criterion of interpolation curves; form constraint criterion; criterion for surfaces obtained by rotating a curve around an axis; criterion for surfaces obtained by moving a curve along a guide curve, etc..; α – weighting factor for the local criterion.

The characteristic that defines the characteristic is a method of searching and calculating. The local complexity criterion of product complexity $q_n(x)$ can be represented as dependence 2:

$$q_n(x) = F(D_i, WD_i, C) \quad (2)$$

where D_i – characteristic of local complexity criterion, WD_i – interval, C – category.

Method for determining a local complexity criterion:

Analysis *.step product file: definition of D_i according to the relevant indications L_{ij} according to dependency 3:

$$D_i = \sum L_{ij} \quad (3)$$

So, for example, if as a characteristic of a local criterion q_1 select D_i – the number of dimensions of elementary surfaces, then we will take into account the following features L_{ij}:

L_{11} – sign of planes in the geometry of the product;

L_{12} – sign of spherical surfaces in product geometry;

L_{13} – sign of solid cylinders in the product geometry.

2) Based on the characteristics D_i and the table of intervals WD_i the complexity category C is determined for each local criterion q in accordance with dependence 4:

$$WD_i[C]=D_i$$
$$D_iC_j=[\min D_iC_j \ldots \max D_iC_j] \quad (4)$$

Table 2 of intervals for each characteristic is determined by an expert based on the experience of the work of the laboratory of additive technologies, and is a two-dimensional matrix D_iC_j.

Table 2

Boolean values of local complexity criteria

Boolean values of local complexity criteria	Value
Elementary	1
Very simple	2
Simple	3
Normal	4
Moderate	5
Complex	6
High complex	7
High	8
Definitely high	9
Indefinitely high	10

Result discussion

The definition of intervals WD_i is carried out in accordance with the following algorithm:

- choice of characteristic assembly units;
- expert analysis of assembly units;
- grouping of unique details;
- calculation of the characteristics of the complexity of the part;
- calculation of the table of part intervals: for example, for category 1 of complexity in accordance with dependence 5:

$$\min D_iC_1=\min D_i(C_1);\ \max D_iC_1=\max D_i(C_1);$$
$$\min D_iC_j=\max D_iC_{j-1}+1;\ \max D_iC_j=\max D_i(C_j),\ j=[2-9]; \quad (5)$$
$$\min D_iC_{10}=\max D_iC_9+1;\ \max D_iC_{10}=\min D_i(C_9)\cdot S;$$

where S – uncertainty factor, S =1,5.

- calculation of a single criterion of complexity for a part;
- calculation of complexity characteristics of the geometry of assembly units;

- calculation of the table of intervals of assembly units.

The assembly unit "Burner device" was chosen (Figure 2). This Part was assigned the ninth level of difficulty category.

Figure 2. *Burner device*

Assembly unit "Burner device" consists of four parts: housing, swirler, nozzle sleeve, nozzle. At the same time, these details have different levels of complexity:

- housing – local complexity criteria (difficulty level): 7;
- swirler - local complexity criteria (difficulty level): 8;
- nozzle – local complexity criteria (difficulty level): 4;
- nozzle sleeve - local complexity criteria (difficulty level):3.

The proposed categorization of aerospace products manufactured by additive technologies makes it possible to more accurately determine the labor intensity, typical technological solutions and production costs in accordance with the accepted quality management system.

Conclusion

The article describes an approache to the classification of products manufactured using the technology of selective laser melting in the organization of high-tech production of industrial gas turbine engines with an intelligent system of design and technological preparation to improve their functional characteristics. 4 classes and 9 levels of product complexity are determined by the expert method.

The "Burner Device", manufactured by the selective laser melting, is assigned to the 9th level of complexity by local complexity criterion and the 4th class: details of complex shapes with a large number of measurements and mating surfaces that require special CAD / CAE calculations, taking into account increased requirements in determining tolerances, containing complex surfaces and structural elements that require calculations of a large number of mating dimensions, having cast and welded elements of complex configuration with test work.

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APPLICATION OF THE NANOFILTRATION METHOD AT WATER TREATMENT STATIONS FOR PURIFICATION OF THE SCENTAGE FOR SLUDGE DEHYDRATION

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Abstract. *Experiments on the purification of centrate (silt water) after sludge dehydration at the Eastern Water Treatment Plant are described. It is shown that the use of a membrane plant makes it possible to obtain purified water and ensure an effective reduction in such indicators as COD, aluminum concentration, and oxidizability to standards below the requirements for drinking water. Experimental curves are presented that make it possible to select membranes at each stage and predict the composition of purified water at each purification stage. A technology is presented not only for water purification, but also for the utilization of the membrane plant concentrate, which is sent to the inlet to the sediment thickener. Based on the results of experimental data processing, a balance diagram of the process of sludge dehydration with centrifuge purification at a membrane plant is presented, according to which all impurities removed by membranes are removed together with the sludge.*

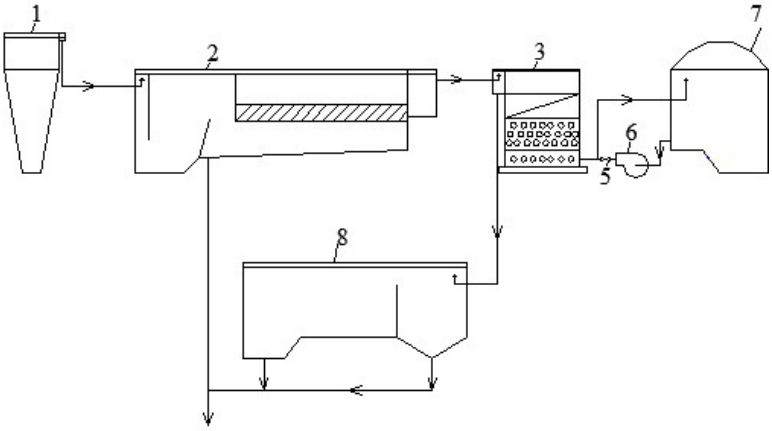
Keywords: *wastewater treatment, application of membrane devices, nanofiltration, sludge dehydration.*

1. Introduction

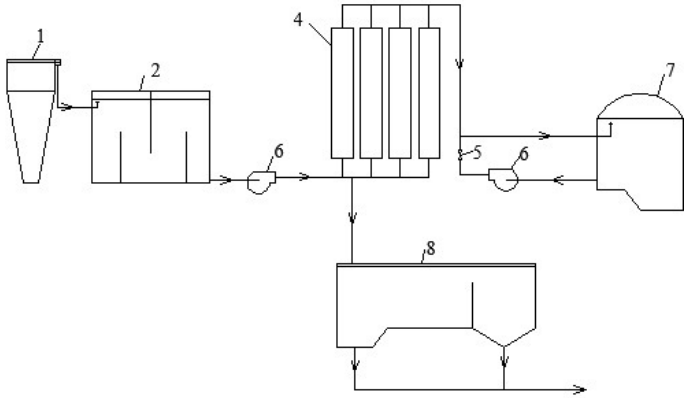
When building new residential facilities, it is often necessary to solve the problems of drinking water supply from sources with a high content of

anthropogenic pollution (pesticides, organochlorine pollution, etc.). Of particular difficulty is the fact that water purification systems have their own effluents, the volume of which can be from 2 to 15 percent of the total consumption of treated water (the so-called "water consumption for the station's own needs"), containing all the pollution removed from the water. "Water consumption for own needs" of water treatment plants is an important environmental parameter that characterizes the efficiency of industrial enterprises. Despite the mandatory "circulation of rinsing water" at drinking water treatment plants from surface water sources, a number of wastewaters are traditionally discharged into the sewer. This is due to the complexity of wastewater treatment after compaction and dehydration of sludge from wastewater treatment plants.

For example, only at the Moscow water treatment plants 25 tons of sludge is formed (in terms of dry matter) per 1 million cubic meters. meters of drinking water. Every year Moscow consumes 1.2 billion cubic meters of drinking water prepared from surface water sources, which leads to the formation of 35 thousand tons of sediment per year. The sludge can be disposed of by dehydration. However, the moisture content of the dehydrated sludge is in the order of 80%. When the sludge is dehydrated, silt water or centrate is formed, which is about 2% of the total volume of treated water. 30 million cubic meters meters per year of purified water (this is the approximate amount of water treated by Moscow's waterworks) gives 2 percent of untreated sludge water, that is, 4000 cubic meters of water per hour. This amount of water is equal to the capacity of an average water treatment plant.



