SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

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这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。 它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。
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These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examine technical, juridical and sociological aspects of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

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探讨区域零售药品综合体初级药品人员管理的具体措施，提高药品服务质量
INVESTIGATION OF THE SPECIFICS OF MANAGEMENT OF BEGINNING PHARMACEUTICAL PERSONNEL IN THE REGIONAL RETAIL PHARMACEUTICAL COMPLEX TO IMPROVE THE QUALITY OF PHARMACEUTICAL SERVICES

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注释。本文讨论了 19 至 26 岁初级药学专业人员群体的特征：对组织的态度（忠诚度）、职业发展、良好工作的激励方面。研究发现，连锁药店应该寻找方法让年轻员工的生活充满积极情绪和趣味性。制药综合体中初级药学专业人员的管理首先需要系统的方法和联合教育和教育工作，即大学–大学–药房网络的三重奏。

关键词：药学专业人员、药剂师、药剂师、区域经济、药学服务、年轻员工。

Annotation. *The article discusses the characteristics of the cohort of beginning pharmacy professionals aged 19 to 26 years: attitude to the organization (loyalty), career development, motivational aspects of good work. It is found that pharmacy chains should look for ways to make the life of a young worker rich in positive emotions and interesting. Management of novice pharmacy professionals in the pharmaceutical complex requires a systematic approach and joint educational and educational work first of all, the triad of college-university-pharmacy network.*

Keywords: *Pharmacy professionals, pharmacists, pharmacists, regional economics, Pharmaceutical Care, young employees.*

According to Federal Law No. 489-FZ “On Youth Policy in the Russian Federation” dated 30.12.2020 (Article 2, paragraph 6), a “young worker” is a citizen under 35 years of age inclusive, who has a work experience of not more than three years and is not categorized as a “young specialist”. The presence of a “young worker” with no more than three years of work experience distinguishes him or her from the category of “young specialist”. A “young specialist” is an employee

up to 35 years of age inclusive with a certain level of education bachelor's, master's, secondary vocational education, who for the first time gets a job in his/her specialty. Until 22.04.2024, any length of service obtained while studying at a university or college deprived the employee of the status of a young specialist. At the moment, the length of service obtained during studies does not affect the status of a "young specialist".

These terms were introduced in order to organize by the state a set of incentives for citizens under 35: preferential mortgage lending, compensatory payments for the purchase and construction of housing, "lifting" payments, incentive bonuses to wages, promotion of professional growth and scientific achievements. We could not but refer to the normative definitions of "young worker" and "young specialist", but for the purposes of our study we cannot use these terms. They do not fully reflect the target audience under study: workers with little life and professional experience, who have just graduated from university or college and have chosen a profession in the specialty "Pharmacy". To avoid violating the boundaries of regulatory definitions, the term "beginning pharmacy professionals was used.

According to the professional standard "Specialist in the field of pharmaceutical management" [1], in order to obtain the degree "Specialist in the field of pharmaceutical management, with higher pharmaceutical education requires a minimum of two years of work experience in the specialty 'Pharmacy' is not less than two years. We will assume that during this time there is a set of experience and adaptation in the profession. If we take into account that school in the Russian Federation is finished at the age of 17-18-19 years, the term of study in the specialty "Pharmacy" in the university is 5 years, and in college 3 or 2 years (respectively, depending on whether the basis of 9 or 11 school grades education was), then in pharmacy organizations (they are the main place of work of pharmaceutical professionals) graduates go to work at the age of 19-24 years. Thus, we determined the age of "beginning pharmacy professional", adding two years of experience and increasing the upper limit of age - we got the age of 19-26 years inclusive.

The study of a cohort of beginning pharmacy professionals of pharmacy chains in Nizhny Novgorod and Nizhny Novgorod region (120 people) showed that beginners differ from their more senior colleagues in their position towards some work processes. The first thing they treat differently is career development. To study the career preferences of beginning pharmacy professionals, we developed a questionnaire "Career development of a modern pharmaceutical specialist" containing open-ended questions. To evaluate the results, the answers to each question were combined into groups according to their meaning. It was found that for the majority of respondents building a career is the achievement of personal goals (Table 1).

Table 1

Results of the analysis of answers to the question "Give your own definition of the concept of 'career'"

Question	Response	%
"Give your own definition of the term 'career'"	"Goal attainment."	72%
	"Job growth"	42%
	"Decent salary"	26%
	"Increased self-esteem"	18%
"Give associations and synonyms for the definition of 'career'"	"Career advancement"	24%
	"Self-realization"	21%
	"High salary"	7%

Among the qualities that help to make a career, 64% of respondents identified "goal-orientedness", 29% - "communication skills", 21% - "work experience", 18% - "responsibility". As a synonym of the category "success" 60% of respondents used the word "goal-orientedness". One third of respondents (33%) indicated that career development is influenced by the organization in which they work; 16% indicated that career development is shaped by chance circumstances; and only 0.01% indicated that career development is possible due to family ties [2]. Pharmacy organizations themselves are not very inclined to develop such a line of personnel management as "career management" - due to the greater labor intensity of these activities, as well as a number of reasons that have developed in the pharmaceutical market, as a result of which the company cannot guarantee a noticeably fast career growth (within 1-2 years): the trend called "cluster heads" [3] - when one head manages 2-5 pharmacies; due to the "cluster heads" in the pharmacy chain, there are even fewer positions that can be considered as "career management".

Horizontal (deepening in the profession) career growth is not considered by new pharmacy professionals; the career track of a pharmacy professional is strictly limited by regulations, so it has few job steps (two, maybe three); new employees - college graduates and university graduates have equal rights to hold the position of pharmacy manager [4], which demotivates those who have higher education to grow in their career and generally develop in the organization.

At the same time, the study of ANO "Russia - a country of opportunities" showed that novice workers of all specialties, including the specialty "Pharmacy" are most motivated by "self-development" (opportunity to learn new things), "meaning" (feeling the value of activity), "belonging" (feeling part of the group), "working conditions" (opportunity to work in a comfortable and healthy environment) and "earnings" (opportunity to achieve a high level of material well-being). The feelings of boredom, stagnation, lack of prospects, growth, and development

are the most demotivating [5]. Apparently, this is why beginning pharmacy professionals stably repeat the structure of professional burnout of other age groups [16] (Glushevskaya E.V., 2012) - in the second year of work 54.5% of employees have an average degree of professional burnout; and also demonstrate low loyalty, mainly due to the lack of meeting expectations after starting work in the pharmacy chain (in terms of salary, working conditions, career development, relations with the direct supervisor - pharmacy manager, etc.).