(a)



(b)

Figure 1. *Schemes of sediment formation at stations for the preparation of drinking water from surface water sources and circulation of wash water: a) - at stations using a scheme with coagulation and settling; b) - at stations using the ultrafiltration method. 1 - mixer; 2 - sump; 3 - fast filter; 4 - ultrafiltration membrane devices; 5 - switching valve; 6 - flushing pump; 7 - clean water tank; 8 - sediment compactor*

At three Moscow water treatment plants, water sludge is discharged into the city sewer for further processing at treatment facilities together with sewer sludge. At the Vostochnaya Station, until recently, the treatment of water sludge was carried out by natural drying on sludge beds. Silt water was discharged into natural reservoirs. The composition of runoff depended on the composition of the sediment, weather factors, and the groundwater regime in the surrounding areas.

A mechanical sludge dewatering system has now been introduced at the Vostochnaya Station. The operation of sludge treatment facilities is based on the principle of sequential mechanical thickening, first in gravity thickeners, then on drum thickeners, and then - mechanical dewatering in centrifuges to a design moisture content of 80 percent. A flocculant is introduced at all stages of sludge treatment. As a result, a sludge is formed, ready for removal and disposal at landfills. However, the sludge water formed after compaction and dehydration of the sludge, which is 2% of the volume of treated water, is discharged into the sewer. This is due to the high content of various contaminants in the centrate (organic substances, aluminum, bacterial contaminants, etc.), which makes it impossible to turn this water and mix it with the source water.

The use of flocculants to reduce the moisture content of the sludge has been studied for a long time by the specialists of JSC "Mosvodokanal" [1]. The most encouraging results were obtained using the "Praestol-TR-650" flocculant at a dose of 10 kg per ton of dry matter. When using this flocculant to improve sludge compaction, the best ratio of sludge moisture and centrate quality was obtained. At the same time, the quality of water after sediment compaction had the following indicators:

Turbidity - 68 mg/l (in various samples from 25 to 170 mg/l)

Color - 78 degrees (in various samples from 30 to 210 mg / l)

Oxidability - 35.2 mg/l

Al^{3+} - 28 mg/l (in various samples from 11 to 63 mg/l).

But, due to constant fluctuations in the quality of the water supplied to the pilot plant, it was not possible to assess the dependence of the quality of the filtrate on the dose of coagulant used. The best indicators of the quality of purified water in the purification of centrate after sludge treatment were:

- Turbidity - 0.6 -2.1 mg/l;

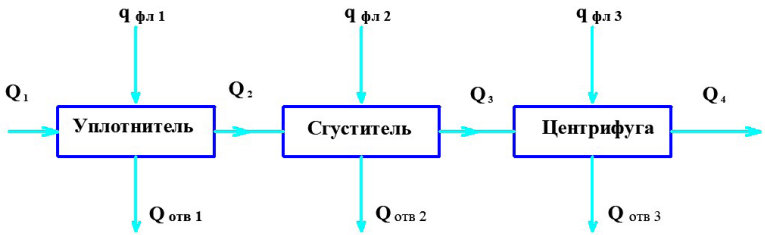
Oxidability - 6.9 - 8.0 mg/l;

-Al^{3+} - 0.05 - 0.17 mg/l

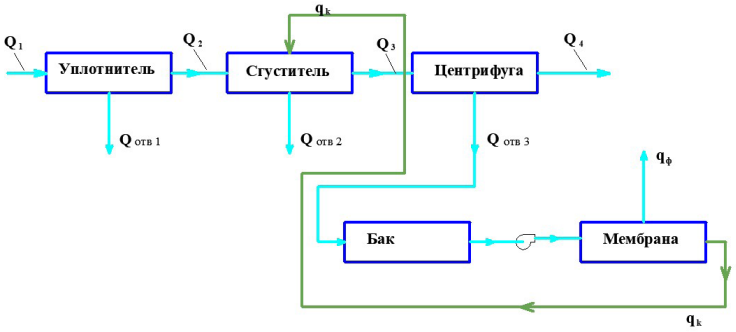
Mn - 2.5 mg / l (exceeds the standard by 38 times)

In addition, centrate contains arsenic, nickel, mercury, lead.

The principles of wastewater treatment during sludge compaction and dehydration are shown in fig. 2(a). Effluent from the compactor and thickener is sent to the circulating system VWTS (Vostochnaya water treatment station). Effluent after the final stage of centrifugation (centrifuge) is sent to the sewer system. The bulk of wastewater is formed at the stage of compaction and thickening. The effluents obtained at these stages are supposed to be mixed with the filter wash water, subjected to chemical treatment and directed to the "head" of the facilities, mixing in a combination of 1: 3 with the filter wash water.



(a)



(b)

Figure 2. *Scheme of sludge treatment at the Vostochnaya Station (a) and proposed scheme of centrifuge treatment (b): Q1 - volume of initial sludge from settling tanks; Q2 - volume of dehydrated sludge supplied to the thickener; Q3 is the volume of thickened sludge fed to the centrifuge; Q4 - volume of dehydrated sludge; Qotv 1 - the volume of supernatant liquid removed from the compaction stage; Qotv 2 - the volume of discharged effluents from the thickening stage; Qotv 3 - the volume of centrifuge discharged from the centrifuge; qfl - volume of flocculant solution for compaction; q fl2 - volume of flocculant solution for thickening; qfl3 - volume of flocculant solution for dehydration; q f - permeate consumption of the membrane unit; q to - the consumption of the concentrate of the membrane installation.*

1.1 Nanofiltration method

The purpose of this work was to study the possibility of using membrane technologies for centrifuge purification and utilization of the membrane plant concentrate. The use of reverse osmosis membrane technologies for the treatment of natural and waste waters has been carried out over the past 40 years [2]. In recent years, interest has increased in nanofiltration as a method of preparing drinking water from surface water sources [3–6], due to the high efficiency of retention by these membranes of organic substances that form water color [7, 8]. Due to the "universality" of membranes in retaining organic substances of various nature and molecular weight, reverse osmosis and nanofiltration membranes are already widely used in the processes of post-treatment of domestic wastewater for the purpose of their reuse [2–8]. In addition, due to the different selectivity of membranes (retention efficiency) for monovalent and multivalent ions, as well as organic substances, separation of solutions and separation of various components from solutions are used in the processes of industrial wastewater treatment [7–23]. And, finally, thanks to the development of nanofiltration membranes, it became

possible to deep multiple concentration of waste brines, effluents and concentrates for the purpose of their further utilization [19–21]. In particular, there is a lot of information on the use of nanofiltration for purification of centrifuges after dehydration of mineralized sediments of natural and waste waters [9–20]. The authors of this article have already conducted research at the REC MSUCE on the basis of the Department of W&S on the use of reverse osmosis and nanofiltration processes not only for the purification of centrifuges (silt water) for the dehydration of sewage sludge and the treatment of filtrates from solid waste landfills [24], but also for the disposal of concentrates from membrane plants and removal of all contaminants retained by the membranes together with the dehydrated sludge [25,26].

The new development consists (Fig. 2, b) in the use of a membrane plant for centrate purification and guaranteed production of high-quality purified water. The concentrate from the membrane plant is returned to the tank.

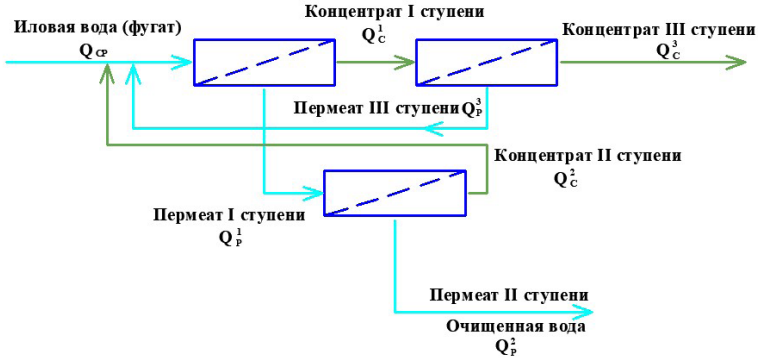


Figure 3. *Scheme of connection of membrane devices and direction of the main flows of permeates and concentrates*

An installation based on reverse osmosis membranes and nanofiltration (Fig. 3) for centrifuge purification after sludge dehydration in a centrifuge operates according to a two-stage scheme [24, 25]. On fig. 3 shows the connection diagram of the membrane apparatus and the direction of the main flows of permeates and concentrates. The cascade connection of nanofiltration devices at the first stage makes it possible to achieve high values of the concentration ratio K of the membrane unit and the minimum concentrate flow rate [26]. The use of reverse osmosis membrane devices at the second stage of purification makes it possible to reduce the concentration of organic substances in the water treated at the second stage and increase the productivity of purified water [24].

2. Experimental part: materials and equipment

The purpose of the experiments was to study the purification of the centrate and obtain clean water and a concentrate containing all the removed contaminants.

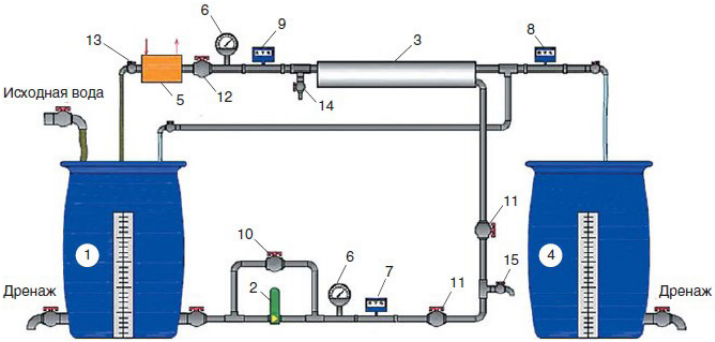


Figure 4. *Experimental setup for determining the operating parameters of membranes in the separation of MSW filtrate*
1 - source water tank; 2 - pump; 3 – membrane element in the pressure vessel; 4 – filtrate tank; 5 – heat exchanger; 6 - manometer; 7–9 – flow meters; 10 - bypass valve; 11 - valve for adjusting the flow of source water; 12 - valve for adjusting the working pressure and concentrate flow; 13 - valve for adjusting the flow of cooling water; 14, 15 - samplers

The experimental setup is shown in Fig.4. The volumes of water (fugate and permeate) were 20 liters each. The source water was placed in the source water tank 1, from where it was supplied by pump 2 to the membrane apparatus 3, in which it was separated into permeate (purified water) and concentrate. The concentrate was returned to tank 1 and the permeate was sent to tank 4. The Procon rotary pump used was 180-200 liters per hour at a pressure of 16 bar. The experiments were carried out using serial membrane elements of the 1812 standard model produced by the Korean company CSM with reverse osmosis membranes of the BLN model (selectivity for salts of 95-96%) and nanofiltration elements of the model with membranes of the 70 NE type with a selectivity of 70%). The area of the membranes in the membrane apparatus model 1812 was 0.5 square meters. As the permeate accumulated in tank 4, the volume of initial water in tank 1 decreased, while the concentrations of contaminants - dissolved salts and organic substances, generally estimated by the COD indicator - increased, and the productivity of the membrane apparatus for purified water decreased. The experiments made it possible to determine the effectiveness of the retention of various contaminants by the membranes and the performance of the membranes for the development of the installation.

The experiments consisted in the operation of the experimental unit in the circulation mode, in which the operation of membrane apparatuses at the first and second stages was simulated (Fig.3). At the same time, indicators of membrane selectivity for various impurities and membrane productivity were determined depending on the filtrate yield of the installation at each stage (the ratio of the permeate flow rate to the flow rate of the initial water entering the membrane apparatus Qp/Qi). In the course of the experiments, the dependences of the efficiency of water treatment for various contaminants on the value of K were determined, which is the ratio of the volume of source water to the volume of concentrate in the tank at the end of the experiment and is called the concentration coefficient or the coefficient of reduction in the volume of source water in the membrane installation. The value of K corresponds to the indicator of the permeate output of the installation, which is equal to the ratio of the permeate flow rate to the flow rate of the source water Qp/Qi, by the ratio: Qp/Qi = 1-1/K .

At the first stage of the experiments, the operation of the devices of the first stage of the membrane installation was simulated (Fig. 3), while during the experiment the volume of the initial water decreased from 20 l to 0.5 l. At the second stage, the permeate of the first stage (volume 16 l) was placed in tank 1 and the experiment was repeated. At the second stage, a membrane apparatus with low-pressure reverse osmosis membranes was used.

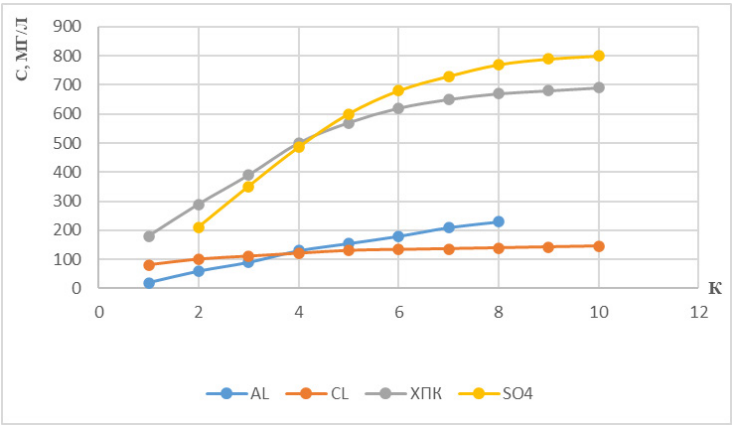
3. Experimental results

The results of the experiments are presented in Table 1 and in fig. 5.6. the concentrations of pollutants are shown, as well as the dependences of selectivity (Fig. 7) on K , allowing the calculation of installations. On fig. 8 shows the change in the performance of nanofiltration and reverse osmosis membranes during the experiment depending on the value of K.

Table 1.

Results of determining the concentrations of various contaminants in the source water, permeates, and membrane concentrates at different purification stages.

№	Indicators (Solutions)	COD, mg/l	Al^{3+}, mg/l	SO_4^{2-}, mg/l	Cl^{-1}, mg/l	Oxidizability, mg/l
1	Initial centrate	158	8	75	90	21
2	Permeate □ steps	19,8	0,42	9,0	65	6,7
3	Permeate □ steps	13,5	0,016	0,475	9,7	3,1
4	Concentrate	650	18,1	702	480	49



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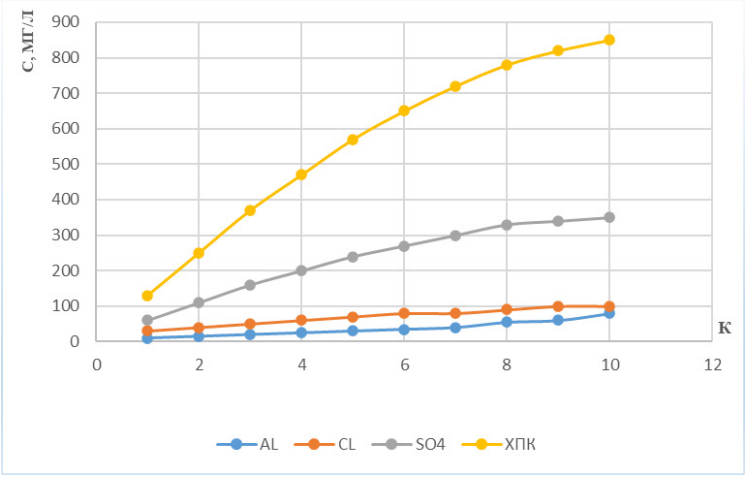

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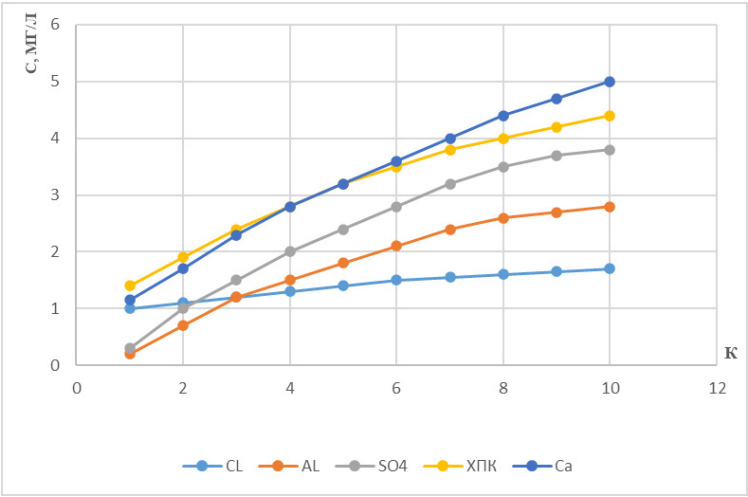
Figure 5. *Dependences of concentrations of aluminum, calcium, chlorides and sulfates, as well as COD values on K in concentrate (a) and permeate (b) of the first stage of the installation with nanofiltration membranes*



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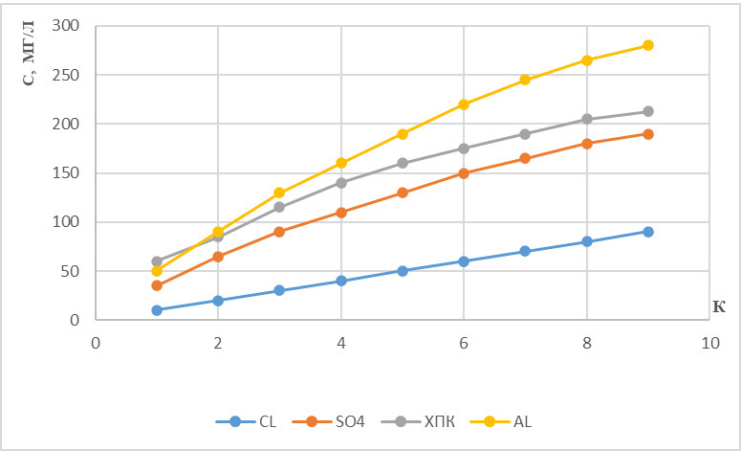