This means that pharmacy chains should look for ways to make the life of a young employee full of positive emotions and interesting: for example, to involve them in team competition projects with monetary motivation (the material factor of motivation in pharmacy professionals, not only in beginning pharmacy professionals, is in the first place). This position would fit into the modern idea of a person-centered approach in personnel management [7]. Person-centeredness means that work for a person should fulfill three main functions: work should give pleasure and create conditions for creativity; communication with other people is important in work, so it should be performed mainly in a team; it is the personal manifestations of the employee that become the basis for productivity growth, primarily such as social competence and emotional intelligence. The main function of the manager is to give meaning and significance to the work [8]. Consumer attention from pharmacy chains to young pharmacy professionals is, in our opinion, the main problem of managing beginning pharmacy professionals in the Nizhny Novgorod region.

Scientists (Filina I.A., 2016, Sushkova M.V., 2023) [9,10] emphasize the importance of organizing for beginning pharmacy professionals professional adaptation (2 years), psycho-physiological (1 year) and socio-psychological (also 1 year). The main tools of assistance novice workers consider the adaptation program (57%), mentoring (34%) and competently drafted standard operating procedures (job descriptions, (47%), trainings (25%). Moreover, mentoring should not only be in the pharmacy chain, but should start at university and college [11]; it should continue in the pharmacy. Unfortunately, our survey of young pharmaceutical personnel (60 graduates of the Faculty of Pharmacy of the Privolzhsky Research Medical University - 2024) showed that in the pharmacy chains of Nizhny Novgorod and Nizhny Novgorod region mentoring is conducted formally, often remotely - it consists in taking tests and memorizing service standards, is more introductory in nature, that is, its purpose is mainly to reduce the company’s losses due to errors in work.

According to the experience of the Nizhny Novgorod region, pharmacy chains, unlike industrial pharmaceutical companies, are also reluctant to participate in joint mentoring programs: the Faculty of Pharmacy of the Privolzhsky Research Medical University was unable to attract commercial pharmacy chains to conduct

and organize joint courses in 2023-2024. The main reasons for refusal were: the need for additional employees, the need for additional payments, the workload of individual employees, the labor intensity of the process, the lack of competence to conduct the courses, and the danger to trade secrets.

Management of novice staff in the region directly affects the quality of pharmaceutical services provided by the regional retail pharmaceutical complex. Key aspects. Firstly - increasing the level of professionalism. Educated and trained staff are able to counsel customers more effectively, leading to a better understanding of patients' needs. Secondly - improved customer service. Management focused on communication skills and error prevention creates a positive experience for pharmacy patients.

1. Recommendations for improving the management of start-ups in the region
2. Establish a structured and collaborative training program with the college, university, and pharmacy chains that includes courses for entry-level workers that cover the key areas of pharmacy - therapeutics, pharmacology, and OTC drug selection - first; and sales technology second.
3. Development of a feedback system: it is important to provide opportunities for novice practitioners to express their views on the training process; both to the employer and to the college and university.
4. Facilitating teamwork: Creating conditions for novice and experienced professionals to work together - a working mentoring system that will improve the exchange of knowledge and experience.
5. Involving novice workers in projects that would spur interest in the work and make it "not boring" in a good way.

Management of novice pharmaceutical staff in a regional retail pharmaceutical complex requires a systematic approach and specific solutions to improve the quality of pharmaceutical services. An effective management system will not only help develop the skills of young professionals, but will also improve overall customer satisfaction with pharmaceutical services. Implementation of the proposed recommendations can help to create conditions for successful work of beginning pharmacy professionals and increase the image and attractiveness of the pharmaceutical sector in the region and the profession of pharmacy professional.

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当前市场卖家权益保护中存在的问题
CURRENT ISSUES IN THE PROTECTION OF MARKETPLACE SELLERS' RIGHTS

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摘要。本文探讨了当前电商平台企业家权益保护面临的问题。作者分析了电商平台卖家面临的主要挑战，包括旧货退货、产品替换、卖家付费退货、商品损失和价格压力。提出了解决这些问题的具体措施，例如强制买家身份识别、卖家可以选择是否为状况良好的商品提供免费退货、明确划分商品处理的责任区域、禁止跨平台因价格差异而受到处罚。实施这些措施将改善商业环境，保护企业家权益，并为所有市场参与者创造一个更加公平和透明的环境。

关键词：企业家权益保护、电商平台、商品退货、产品替换、买家身份识别、卖家付费退货、商品损失、价格控制。

Abstract. *The article addresses current issues in the protection of entrepreneurs' rights on marketplaces. The author analyzes the primary challenges faced by sellers on these platforms, including the return of used goods, product substitution, seller-paid returns, goods loss, and price pressure. Specific measures are proposed to address these issues, such as mandatory buyer identification, the option for sellers to choose whether to offer free returns for goods in proper condition, clearly defined responsibility zones for goods handling, and a prohibition on penalties for price discrepancies across platforms. Implementing these measures would improve business conditions, protect entrepreneurs' rights, and create a fairer and more transparent environment for all market participants.*

Keywords: *entrepreneur rights protection, marketplaces, goods return, product substitution, buyer identification, seller-paid returns, goods loss, price control.*

Introduction: In the context of the modern marketplace, major e-commerce platforms have come to dominate the landscape, accounting for over 75-80% of total online retail turnover, as evidenced by the Tinkoff Data analytics project. In Russia, for instance, there are more than 100,000 online stores, according to

eComm Central statistics. These numerous stores combined make up only around 25% of the market turnover, with the remaining three-quarters controlled by a few of the largest players.

The growing concentration of market share among these large platforms has profound implications for new entrepreneurs seeking to enter the e-commerce industry. Compared to 10-15 years ago, it has now become nearly impossible for small businesses to establish themselves independently and achieve effective trade operations. Consequently, most new entrepreneurs are compelled to begin their business activities by participating in major online marketplaces. This trend not only limits the avenues for independent growth but also introduces entrepreneurs to a new set of operational and regulatory challenges that require legal consideration.