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Figure 6. *Dependences of the concentrations of aluminum, calcium, chlorides, sulfates, as well as COD values on the K value in the permeate (a) and concentrate (b) of the second stage of the membrane unit with reverse osmosis membranes*

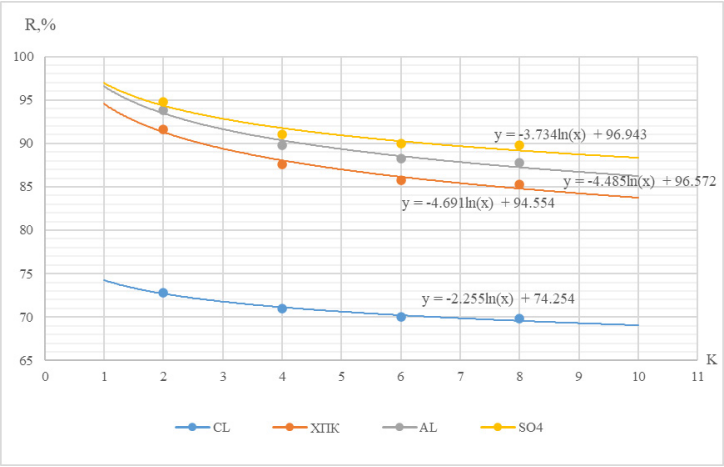

Figure 7. *Dependences of the value of selectivity R for aluminum ions, chloride ions, sulfate ions and for the value of COD from K*

Depending on the composition of the centrate, the quality of purified water can be determined.

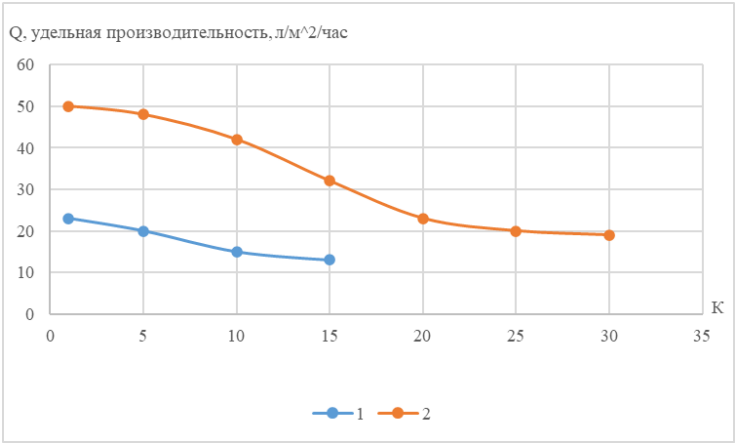

Figure 8. *Change in the value of the specific productivity of nanofiltration and reverse osmosis membranes during the experiment depending on K*

Based on the results obtained, membrane types and plant parameters can be determined. The processing of the results made it possible to determine the

dependencies of the selectivity of membranes for various ions and contaminants. As can be seen from Fig. 7, the dependence of the selectivity of the 70 NE membrane on the value of K has the form of a natural logarithmic function, which facilitates calculations for predicting the quality of purified water at different stages of purification [26].

The balance diagram of the process compiled according to the results of the experiment is shown in fig. 9. Based on the balance calculation, the required flow rate of the plant filtrate and concentrate, as well as the concentration of salts in the plant concentrate returned to the receiving tank of the sludge thickener, with a plant filtrate output of 0.95, were determined. Purified water can be added to purified drinking water or used as industrial water (in boilers, etc.). Preliminary feasibility studies show that for the case of using the developed membrane plant in the sludge dewatering shop of the Eastern Water Treatment Plant and the centrate flow rate is 20 cubic meters per hour, the use of the developed technology at a cost of 200,000 rubles/m^3 per hour allows you to fully utilize the waste water of the waterworks and get a high economic effect compared to discharging the centrate into the city sewer.

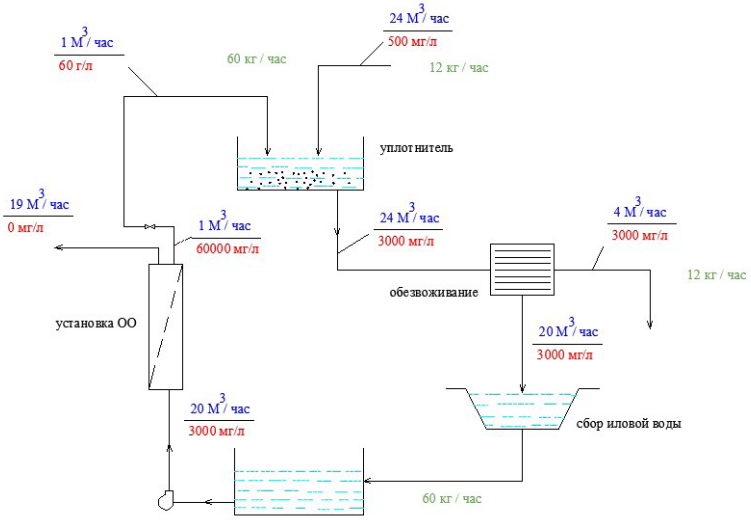

Figure 9. *Balance scheme for sludge treatment and centrate purification*

Conclusions:

1. A technology has been proposed that allows obtaining a stable cleaning effect, despite fluctuations in COD, oxidizability, and aluminum.

2. For purification of centrate after sludge dewatering by reverse osmosis, a two-stage scheme can be effectively applied to achieve the purification effect.

3. Analysis of the cost of discharge to the sewer shows that the application of treatment technology pays off.

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THE USE OF MEDICINAL-TECHNICAL AND SPICY-AROMATIC PRODUCTS IN THE TECHNOLOGIES OF TEA AND TEA DRINKS

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Abstract. *The article provides an overview of functional drinks based on tea; their useful functional properties are considered and analyzed depending on the raw materials used; the classification of this type of drinks is proposed; the relevance of the use of medicinal-technical and spicy-aromatic raw materials in the technology of tea and tea drinks is substantiated.*

Keywords: *tea, tea drink, functional drink, medicinal and technical raw materials, spicy aromatic raw materials, technology.*

Functional drinks are the most convenient, affordable and preferred form of enrichment of the human body with various micronutrients. The actual direction in the development of functional drinks is the use of medicinal-technical and spicy-aromatic raw materials [1]. These types of raw materials are characterized by a high content of physiologically important native micronutrients with pronounced biological activity, and allow the production of drinks with a wide range of effects: soothing, anti-stress, tonic, dietary, stimulating mental activity; stimulating the work of the gastrointestinal tract; improving the functioning of the cardiovascular system; strengthening immunity and others. This is the rationale for the relevance of the use of medicinal and technical and spicy aromatic raw materials in the technology of tea and tea drinks. [2]

To date, many recipes for functional tea-based drinks have been created. These drinks are blends of tea and medicinal-technical and spicy-aromatic plants, which have a beneficial effect on the body and contribute to the prevention of various diseases, and are also combined in organoleptic properties. [3]

According to the functional purpose, tea-based drinks are usually divided into three groups: daily household, preventive and therapeutic.

The composition of everyday household drinks includes medicinal-technical and spicy-aromatic raw materials, which are characterized by a high content of biologically active substances and microelements. They have a pleasant taste and aroma, have a positive effect on digestion, and stabilize metabolic processes. Everyday household drinks are classified as multivitamin, tonic and soothing.

The composition of multivitamin drinks includes plants rich in vitamins: fruits - sea buckthorn, wild rose, strawberries, black currants; leaves - strawberries, black currants, etc. This raw material stimulates the metabolism and favorably affects the immune system.

Tonic drinks are made from raw materials containing biologically active substances that stimulate the activity of the central nervous system, have a beneficial effect on the liver, endocrine glands, help regulate blood sugar levels, pressure, relieve fatigue, increase mental activity and physical performance. This raw material includes berries and leaves of blueberries, lingonberries, as well as thick-leaved bergenia, rosea rhodiola, narrow-leaved fireweed, soflorous leuzea, creeping thyme (thyme), Chinese magnolia vine, high zamaniha and other herbs.

Soothing drinks are made from raw materials that relieve tension, irritability and have a beneficial effect on sleep. It includes sweet clover, lemon balm, peppermint, oregano, blackberry leaves, hawthorn, spring adonis, marsh belozor and other plants.

Prophylactic drinks are obtained from raw materials that have a strict focus on specific organs and systems. They can be anti-inflammatory, antimicrobial, antispasmodic, antisclerotic, etc. For example, the composition of the anti-sclerotic tea drink includes the leaves of wild strawberries, raspberries; white rose petals; herbs of horsetail, motherwort, St. John's wort; sea buckthorn, white mistletoe and other plants.