A closer examination of the demographics of marketplace participants reveals that approximately 97% of sellers on these platforms are either individual entrepreneurs or small companies with fewer than five employees. This statistic highlights the critical role that small and medium-sized enterprises (SMEs) play in the marketplace economy and underscores the importance of creating a supportive legal framework for them. In this context, a novel area of legal regulation has emerged within the modern economy, focusing on the rights and protections of these small business sellers. While the concept of "consumer rights protection" is widely recognized, there is now a growing need to address the "protection of entrepreneurial (seller) rights" as well.

Entrepreneurs on these platforms face a variety of risks and challenges, ranging from hefty fines to compulsory participation in promotional campaigns, unregulated commissions and fees, and other factors that compromise their ability to operate fairly and profitably. There are also other underlying risks and areas for consideration that need to be addressed to ensure a conducive environment for small businesses within e-commerce.

Problems and Proposals:

Return of Used Goods: One major issue in the current e-commerce landscape is the disposal of returned goods. Consulting firm Invesp reports that approximately 30% of online purchases are returned, a figure significantly higher than the roughly 9% return rate observed in brick-and-mortar stores. This discrepancy arises partly because unscrupulous buyers exploit the limitations of the return process, taking advantage of the inability of couriers or pickup points to conduct thorough inspections of returned items. Often, customers use products before returning them, which leads to significant losses for sellers.

In cases where sellers operate under the Fulfillment by Seller (FBS) model, returned goods often arrive back at their warehouses in a used condition. Sellers in such situations are unable to claim compensation, even if video evidence of the

initial order assembly and return unpacking is provided. Consequently, they are forced to resell these items as second-hand at a lower price, absorbing the loss. For those using the Fulfillment by Operator (FBO) model, returned items go to the marketplace warehouse and are eventually discarded, again without any compensation to the seller.

Product Substitution: Another serious issue that has gained prominence involves product substitution fraud. In this scheme, fraudulent buyers purchase an original high-value product and then substitute it with a counterfeit item, often of much lower value but visually similar. This practice exploits the return policy, as couriers and staff at pickup points are generally unable to verify product authenticity at the point of return. For sellers using the FBS model, this means counterfeit goods are returned to their warehouses, where compensation is difficult to obtain, even with video documentation of the return.

In the FBO model, the substituted counterfeit item is retained in the marketplace's warehouse and, in some cases, re-entered into circulation, eventually reaching unsuspecting customers. This situation not only harms sellers, who lose genuine items, but also tarnishes the platform's reputation among consumers. Unscrupulous buyers often retain the original items for personal use or resale on peer-to-peer platforms, further undermining marketplace integrity.

Proposed Solutions for Issues 1 and 2: One effective preventative measure would be to introduce mandatory identification for buyers, such as requiring passport information upon account registration. This step is intended to serve as a deterrent rather than a punitive measure, reminding potential offenders of the consequences of their actions. For example, the registration process could involve submitting a passport scan and a selfie with the passport, similar to the verification methods used by car-sharing services. Additionally, offering free shipping and returns exclusively for verified users with confirmed accounts would encourage adherence to marketplace standards while restricting access to certain categories (e.g., age-restricted products) to verified individuals. This measure could protect the rights of loyal and genuine customers and enhance the level of control marketplaces have over user activities.

Seller-Paid Returns: Frequent returns of goods in acceptable condition represent another issue, as sellers are often required to cover the costs of these returns. The right to free returns is frequently abused by dishonest competitors who place bulk orders solely to cancel them, or by consumers who engage in compulsive purchasing behavior only to return the items shortly thereafter. Sellers incur significant losses from these returns, which forces them to increase prices, ultimately affecting loyal and genuine buyers.

Proposed Solution: To mitigate this issue, sellers could be given the option to choose whether to offer free returns for goods in proper condition. This approach

would allow those sellers who prioritize customer acquisition to continue offering free returns, while others who wish to preserve the quality of their inventory could opt out. This flexibility not only accommodates the varying business strategies of sellers but also provides an indirect solution to the previous issues.

Loss of Goods: Another challenge that sellers frequently encounter involves disputes over goods that are lost in transit. Sellers often report that items delivered to the marketplace in good condition fail to reach customers, with no sufficient compensation provided for the loss. Furthermore, customers who do not receive their items are likely to leave negative reviews, which can adversely affect the seller's reputation.

Proposed Solution: To address this problem, clear legislative guidelines are needed to define responsibility zones during the handling and delivery process and to mandate full compensation for lost goods, equivalent to the amount the seller would receive upon a successful sale. Additionally, negative feedback from customers related to such instances should be removed to avoid unjustly penalizing sellers.

Price Matching Across Platforms: Many marketplaces employ aggressive price-matching policies to offer the lowest prices. Automated algorithms compare the prices set by sellers on various platforms and prompt them to align prices across all outlets. However, this requirement overlooks platform-specific fees, commissions, and logistics costs that influence the final price. Some platforms also run promotions and discounts at their own expense, further complicating price comparisons. As a result, sellers may feel compelled to either inflate prices artificially or cease working with certain platforms to avoid penalties.

Proposed Solution: A prohibition on negative sanctions, such as fines, lower search rankings, and the removal of listings for price discrepancies between platforms, would alleviate this pressure. Such tools should only be used for informational purposes to guide sellers without imposing penalties.

Conclusion: The issues addressed in this article represent critical challenges that entrepreneurs face in the marketplace ecosystem. Implementing the proposed solutions would improve conditions for business operation, protect sellers' rights, and contribute to a fairer, more transparent environment for all marketplace participants. In fostering such a landscape, marketplaces could better support the growth of small businesses and ensure that sellers are safeguarded against unfair practices, ultimately leading to a healthier and more equitable e-commerce ecosystem.

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上合组织和金砖国家在俄罗斯欧亚政策演变中的作用。中国合作的载体和土耳其对成功的影响

THE ROLE OF THE SCO AND BRICS AS DRIVERS IN THE EVOLUTION OF RUSSIA'S EURASIAN POLICY. THE CHINESE VECTOR OF COOPERATION AND TURKISH INFLUENCE ON SUCCESS

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注释。作者考察了俄罗斯参与欧亚大陆发展的情况，并对其可能的发展和未来的潜在格局提出了一系列假设，这些假设决定了俄罗斯作为这一进程领导者之一的角色和地位。

关键词：上合组织、金砖国家、俄罗斯、欧亚主义、欧亚经济联盟、中国、土耳其、盎格鲁-撒克逊人、一带一路、人工智能、大数据、工业 4.0、欧亚经济联盟。

Annotation. *The author examines Russia's participation in the development of the Eurasian continent and constructs a chain of assumptions about its possible development and the future potential configuration that determines Russia's role and place as one of the leaders of this process.*

Keywords: *SCO, BRICS, Russia, Eurasianism, EAEU, China, Turkey, Anglo-Saxons, OBOR, AI, Big Data, Industry 4.0., EAEU.*

Following the July SCO summit in Astana (with the participation of the presidents of the member states) and the subsequent October summit in Pakistan (with the participation of the prime ministers), 2024 has become not only the year of growth of the number of participants from 10 to 11 members (accepting the Republic of Belarus as a full partner) and maintaining the observer status of two countries - Mongolia and Afghanistan, which actively participate in the formation of the agenda, are permanent observers and apply for membership in the organization itself. There are also 6 other candidate countries that have applied and participate as observers in various events to form and develop the Eurasian agenda - Bangladesh, Vietnam, Iraq, Israel, Syria and Ukraine.[1] At the same time, the

initial tasks of the association itself were designated as “joining efforts to combat terrorism, drug trafficking and extremism.” Humanitarian and social exchanges among participants in matters of economic and energy cooperation, in the implementation of cultural exchanges and socially oriented interactions in the direction of the potentially growing strengthening of the PRC were not forgotten. Moreover, this development was accompanied by an unspoken but implied lobbying attitude towards the main project of the Celestial Empire, the creation of the Second Silk Road, “One Belt, One Road”, which allowed it to become the engine of China’s gradual expansionist penetration into the infrastructure and technological network of the participating countries through the mechanisms of “soft” and “smart” power, capable of building a reasonable balance of interests for each participant, preserving national characteristics, and transforming logistics and production chains into a comfort zone for enterprises of the Asian degree of technocratic solutions, taking into account a mixture of investments, unique knowledge and developing payment and settlement systems, reducing dependence on the US dollar and giving everyone their place in the process of unified interaction and emerging integration. [2]

At the same time, today it is worth taking into account the fact tha tmutual trade between Moscow and the SCO countries grew by almost 12 percent due to the manifestation of multiplier effects in infrastructure solutions, a reduction in the cost of overly complex logistics, and the manifestation of synergy in the partnership of actors at the meso- and macro-levels, solving the issues of fragmentation of glocalization of alter-globalization chains of the ongoing post-COVID recovery in the coming global recession and a slowdown in the growth rate of its drivers - the construction and ICT industries. [3] This led to the fact that the impact of the fall in housing capitalization in China, the growth of raw materials in commodity markets, which are expecting a decrease in sales of creative industries goods under high geopolitical volatility, which are the mainstream expectation of the behavioral economy of Daniel Kahneman and Richard Thaler from the standpoint of growing expectations for the victory of the ideas of transhumanism and bloc division of the world.

At the same time the 23rd meeting of the heads of government of the Shanghai Cooperation Organization (SCO) was more focused on ways to increase trade and economic cooperation between the countries of the association [4], search for breakthrough solutions in the convergence of industry and regional interactions, cross-border cooperation and diversification of risks in particularly toxic areas of the Eurasian continent. Such tasks included “road maps” for the creation of mechanisms for financing joint projects: the establishment of a special account for their support and phased implementation in the commonwealth of countries and their step-by-step cooperative interaction, as well as the emergence of the SCO

Development Bank and Development Fund, which has been discussed for more than ten years [5]. Earlier, the head of the Ministry of Industry and Trade of the Russian Federation Anton Alikhanov said that by the end of 2023, Russia's trade turnover with the SCO countries had increased by almost 25 percent compared to the 2022 figure and reached $333 billion. The total volume of monetary investments by the member states in the Russian economy during this period amounted to approximately $10.2 billion. [6]

At the same time, if we look at the Kazan Declaration of BRICS, also from October 2024, where Russia was the host party as a result of its chairmanship, and more than 40 countries of the world, especially the "global South", also want to join this business club, and 13 entered, as having previously proven their systemic nature and strategic involvement in the ongoing processes of building a polycentric and multipolar world, then again we can notice repeated calls for WTO reform, and for a decisive impact on the reform of the international monetary financial system to promote mechanisms for diversifying payment risks in the context of growing sanctions, growing retorts and reprisals for TNCs and the military-industrial complex and space sectors. [7]

In the communiqué adopted following the meeting in Pakistan, the countries of the SCO confirmed a similar desire to increase the shares of national currencies in mutual settlements, and to henceforth try to coordinate methods for conversion and for determining equivalents in mutual trade with each other, which is already being done de facto, but has neither legislatively enshrined decisions nor currency conversions for any equivalent or goods from the standpoint of universalism and mercantilist tendencies of a significant number of members in regulating issues of export and import in their own national economies. [8]

Moreover, Ukraine itself, which has the task of reducing the effectiveness of any agreements, in the event of its involvement in real integration processes and in constant opposition to the role of Russia in any international projects, as a participant in the NWO and a representative of the collective West, which is destroying any Eurasian initiatives, as the collapse of the hegemony of the Anglo-Saxons and the further strengthening of the Bretton Woods agreements, from the position of their lack of alternative and further keeping afloat the neocolonial ideas of the "white man" in the struggle with "native attempts" to break free from the yoke of the "golden billion".

At the same time, both the EU itself and the Marshall Plan itself, which actively buried the ideas of European, and then Eurasian integration from Lisbon to Vladivostok, did not support: either the covenants of the great khans of the past, such as Ulugbek and Timur, or the prophetic thoughts of Otto von Bismarck about the union of Russia and Europe through Prussia with the involvement of the imperial states and Asia, capable of resisting the Anglo-Saxon claims, and also

turned away from the neighborly oriented proposals, initially accepted by them, of the same Kazakhstan, which N.A. Nazarbayev often expressed both at European security forums and attracting partners and investors to Central Asia not according to the "5C+1" formula, but with the expected expanded cooperation of both Russia and China, as the most important players in the Greater Eurasian space.[9]