Medicinal drinks have an even more pronounced therapeutic effect on the body. These include choleretic, emollient, expectorant, antimicrobial, anti-inflammatory, tonic, wound healing and hemostatic. These drinks are characterized by a lower content of potent substances.

For example, an anti-alcoholic tea drink has been created - a multicomponent composition of medicinal plants, which includes tansy, sage, wild rose, hawthorn, lingonberry leaf), as well as biologically active substances of natural origin, potassium, magnesium, copper, iron, zinc and vitamins group B. A drink based on this blend has the following therapeutic effect:

1. lowering the primary craving for alcoholic beverages;
2. neutralization of toxins;
3. elimination of vegetative disorders;
4. improved appetite;
5. sleep improvement;
6. providing a general strengthening effect.

There is also an anti-nicotine drink - a multicomponent composition of medicinal and technical raw materials, which includes tansy, calendula, elecampane, licorice, St. John's wort, biologically active substances of natural origin, potassium, magnesium, copper, iron, zinc and B vitamins. This blend is effective at all stages of the treatment of tobacco smoking, as well as in various diseases of the bronchi and lungs. Its therapeutic effect is manifested as follows:

1. reducing craving for smoking;
2. elimination of cough, shortness of breath and wheezing;
3. purification of the lungs and bronchi;
4. decrease in irritability and anxiety;
5. sleep improvement;
6. providing a general strengthening effect. [4, 5]

Thus, the use of medicinal-technical and spicy-aromatic raw materials in the technology of tea and tea drinks makes it possible to develop and produce a wide range of products that have a wide range of beneficial properties for the body.

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THE USE OF THE OPEN-PIT MINING METHOD AT METRO FACILITIES AND GEODETIC SUPPORT FOR EARTHWORKS

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Abstract. *In the article, the authors considered and analyzed the stage of earthworks in industrial civil construction and its geodetic monitoring on the example of pits with different production specifications. It is noted that the production plan of geodetic surveys and earthworks may differ in details, but it is uniform in general. Also, the authors analyzed the methodology of earthworks production and their geodetic monitoring of such objects on the example of connecting branches of the subway tunnel.*

Keywords*: subway tunnels, underground works, pit, geodetic support, iron concrete constructions, construction, monolithic works.*

Introduction

The general plan for the development of Moscow provides that the total length of the lines of the Moscow Metro will be 650 km by 2025. The addressable investment program of the city of Moscow for 2021-2024 is the basis for financing new construction for the development of the Moscow metro [1]. By the end of 2023, it is planned that the length of the metro will increase to 30.96 km, and the number of stations will increase to 13 units. In 2024, the indicators will be 26.0 km and 11 units, respectively. Unfortunately, often (approximately 40% of open stations) there is a delay in actual commissioning compared to the initial plan of 3-4 years. In this connection, the use of effective technologies in the construction of the met-

ro and its geodetic monitoring is a relevant research topic.

When earthworks on the objects of the metro often use the method of development in an open way. It consists in the arrangement of fastening of the future pit, as a rule, by the method of boring piles or by the method of a wall in the ground. The bottom of the pit of the metro facilities, as a rule, is located at a great depth, which does not allow to develop them with natural slopes. The possibility of fixing the walls of the pit allows you to reduce the size of the construction site and avoid all related problems, such as disposal or storage of large volumes of soil from natural slopes. Approach to the development of a pit on construction sites with such a specific production of work should be carried out with special responsibility and attention.

In connection with the above, it is expedient to analyze the method of production of earthworks and their geodetic monitoring of such objects on the example of the connecting branches of the subway tunnel.

The V. I. Lenin Order of Lenin and Order of the Red Banner of Labor Metropolitan (SUE "Moscow Metropoliten") acts as the customer of works on the construction object. The general contractor is the organization "StroyMontazh-14" LLC, and the contractor for the production of earthworks is the company "STROYMEHAVTO" LLC. The projects of all stages of construction work were released by the leading Russian design and research company for the creation of transport infrastructure and underground structures JSC "Metrogiprotrans".

Materials and methods

The tunnels of the subway facilities have an elongated shape, which complicates and complicates the approach to construction work in general. Therefore, these objects are divided into parts, for each of which a project is issued separately for each stage of work. In this case, we will consider one of such parts.

The object of consideration is part of the third transfer circuit and is located at the address: South-western section of the third transfer circuit, "Prospekt Vernadskogo" st.- "Mozhaiskaya" st. Connecting branches to the electric depot "Aminyevskoe" with "Davydkovo" st.

The specificity and complexity of the production of earthworks on the objects of the metro is in the large number of technical units involved in the development of the pit, the need to transfer the geodetic base to each level of the spacer system, due to the low visibility of the marks, difficulties with the drainage of ground and surface water, due to the large the depths of the bottom of the pit, the peculiarities of the production of earthworks in tunnels, which require special skills from all participants of the production [2-6].

First of all, let's consider the project for earthworks (Fig. 1).

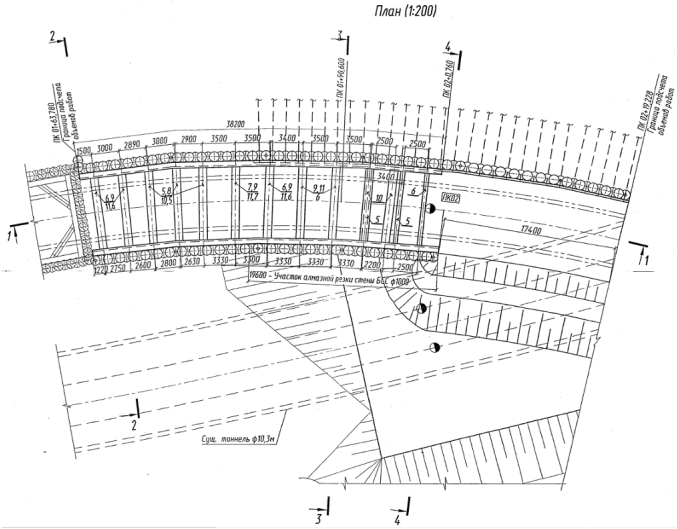

Figure 1 - *Project for earthworks*

This project is an integral part of the whole tunnel, as a result of which the boundaries of the scope of work are present on the drawing. Also, this project does not provide for building axes, the boundaries are determined by the pickets of the station axis (PK02 + 19.228 - the right boundary of the work count). To fix the walls of the pit, two methods are used: the method of secant piles with a spacer system and anchor fastening. There are also natural slopes of 1:0.75 (53.17 degrees). The project does not provide for pits and trenches, the bottom of the pit is flat and has a uniform slope of 40 thousandths (4 cm in height per 1 meter in length).

Results and discussion

Prior to the start of earthworks, a geodetic survey of the initial surface of the excavation is carried out, then, based on its results, a digital relief model is built, agreed between representatives of organizations, and executive documentation is formed, which approves the initial surface as the basis for calculating the volume of work.

Earthworks are divided into 5 stages (Fig. 2), which must be strictly observed, since a tier of the spacer system is mounted on each of them. If the requirements of the project are neglected, then the load on the secant piles of the excavation will become critical, which can cause their destruction. It is necessary to redistribute this load at each stage of excavation.

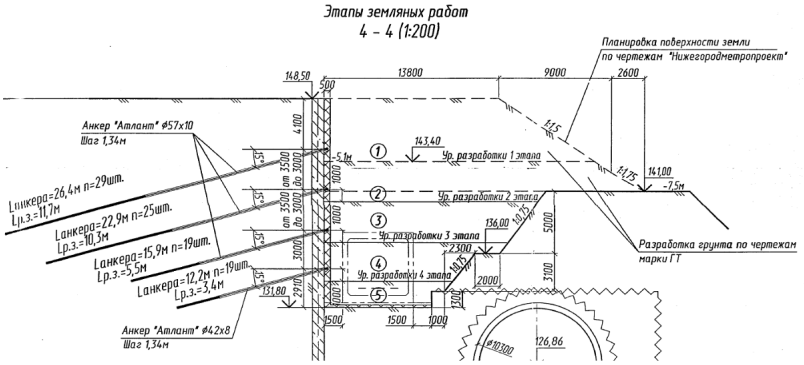

Figure 2 *- Stages of excavation*

Nevertheless, in practice, when installing the spacer system, it is possible to provide for loading berms along the foundation of the pit, which will redistribute the load on the walls, and develop the central part of the pit below the project stage. Also, to speed up the work, as the spacer system is installed, you can proceed to the next stages of excavation immediately.

Due to the length of the tunnel, more vehicles need to be brought in to excavate efficiently as the excavation progresses. Each excavator has its own area of work, limited by the outreach of the boom, development in an area larger than this radius is possible, but it is associated with certain difficulties in transporting the soil. The excavation area will gradually increase, therefore, as it increases, additional pieces of equipment are attracted to the development. The method of level excavation is also used (Fig. 2), since the bottom of the subway tunnels, as a rule, is deep from the original surface. The complexity and specificity of the work of the excavator driver in the tunnel is complicated by its small width, but the most important thing is the spacer system mounted during the development of the pit. It limits the visibility and area of operation of the equipment, which requires special qualifications and caution from the driver.

Geodetic support for each stage of earthworks consists in monitoring the absolute mark of the surface of the excavation stage according to the project and calculating the intermediate volumes of excavation for each reporting period using the cartogram method. Drawing up the relevant as-built documentation, its coordination and approval. However, this comes with some difficulties. Firstly, GPS equipment cannot work in tunnels, since the walls of the pit and the spacer system limit the visibility of the celestial sphere, which is necessary for comfortable operation of the receiver. Secondly, from the geodetic justification located on the construction site at the top of the tunnel, it is impossible to carry out a reverse linear-angular resection of the total station, since it is not visible, due to the same

spacer system, which greatly limits visibility in the tunnel as a whole. In this regard, it is necessary to transfer the geodetic justification to marks for each tier of the spacer system, equalize it and monitor its condition [2-6].

At the final stage of earthworks, after laying out the bottom of the excavation and its final transfer to the contractor for monolithic works, it is necessary to build a digital relief model (Fig. 3) of the final surface of the bottom of the excavation and calculate the actual volume of its development. This result must be compared with the statement of volumes of earthworks provided by the project. In this case, after calculating the soil excavation cartogram, the difference between the actual (10411.88m^3) and theoretical (7700.00m^3) volumes of work was unacceptably large and amounted to 2711.88m^3

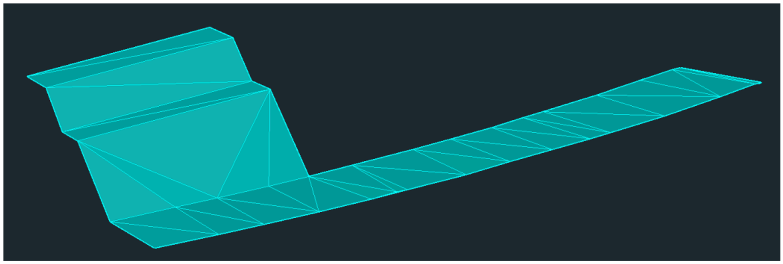

Figure 3 *- Digital model of the end surface of the excavation*

In case of such discrepancies, the project is transferred to the organization involved in its release to make changes to it, however, this may be delayed for an indefinite period, therefore, in this case, the surveyors of the general contractor and the earthworks contractor calculated the volume of earthworks using the cartogram method from the approved initial surface of the pit and design bottom of the end surface of the excavation. The actual volume was 10411.88 m^3 and was approved between organizations.

Next, it is necessary to consider the development of a pit with semi-closed construction methods.

The semi-closed method of construction consists in the construction of the underground part of the building and structure by constructing a fence practically from the surface of the earth (with a minimum preliminary cut) or from the required mark, after which floors are erected and the soil under their protection is developed. The developed soil is extracted to the surface through special technological holes in the ceilings.

There are two main construction methods:

- "top-down" (Fig. 4);
- "up-down" (Fig. 5).

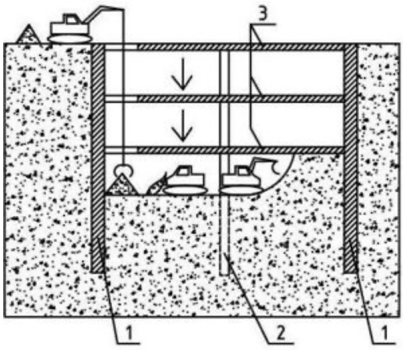

Figure 4 *– Top-down method*

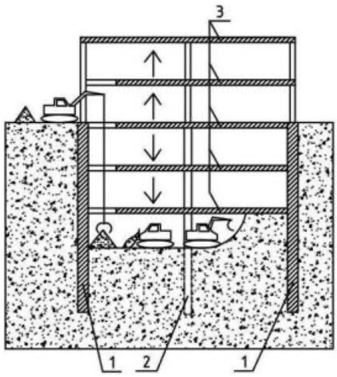

Figure 5 *– Up-down method*

(1 - pit fencing, 2 - temporary support, 3 - building floors)

Earthworks consist in the development of a pit for the underground part of the building in parallel with the construction of floors in the "top-down" method and the construction of the entire building structure in the "up-down" method.

The construction of the underground part of the structure begins with the construction of a "wall in the ground" along its perimeter. It can be made in the form of a monolith, or be prefabricated-monolithic. The structure is made of concrete with high water resistance. Upon completion of the first stage of construction, a monolithic floor is poured, which performs two functions at once, it becomes the zero of the upper floor of the underground structure, and also supports the walls of the pit. Technological holes are left in the monolith, into which small-scale mechanization means are lowered under the monolithic slab - an excavator for excavating the soil and a loader for transporting it to the dump. The excavator-grab carries out loading of soil from the dump into dump trucks, which dispose it to the landfill. Thus, right under the floor slab of the building, the soil is excavated to the design mark and the floor slab of the underground floor is poured, and if necessary, the development cycle can be repeated for each next underground floor.

A special advantage of the technology of the semi-closed method of construction is the ability to perform the construction of the main, ground part of the building simultaneously with the performance of underground work.

In the course of construction work, temporary support structures are used when installing floor slabs. After the design walls and columns have been erected and connected to the floors, the temporary structures are removed. This stage in the technology is especially important, since the load from the topsides, without compromising their strength, must be transferred from temporary to permanent support structures.

Geodetic support of such a method of excavation will be considered on the example of a multifunctional residential complex with a hotel and underground parking, located at the address: Moscow c., Bolshaya Nikitskaya st., 9/15/2, building 1, Middle Kislovsky sidestr., land 2/15, building 2. The customer of the work and the developer at the construction site is VIS-INVEST LLC, the general contractor is the Turkish company ANT TEQ, the general designer is the "Olimpproekt" group of companies, the earthworks contractor is "STROYMEHAVTO" LLC.

This construction site did not produce a project for earthworks, only a project for reinforced concrete structures, however, it provides vertical sections of each monolith node, which can be used to determine the turning points of the excavation. For each cycle of the semi-closed construction method, its own set of design documentation is issued, in connection with which we will consider the project for reinforced concrete structures of the foundation slab of the latest stage of work (Fig. 6).

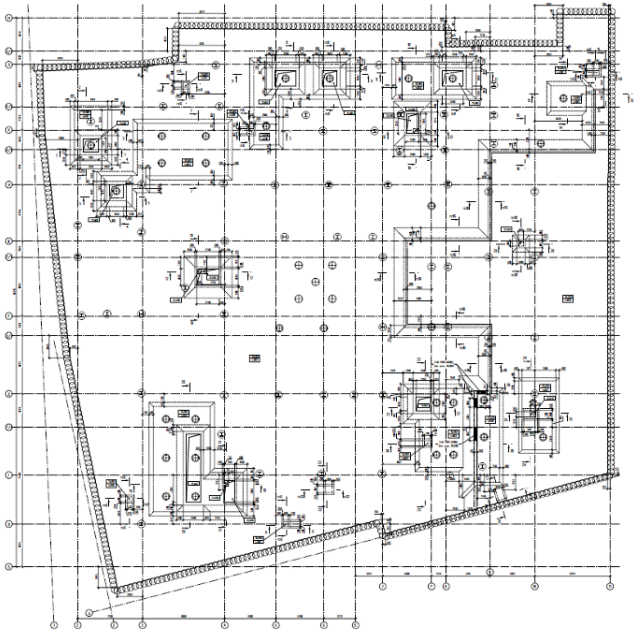

Figure 6 *- Project for reinforced concrete structures*

The foundation pit is fastened with secant piles, the spacer system is the ceilings and reinforced concrete piles, which distribute the load of the structure, until the completion of monolithic work.

The excavation has a complex system of pits and trenches, the development

of which requires the use of small-scale mechanization, in this case, a Hitachi 70 excavator. A Bobcat loader is used to quickly transport the material to the dump to the loading site. The Hitachi 330 excavator-grab, located at the level of the first floor, loads into dump trucks that dispose of soil outside the construction site to the landfill.

The main difference between the geodetic support of this method of excavation is that there is no need to survey and coordinate the black surface of the excavation, its digital model is formed according to the project for earthworks on the "bottom" of the foundation slab of each excavation cycle. Geodetic work consists in the removal of the turning points of the pit and control over the mark of the bottom of the earthwork cycle, geodetic survey of the intermediate surfaces of the pit and the coordination of the corresponding scope of work. At the final stage of work in the cycle, it is necessary to survey the final surface, calculate the actual volumes of earthworks using the cartogram method, their coordination and approval, including comparison with design data [2-6].