At the same time, neither the "Great Turan" on behalf of the Ottomans and Turkey, today implemented by Great Britain as a fuse for Rudyard Kipling's "Great Game", nor the Persian tales of "1000 and 1 Nights" of the modern Islamic Republic of Iran, nor the Francophone march from its colonies in Africa to Central Asia, become an obstacle in discussions about the future configurations of Eurasia, which are being formed between the BRICS and SCO agendas for the creation of zones of reduced turbulence and preferential development of countries building their development trajectory as an independent journey in the world of the 4th industrial revolution, called Industry 4.0 by Klaus Schwab. It is in this world that the robotic-humanoid order is trying to establish a new classless society in the world, as a result of the introduction of AI and Big Data, which, due to generative neural algorithms, will be able to offer optima not only in technological and economic cycles of reasonable and prudent use of mineral and innovative resources, but also offer each state a worthy place in the MRT and in the labor market, which today are increasingly sliding towards "brain drains", offshoring the shadow economy and "capital flight" of an increasingly criminalized array of existing actors. [10]

If we shift our gaze to the ever-growing pressure of corporatocracy through global institutions of governance of national and not yet completely lost their sovereign features of states, then we can conclude that the ever-shortening cycles of urbanization for the harmonization of relations of the increasingly concentrated industrial North against the backdrop of the agricultural South, then it will be possible to offer models of painless transitions within the framework of integration platforms and economic unions capable of keeping the world in a state of creation and moving away from future conflicts that destroy the balance of "power centers" into which Russia, together with BRICS and the SCO, is turning Eurasia today [11], providing systemic solutions from the point of view of food and economic security, building more modernizing hubs of digital and logistics energy structure, providing opportunities for involvement not only in the processes of fragmentation between countries and regions to find their place "in the ranks" with dignity, but also glocalizing the chains of production and distribution of the future, within the framework of network-conducting solutions, which develop the territories themselves more efficiently and reliably, capable of achieving sustainable cycles of unified strategic planning and resource savings in clustering chains and non-competing industries, achieving the UN SDGs and implementing the "green agenda" as an anti-technogenic cure for the "fruits of the actions of economic man."

And this can only mean that Russia, having overcome the conflict of civilizations and having restarted its development institutions through the reindustrialization of the mobilization economy, is becoming the locomotive of a secure future for Eurasia and partner countries in the unity of tasks and interaction within the framework of the BRICS and SCO blocs being created, diversifying the world of spontaneous shocks and unilateral dominance, developing the EAEU and all those structures that create and try to keep up with both the innovations of the scientific and technological revolution and the ideology of common sense and good-neighborly partnership of people responsible for their planet and making peaceful coexistence the basis for the natural evolutionary development of sovereign states. [12]

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网络模因在外语教学中的应用
USING INTERNET MEMES IN FOREIGN LANGUAGE TEACHING

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摘要。本文探讨了网络迷因的概念，它不仅是一种搜索和消费信息的工具，而且是一种有效的外语教学手段。它给出了不同类型的网络迷因的定义，并强调了它们的教育潜力。作者提出了一套基于迷因漫画的练习系统，该系统可以作为实现教学目标的实用工具，并可用于教育过程，以更好地帮助学生掌握语言和演讲技巧。

关键词：外语教育、网络迷因、语言和演讲技巧、练习系统。

Abstract. *The paper examines the concept of Internet memes not only as a tool for searching and consuming information, but also as an effective means of teaching a foreign language. It gives a definition of different types of the Internet meme and highlights their educational potential. The authors offer a system of exercises based on the use of meme comic strips, which can serve as a practical tool for the implementation of teaching goals and can be used in the educational process to achieve better results in students' mastering language and speech skills.*

Keywords: *foreign language education, Internet memes, language and speech skills, a system of exercises.*

Digital technologies and social networks have allowed Internet memes to become an integral part of the virtual space. This digital phenomenon occupies a special place in the global network, representing a synthesis of audiovisual and textual elements that form a kind of network folklore. Internet memes arise and spread at an incredible speed, influencing public sentiment, cultural trends and communication practices. Consequently Internet memes attract the attention of not only users, but also researchers in various fields, including linguistics, sociology, psychology and pedagogy.

The concept of 'meme' was first introduced by Richard Dawkins, a British zoologist and lecturer at the University of Cambridge, who in 1976 published the work, entitled *'The Selfish Gene'* [1]. In his work, Dawkins introduced the concept of 'mimem' (from Greek *Mimesis*, which means 'similarity'). The term was then shortened to 'meme' to emphasize the similarity with the concept of 'gene'. According to R. Dawkins, memes are some small particles of culture, similar to genes that transmit some idea or information from one person to another, which is similar to the transfer of information from the DNA of parents to a descendant.

Today, an Internet meme is understood as a digital object (image, text, idea) that is distributed on the Internet and changed by users. It maintains a reference to a common source, but acquires new meanings in different contexts [2].

Due to the novelty of the Internet meme phenomenon, its exact definition is still under development. There is a variety of synonyms, such as: a creolized text, a semiotically complicated text, a polycode text, a verbal-visual text, a media-text. We have chosen the term 'polymodal text' which reflects the emphasis on different ways of perceiving Internet memes.

In addition to polymodality, the semantics of an Internet meme is characterized by precedence. Precedence is a linguistic category based on the use of phenomena significant to representatives of a particular culture. Such phenomena carry a certain meaning and are associated with specific events, people, objects, etc., related to extralinguistic reality [3].

Precedence suggests that participants in a communication have a common cultural background and share linguistic and cultural knowledge which serves as a background for understanding Internet memes. If the background knowledge of the communication participants coincides, then the Internet meme is interpreted correctly. An Internet meme can be represented as an information iceberg, which only refers to important information, but how deeply this information will be understood and disclosed depends on the recipient's level of development.

Another important feature of Internet memes is their dynamism and variability. They are really ambiguous because their semantic core includes a set of meanings, so they can quickly change, modify and adapt to different contexts, yet maintaining their relevance and significance for the audience.

The most common types of Internet memes today include: visual, auditory, textual and mixed.

In the visual memes that are distributed by users, there are images that are popular and replicated. Visual memes are generally based on a user-recognizable image or a well-known character on the Internet.

Audio memes are audio recordings distributed over the Internet that were accidentally or intentionally published on the Global Network. Audio memes include well-known lines from movies, TV series, songs, and videos from various social networks.

Text memes are verbal expressions, neologisms, poems, slogans that have become popular and well-known on the internet in the form of a text, for example the slogans of Nike *Just do it* or Coca Cola New Year's advertising *Holidays are coming*.

Mixed memes consist of an image and a corresponding inscription. They also include a variety of popular video memes.

Numerous studies have confirmed the effectiveness of using Internet memes as an additional tool in a FLT classroom. Internet memes, along with other audio-visual teaching aids, help to boost students' attention, increase their motivation and develop their cognitive skills.

When using Internet memes in the classroom, the teacher is to create the necessary conditions for active and dynamic students' activity, as well as their intellectual and mental development. Internet memes provide an opportunity to relieve psychological and emotional stress and allow the teacher to establish a better contact with the student. Memes have the ability to express ideas, emotions, and meanings concisely and accurately; it makes them an ideal tool for practicing language skills. Unlike traditional teaching materials, they are a form of entertainment, which makes the learning process more fun and exciting.

A special system of exercises contributes to the achievement of the goals and objectives of teaching a foreign language when using Internet memes. The system of exercises is a set of interrelated exercises classified by categories, types and varieties, and ordered according to the principle of increasing complexity both of language and operational tasks. It should have a number of key properties:

1. Communicative nature: exercises should be focused on the language use in various communicative situations.

2. Scientific validity: the content of the exercises used in the FLT classroom should correspond to the current level of students' knowledge of a foreign language.

3. Accessibility: exercises should be comprehensible and manageable for students at this stage of training.

4. Repeatability: the system of exercises should ensure the repetition of language elements and speech actions.

Due to the massive spread of social networks, in which there are a huge number of thematic communities (publics), it is easy to create Internet memes: you no longer need to download an Internet meme template and then edit it in special programs. There are websites such as *ImgFlip, Meme Creator, Mr. Meme,* and *Character AI*; using them anyone can select or upload their own template image, and then make a funny caption to it. Such websites as *Memepedia* (a Russian platform) or *Know Your Meme* (an English-language platform) can help the teacher understand the context of a meme, as well as to find detailed information about it.

Meme comics (Web comics) – a combination of pictures and text – can be used to develop students' writing, reading, and speaking skills. The stages of classroom work when using meme comics can be described as pre-text, text, post-text, productive (creative) activities [4].

The **pre-text activities** focus on the formation and development of the skills of extracting information from the text at the level of meaning. The main purpose of this stage is to improve the skill of anticipating the content of the text and activating students' knowledge of a specific topic. When working with illustrative material, the following exercises can be used:

− Look at the Internet meme and tell the class what the text might be talking about. (Who do you see? What are they doing?).

− Look at the visual material of the Internet meme, its characters. (Do you know the characters in this Internet meme?).

− Make up a title for this meme. (Look at the meme. What title would you give it?).

Doing exercises at this stage, students maximize the use of illustrative material and learn to associate the content with the name of the Internet meme.

At the **text stage**, the meme comic book is read by roles. The students who do not get the role of readers may be asked to put separate meme strips in the correct order.

The **post-text exercises** are aimed at developing students' critical thinking skills since memes are often based on the use of background cultural and everyday knowledge, ambiguity and humorous content: students learn to compare the knowledge they have with the information from the text, evaluate its novelty and relevance. At this stage the teacher may offer the students to retell the comic based on pictograms, or to fill in the gaps in the comic.

At the **productive stage**, students can be asked to create their own comic using a popular meme and/or a meme template and provide it with a dialogue and a description of events.

In conclusion, an Internet meme is a media text or a unit of information circulating in the Internet space. This phenomenon is a unique communicative unit. An Internet meme in its traditional sense has a two-level structure – an idea expressed verbally and an iconic component. Internet memes are objects of mass art, so it is quite difficult to evaluate them impartially. That is why the selection of Internet memes as teaching aids in a foreign language classroom should be based on careful selection and scrupulous control. The success of classroom work with Internet memes work depends on the teacher's high methodological competence and their interest in obtaining high educational results.

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智力资源的价值语义启动—人力资本实现的管理技术
VALUE-SEMANTIC INITIATION OF INTELLECTUAL RESOURCES – TECHNOLOGY FOR MANAGING THE ACTUALIZATION OF HUMAN CAPITAL

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摘要。认识到人力资本在知识经济发展中的主导作用已成为信息社会建设中的社会文化主导。

这一过程的自然结果是人们越来越意识到需要解决人力资本道德贬值的根本问题，由于在后工业社会中，知识在其创造过程中可能会过时，因此人力资本道德贬值的速度不断加快。这种模式导致了一个悖论：在降低人力资本质量的风险增加的同时，需要增加对提高人力资本质量的投资。本文致力于基于智力资源价值语义启动的人力资本更新技术，该技术可以消除投资风险并同时提高投资效率。

关键词：启动、价值、意义、智力、资源、投资、自我认同、经济、技术、质量、竞争、充分性、协同作用、分叉、系统、人、资本、创新、风险、预测、理解、效率、可持续性、发展。

Abstract. *Recognition of the leading role of human capital in the development of the knowledge economy becomes a socio-cultural dominant in the construction of the information society.*

A natural consequence of this process is the growing awareness of the need to solve the fundamental problem of the moral depreciation of human capital, the speed of which is constantly increasing due to the fact that in a post-industrial society, knowledge can become obsolete in the process of its creation. This pattern gives rise to the paradox of the need to increase investments in improving the quality of human capital in the context of a simultaneous increase in the risk of reducing quality to negative values. The article is devoted to the technology of updating human capital based on the value-semantic initiation of intellectual resources, which allows eliminating investment risks and simultaneously increasing the efficiency of investment.

Keywords: *initiation, values, meanings, intelligence, resources, investments, self-identification, economy, technology, quality, competition, adequacy, synergy, bifurcation, system, person, capital, innovations, risks, forecasting, comprehension, efficiency, sustainability, development.*

Forecasts of the possibility of human self-destruction in the 21st century have become one of the most pressing issues in the global community since the mid-20th century. The opinions of analysts of the last century that the probability of human self-destruction is constantly increasing" and "humanity will be able to survive only if it can transform" are so convincingly confirmed in modern life that, according to the Collins dictionary, the word of 2022 has become "permacrisis" [14]. Supporters of the new terminology argue that the crisis has become a permanent phenomenon and it cannot be resolved, it can only be managed. Their opponents object, citing the fact that the apparent impossibility of resolving crisis phenomena is a consequence of lack of information, which arises from the fact that the most advanced technologies are put "under the rug". It is no coincidence that the Club of Rome's urgent appeal to humanity, as one of the conditions for overcoming the civilizational crisis, points to the need to "lift the ban on all generating devices operating on so-called "free energy", as well as all other breakthrough technologies - in all areas of social development" [22].