Due to the fact that no excavation project was issued at this facility, the actual volume of excavation in the considered cycle was calculated by the surveyors of the general contractor and the excavation contractor using the cartogram method, according to the project for reinforced concrete structures.

To do this, the project data is loaded into the vector environment and scaled. Then, according to the vertical sections, the contour of the pit is drawn, since it is somewhat wider than the contour of monolithic works. Next, the turning points of the pit are assigned absolute or relative marks and a digital terrain model of the final surface of the excavation cycle is created. Finally, the volume of earthworks is calculated using the cartogram method, which is agreed and approved between organizations.

Conclusion

Thus, the stage of earthworks in industrial civil engineering and its geodetic support was considered on the example of pits with different specifics of work. The plan for the production of geodetic surveys and earthworks may differ in details, but is generally homogeneous.

For geodetic support of each excavation, timely surveys of the initial, intermediate and final surfaces, processing of measurement materials, compilation and approval of as-built documentation, setting out the turning points of the excavation, monitoring the absolute or relative mark of its bottom are necessary.

Excavation requires the correct selection of equipment and strict adherence to the project for earthworks, the work plan and the relevant building regulations.

Particular attention should be paid to the study of the project for earthworks, in which it is often possible to obtain information about all the nuances that may arise both during the development of the pit: the method of fixing the walls of the

pit, the configuration of the spacer system, the method of draining ground and surface water, and for geodetic surveys: marks of the bottom of the excavation, pits and trenches, coordinates of turning points, marks and contours of the stages of earthworks.

Difficulties arise mainly in deep pits and when working in cramped conditions, which was described in the second and third paragraphs of the section, and are mainly related to the cramped conditions, reduced visibility of the construction site, and the inability to use GPS equipment. However, this only affects the time required to perform geodetic work and at the same time makes it necessary to take a more careful approach to their production.

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FUNCTIONAL UNREGULATED ACCESS POINTS ON CITY STREETS AND ROADS

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Abstract. *This article gives the theory of many methods for calculating the critical intervals. With the help of video filming of the intersection in Moscow, Orenburg, Lipetsk and beyond; the results of numerical studies are given, and the number of rejected and accepted intervals in the peak hour traffic. In the Russian Federation, there are urban planning guidelines using the concepts of access to urban streets and roads. The two urban planning guidelines do not contain detailed urban planning and technical standards for access control in cities. The characteristics of the transport flow of access points to city streets and roads are studied, the basic characteristics of the parameters that need to be taken into account the share of the free part of the flow are analyzed, as well as the parameters of the interaction of transport flows that are used to calculate the high capacity from the secondary direction of access points, vehicle delays, the length of their follow up and distribution density. The results of a comparison of three methods of critical studies of a number of unregulated intersections are presented.*

Keywords: *access points, access management, critical intervals, follow up.*

1. INTRODUCTION.

Russian urban planning guidelines SP 42.13330.2016 “Urban planning. Planning and development of urban and rural settlements” and SP 396.1325800.2018 “Streets and roads of settlements. Rules of urban design” uses the concept of access to city streets and roads. In this case, access is understood as the possibility of entering the street or road, leaving the street or road to the adjacent territory and to the building. Urban planning or zoning design rules “uses

the concept of access to city streets , roads and the distance between access points without changing the planning and zoning systems of the territory of residential or shopping centers providing mobility and accessibility in cities. With this access point, it is understood as an intersection or junction through which access to the adjacent territory from the street or road and from the adjacent territory to the street or road.

Both considered documents do not contain detailed urban planning and technical standards for access control. At unregulated intersections with two traffic flows, the flow of vehicles on main roads takes precedence over intersections; the vehicles the traffic on the minor road must wait for a sufficient gap of traffic flow on the major road. At unregulated intersections with two traffic flows, the flow of vehicles on main roads takes precedence over intersections; the traffic on the minor road must wait for a sufficient gap of traffic flow (Wan X. W., 2014) .This paper shows a good explicit model that details the interactions of vehicles in the flow of a major roads. For this achievement, the grouped exponential vehicle crossing interval distribution model is used (Akcelik R. and Associates 2004; Akcelik R., 1994; Troubeck R.1989). A new model of proportion of grouped vehicles is given. The model considers Akçelik R.'s speed lag parameter flow model as grouping parameter, this thinking grouping and speed models flow to a more integrated framework for modeling uninterrupted traffic flows. This clustering pattern has was implemented in the intersection analysis software SIDRA (Akcelik R. & Associates 2004). Critical interval is the minimum main flow interval during which a typical low current vehicle can maneuver and Critical gap cannot be shorter than the follow-up time (tf). Otherwise the arrival time of the next major stream vehicle might take place before a minor stream vehicle has departed from service .This is an important condition for capacity models, which assume a constant queue of minor stream vehicles (Luttinen R.T., 2004).

2. MATERIALS AND METHODS

The concepts of "access management" (Access Management) and access control (Access Control) appeared more than 50 years ago. Another concept is directly related to them - "access point" (Access Point). An access point is understood as an unregulated junction or an unregulated intersection from which interaction (entry or exit) with the adjacent territory is carried out [8, 9].

The planning parameters for placing access points are:

• Placement of access points relative to the list and interchanges

• Mutual placement of access points.

• Permission/prohibition of left turns.

• Model for calculating the throughput of conflict points - guides HBS [10,15] and HCM [14] and Capacity and Level of Service at Finnish Unsignalized Intersections [6,7];

• Model for calculating delays and queue lengths - HBS and HCM guidelines;

• A model for assessing the reduction in capacity of the extreme right / left lane from which the turn is made - the development of the topic of the research work carried out by the Department of Urban Development of Moscow State Civil Engineering University 2020-2021. There are many methods for determining the critical interval estimate:

Where Fa (t) is the cumulative gaps of the received interval; Fr (t) - cumulative gaps

Rejected interval; t is the interval of two continuous gravel flow vehicles.

- Ashworth method is associated with the distribution of the accepted interval at various flow rates of the gravity flow, provided that the critical interval obeys an exponential distribution and the critical interval and the accepted interval obey a normal distribution. Ashworth gave the following calculation formula:

$$tc = t\alpha - q\sigma^2 \quad (1)$$

Where tc is the critical gap; q is the intensity of the movement of cars in the gravel direction (cars /s); tα is the average value of the accepted interval (s) and σ2 is the variance of the accepted intervals (s^2).

In general terms, the capacity of the secondary direction of movement at the conflict point c (cars /h) [3, 24]

$$c = \frac{q\varphi e^{[-\lambda(t_c-\Delta)]\cdot}}{1-e^{-\lambda t_f}} \quad (2)$$

Where q is the intensity of movement of the main flow at the conflict point; φ is the free share of the flow (i.e. the share of vehicles, the intervals between which exceed Δ); tc-critical interval, s; Δ is the minimum interval in the flow, Δ = 1.8–2.0 s, λ is the distribution parameter.

3. MAIN PART.

An analysis of the Conflict points are places where the trajectories of vehicles or vehicles and pedestrians intersect at the same level, as well as places of deviation or merging (separation) of traffic flows. Systematic analysis and comparison of grassroots urban mobilization is difficult due to the diversity of topics, actors, repertoire, strategies and tactical decisions, resources and outcomes. To streamline our knowledge of this subject, we rely on the methodology of "analysis of protest events" and "analysis of conflict episodes". Our methodological starting point is the notion that grassroots urban mobilization is a special case of "adversarial politics" - "episodic public collective interactions between the subjects and objects of claims in conditions where the government is a party to or part of the process of claims and, being implemented, demands affect the interests of at least one of the

parties". As conceived by the creators of this concept, adversarial politics covers a wide range of processes from revolutions and social movements to local ethnic clashes and grassroots mobilization.

Most often, such interaction of traffic participants occurs at the intersections of roads, where flows of different directions meet. At the same time, part of the conflicts also occur on the stretches of roads when changing lanes of cars in rows and when pedestrians cross the carriageway outside intersections. Thus, it becomes possible to assess the potential danger of certain sections of the roads by the number of conflict points fig.1.