An analysis of the topics of scientific research in the global professional community allows us to consider one of the main areas of breakthrough research to be the search for opportunities to manage the quality of human capital, minimizing risks and increasing the efficiency of investment.

Despite the widespread belief that the main productive factor in the development of the modern economy is human capital, requiring investments aimed at improving its quality, ensuring sustainable competitiveness, in practice, as a rule,

mainly outdated technologies for increasing human capital are financed, causing, at a minimum, an increase in the volume of lost profits, and in the worst case, a negative result. A paradoxical situation is created - on the one hand, there is a rapid growth in the need to increase investments in the quality of human capital, and on the other - an even more rapid growth of risk caused by the property of quality to change its sign to the opposite, which was noted by Aristotle. Therefore, the theory of human capital, created by the works of Nobel Prize winners T. Schultz, G. Becker, S. Kuznets, while retaining its fundamental significance, nevertheless causes great difficulties in practical application, despite the significant improvements made to it by the works of S. Fisher, E. Denison, R. Lucas, J. Kendrick, R. Solow, E. Phelps, R. Nelson and other authoritative scientists. A.V. Bondar argues that "in modern conditions, the workforce, characterized by the presence of intellectual activity, as the ability to accumulate, process and generate new knowledge, and the active, innovative nature of entrepreneurship constitute the substantial basis of human capital" [1]. However, the lag of this ability, which constitutes the substantial basis of human capital, behind the pace of knowledge development is today recognized as the main challenge to humanity. In particular, the Strategy for the Development of the Information Society for 2017-2030 notes: "The pace of development of technologies, creation, processing and dissemination of information has significantly exceeded the capabilities of most people in mastering and applying knowledge" [20].

The Club of Rome calls this problem the "human gap", characterizing it as a gap between a person's ability to make quality decisions in rapidly changing conditions and the rapid growth of the world's complexity [13].

The weakness of the substantial basis of human capital becomes especially dangerous in conditions when, as V.V. Putin noted: "The world is in a state of transformation. A very powerful, dynamically developing transformation. ... In general, the situation is developing dramatically both in the world and in our destiny too" [18].

Yu.A. Korchagin believes that "within the framework of the synergetic approach, development is a process of self-organization of society, based on the growth of the level and quality of human capital and the life of the population" [2]. The danger lies in the fact that in terms of synergetics, the transformation that politicians and economists talk about means a process of bifurcation changes that involve enormous risks and unpredictable consequences, including catastrophic ones. In fact, we are talking about a sociological "flutter" - a phenomenon that in aviation manifested itself in the fact that when the speed increased, the plane began to shake and it collapsed in the air, the flutter phenomenon occurred so suddenly that the pilot did not have time to reduce the speed. After M.V. Keldysh created a mathematical model of flutter, which made it possible to accurately de-

termine the causes of its occurrence and take measures to eliminate it, the possibility of sustainable development of aviation appeared. The current state of humanity is characterized by the threat of "sociological flutter" caused by the irreversible increase in the rate of scientific and technological progress, which is accompanied by an increase in the number of scientific forecasts about the possibility of self-destruction of humanity if the problem of adequate management of the quality of the substantial basis of human capital is not solved. The most famous are the works of F.G. Coombs, dedicated to the crisis of education in the modern world, Aurelio Peccei, who studied the possibilities of preventing the self-destruction of humanity by developing new qualities in each person, N.N. Moiseyev, who proved that the transition of the biosphere to a state in which it would be impossible for humans to survive could occur abruptly, that is, suddenly and instantly [4, 16, 17]. In 1983, Yu. V. Andropov officially announced that a critical situation had developed in the social sciences, which did not allow their recommendations to be used in practice, which forced politicians and economists to move by the most unproductive "trial and error method," setting the task of raising the practical value of the social sciences to the level of the natural sciences [19]. As a result of the implementation of this task, exact humanities were created, based on the system-synergetic synthesis of reality, which makes it possible to exclude the possibility of destructive bifurcation, such as value-semantic philosophy, value-semantic psychology, value-semantic sociology, value-semantic management, value-semantic economics, value-semantic ethics, value-semantic aesthetics, value-semantic culture, value-semantic pedagogy, value-semantic education and a number of other technologies that form the basis of scientific and methodological support for the system of value-semantic education of the intellectual economy of a sustainable world [6, 7, 8, 9, 10, 11, 12]. Exact humanities based on the method of system-synergetic synthesis of reality make it possible to create a mathematical model of sociological flutter, learn to predict its occurrence and take timely measures to prevent destructive effects.

An example of the possibilities of using exact humanities to adequately predict destructive bifurcation points is a study published in 2011, "The Paradigm of Sustainable Development in Education", which provides graphs of the functions of the dynamics of the information environment and the substantial basis of human capital [5]. The forecast of the moment of the end of sustainable development of mankind and the transition to a state of "turbulence", indicated in the graph, coincides with the beginning of the special military operation (SMO) in 2022. The work also pointed out the possibility of eliminating undesirable phenomena and preventing irreversible losses. However, artificial problems created to block the introduction of advanced technologies did not allow maintaining a state of relatively sustainable development of human civilization, causing the need to use military force to ensure security.