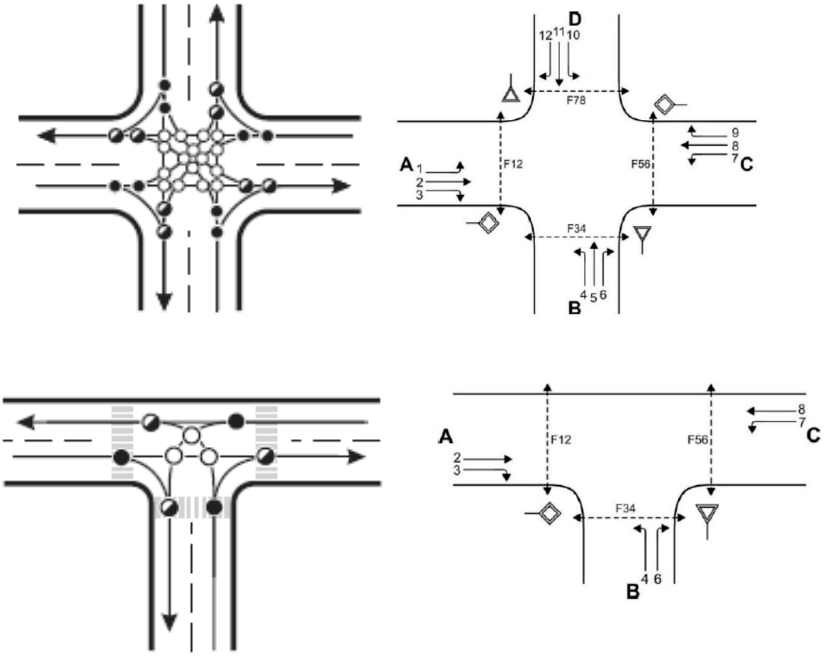


Figure 1. *Conflict points and design schemes at unregulated intersections and junctions*

An analysis of the most common real situations of interaction between adjacent territories and the carriageways of city streets and roads allows us to propose 4 main types of access points (Fig. 2) and methods for processing video of unregulated intersections, determining critical intervals, intervals from the queue, standards, design and regulatory and technical documentation in the field of urban development, published articles and material foreign research on this

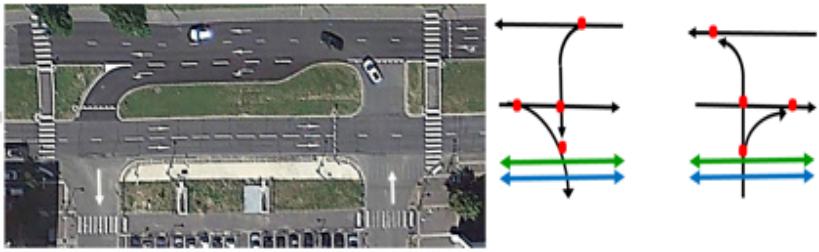
topic were analyzed. In general, classifications and design standards are subject to the solution of the most important task to obtain such a distribution of flows, in which traffic over long distances is served by roads of higher categories, and the local network only provides services to adjacent territories. In accordance with this, restrictions are carried out on the main roads, strict control of the so-called access, isolation from pedestrian and bicycle traffic.

The design solutions of the local network of residential areas involve the prevention of transit traffic; to this end, speed limits are introduced and traffic calming is applied. All this makes it possible to achieve a clear differentiation of the elements of the roads according to the speed of movement. The results of such technical and urban planning policies are well tracked by both national and regional United States transportation statistics. Methods are considered functional intersections to junctions or intersections and the theory of constraints:

Type1: multi-lane main streets and roads with flat axial markings or a dividing strip

Bicycle
Conflict points in traffic flow
Pedestrians

Type 2 and 3: access through median access



Type 4: allowed with a left turn into or out of the street

Figure 2. *Proposed typology of access points to the road network*

To perform an analysis of the characteristics of the transport flow of access points, the first step is to process the video of the obtained values of the free share of the flow part, which can be used to draw conclusions about the unevenness or regularity of the transport flow of access points in cities. The numerical values of the statistics are presented in the form of a graph of the traffic flow distribution density in Fig.4 and Fig.5.

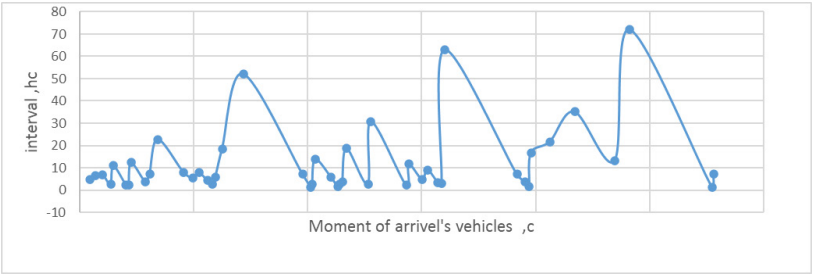
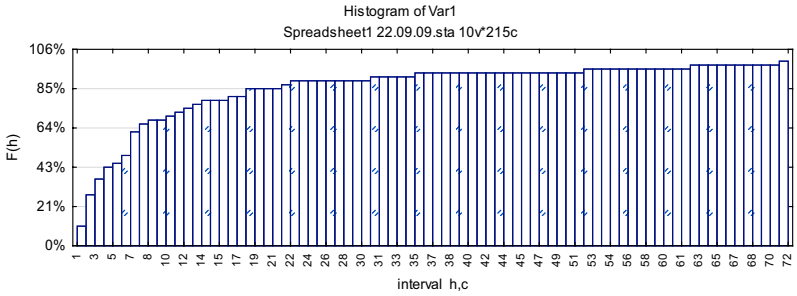


Figure 3. *Density of distribution of intervals and Distribution function*



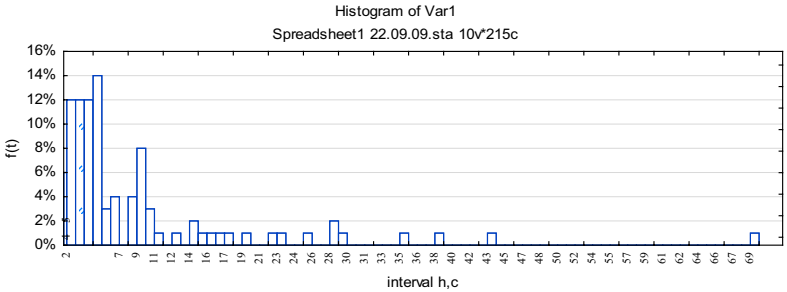


Figure 4. *Periodicity of occurrence of large gaps*

The studies of unregulated intersections in different cities of Russia are considered. Clearly, Critical Interval is an important parameter affecting the throughput and delay of unregulated intersections. There are different values of the critical interval for drivers in different geometry parameters and driving conditions. Various methods have been introduced to calculate the critical interval at intersections. In America and Europe, there have been many studies on the acceptance of spacing at junctions. This article gives the theory of many methods for calculating the critical interval. with the help of video filming the intersection in Moscow, Orenburg, Lipetsk and Volzhsk; the results of numerical studies are given, and the number of rejected and accepted intervals in peak hour for major traffic . Critical intervals can be calculated using various methods, including the Ashworth method, the Raff and Scheilglosh's methods. In the process of analyzing the results of these methods; the Raff and Scheilglosh's methods can be recommended for practical use, while the Ashworth method gives a greater result and is also limited for several intersections, and accordingly uses only the values of the allowable interval.

Table 1.

Results of evaluation of critical intervals and intervals follow up time

	Left turn from the major direction		**Right turn from minor direction**	
	Ashworth 's method		Ashworth's method	
Lipetsk	3,98	2.66	4,80	2.61
Orenburg	2,22	2.95	-	3.63
Volzhskiy	0,15	2.72	-	2.67
	Raff 's Method		Raff's Method	
Lipetsk	6,3	2.66	4,86	2.61
Orenburg	8,4	2.95	9,7	3.63
Volzhskiy	4,5	2.72	3,96	2.67

Critical interval in various methods of Ashward and Raff; Ashworth's method only uses the allowed interval, but other methods also use rejected intervals. Raff's method considers the rejected interval to be zero, so its result is greater than the results of the ashword. Raff's method is more reliable than others. It uses the accepted intervals and rejected the intervals itself, despite the entry condition being broadcast and polled. Ashworth's method is needed to calculate the critical interval, but make sure that the advancement of the circulating flow follows an exponential distribution and the accepted interval follows a normal distribution. It is obvious that the raff and ashword methods have more results, so we will transfer the sheilglosh's method more reliable than the two methods (raff and ashword).

CONCLUSIONS

1. In the course of the study, it was found that the methods for determining the critical intervals of Raff and Ashworth are not applicable in cases. The solution of unregulated intersections is presented as a way to solve the safety problems of multi-lane intersections. This that article presents the concept of unregulated intersection, its general diagrams and the main possible use cases.
2. In the streams of the main direction, there are breaks with a duration of more than 20 seconds, comparable to the duration of green signals. In this case, in the case of using the Raff method, overestimated values of critical intervals are obtained, which contradict the results of many studies. Unregulated intersections were compared to conventional two-way intersections in terms of safety and ability. Geometric characteristics of intersections effectively define minimum deviation levels and speed control, and reduce points of conflict, resulting in safer operations. These findings are consistent with international standards.

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