Taking into account numerous confirmations of the validity of the conclusions of authoritative scientists that "the probability of self-destruction of mankind is constantly increasing", it seems advisable to ensure the widespread implementation of the technology of managing the actualization of human capital, based on the value-semantic initiation of intellectual resources [14]. A distinctive feature of the value-semantic initiation of intellectual resources is the possibility of its use at all levels of human capital quality management - megaeconomic (human capital as a source of development of international economic organizations such as BRICS, EAEU, SCO, CIS, etc.), macroeconomic (human capital as a source of development of the national economy), mesoeconomic (human capital as a factor in the development of the regional economy and territorial-production complexes) and microeconomic (human capital as a source of development of the economy of an individual, his family, organization or enterprise). At the same time, the unification of technological processes at all levels ensures the fastest process of achieving a state of sustainable growth in labor productivity in any field of activity. It should be noted that the value-semantic technology ensures the achievement of unification of a special, fundamentally new type, namely, harmonious unification, ensuring harmony between the individual interests of each person and the community in which he carries out his activities. The development of a method that ensures harmonious unification was carried out as a solution to an epochal task, the formulation of which belongs to A.S. Makarenko: "An organizational task worthy of our era can only be the creation of a method that, being general and unified, at the same time gives each individual the opportunity to develop his own characteristics, to preserve his individuality" [15, p. 353]. Researchers were divided in their opinions regarding the fundamental possibility of solving this problem, some believed that "attempts to find a single method that would be applicable everywhere showed that there is no "universal method" and each subject and each problem requires its own method" [3]. Others argued that it is extremely difficult to create such a method, but it is extremely necessary, since "such a method would be effective at any time and useful for any society. … This task remains the main one today…" [21, p. 239]. This task was solved soon after the General Secretary of the CPSU Central Committee Yu. V. Andropov announced in 1983 that the key task in the economic sphere was "a radical increase in labor productivity" to the highest level in the world, and that the main productive force was man [19]. In essence, this is the task of A. S. Makarenko with the addition of a requirement for a higher level of labor productivity, since it must be taken into account that labor productivity depends not only on productive forces, but also on production relations, which is why it began to be called the "Makarenko-Andropov Task" among developers of innovative approaches to managing the quality of human capital. Research aimed at finding patterns in human nature that are significant for solving the

Makarenko-Andropov task showed that the productivity of any type of labor is determined by the quality of human capital and the nature of its dynamics, which, in turn, are directly dependent on the self-identification of the individual. Comparative analysis of theories and methods of self-identification and personality identification created to date by such scientists as I. Kant, Swami Vivekananda, L. Feuerbach, Zheng Xiaoyun, Nandana Datta, A. Jurich, Z. Freud, Zhao Yingxuan, Anand Paranjape, A.S. Petrakova, A. Schopenhauer, Wen Fangfang, Zuo Bin, J.P. Sartre, L.B. Alaev, Xue Yan, G. Rickert, V.L. Belokrinitsky, Liu Juanjuan, Wu Yujun, N. Hartmann, Seyed Javad Miri, Wu Xueqin, Zuo Luping, V.A. Yadov, V. Dilthey, P.M. Kozyreva, A.I. Smirnov and others have shown that aspects of self-identification that directly affect labor productivity and the quality of human capital have not received sufficient attention. The findings presented in studies devoted to the importance of human capital for economic development give grounds to believe that the professional community has reached a consensus in recognizing the quality of human capital as the main resource for social and economic development, and that competition, investment, and innovation contribute to an increase in the quality of human capital. However, all of the listed drivers of human capital growth can simultaneously be factors that increase the risk of destructive bifurcation, manifested in a sudden and abrupt transition of positive human capital to passive or negative. Therefore, for sustainable economic growth, it is necessary to apply technologies that allow for accurate measurement, assessment and direction of the dynamics of human capital quality only in a positive direction: from negative to passive and then to positive. The conducted studies have established that such opportunities are opened by a special type of self-identification, called value-semantic. It should be noted that value-semantic self-identification is guaranteed to lead to an increase in the quality of human capital only if it is carried out according to a strictly verified scientifically based author's technology. Violation of the technology can lead to unpredictable results. In order for a person to master the technology of value-semantic self-identification, which allows solving the Makarenko-Andropov problem, a training cycle is organized, the duration of which depends on the selected mode. The highest results are achieved by the "immersion" mode, where students live in special centers that provide continuous training, which allows for the initiation of the internal intellectual resources of the individual and the development of skills for their further sustainable improvement based on the systematic application of a universal method called the system-synergetic synthesis of reality. At present, the system-synergetic synthesis of reality is the only method that can guarantee the successful solution of the Makarenko-Andropov problem. In this case, initiation is understood as a rapid positive change in the qualities of a participant in the socio-economic process, allowing him to become a conscious, proactive, productive creator of the intellectu-

al economy at all levels from microeconomic to megaeconomic. Practice has shown that in terms of the level of growth of positive human capital, "immersion" designed for one week is comparable to the effectiveness of three years of training according to the widespread lecture-seminar or class-lesson system. The results of forty years of testing have shown that for an adequate response to the main global challenge of our time, which is recognized as the excess of the pace of technological development over human capabilities to master and apply knowledge, it is necessary and sufficient to organize a systematic application of the system-synergetic synthesis of reality, ensuring the effectiveness of the value-semantic initiation of intellectual resources, sufficient for successful management of the quality of human capital. An important feature of the technology is the possibility of its successful application in any economic systems, since it was developed by order of the top leadership of the USSR, to prove the advantages of the socialist economy over the capitalist one. Testing under socialism showed a phenomenal result, but the blockade of more than three hundred breakthrough technologies, which was announced by the President of the USSR Academy of Sciences, Academician A.P. Alexandrov in 1986, did not allow for a sufficiently wide implementation. After the collapse of the USSR, testing continued for more than 20 years in new socio-economic conditions, confirming the universality and record-breaking efficiency of the technology, but wide implementation was blocked due to the adoption of political decisions that are today officially recognized as erroneous. In modern conditions, this technology of managing the actualization of human capital based on the value-semantic initiation of intellectual resources can be successfully applied to build a sustainable and harmoniously developing multipolar world, ensuring an exit from the state of permacrisis with the least losses.

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从道德与价值观的辩证统一谈大学生交往文化

SOME ASPECTS OF THE COMMUNICATIVE CULTURE OF UNIVERSITY STUDENTS FROM THE PERSPECTIVE OF THE DIALECTICAL UNITY OF MORALITY AND MORALITY AND VALUE PERSPECTIVES

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摘要。本文探讨了大学生交往文化的重要方面，以及以人为本的教育过程。交往文化中最重要的部分是对学生的价值观态度。分析了道德与品德的辩证统一。

关键词：交往文化；道德与品德的辩证统一；以人为本；学生教育过程；价值观。

Abstract. *The article discusses important aspects of the communicative culture of university students, as well as a personality-oriented approach to the educational process of students. The most important part of the communicative culture is the attitude towards the student as a value. The dialectical unity of morality and morality is analyzed.*

Keywords: *communicative culture; dialectical unity of morality and morality; personality-oriented approach; educational process of students; value perspectives.*

Communicative activity of university students is an activity aimed at implementing interaction between a student and a teacher. The purpose of such communicative activity is to create correct, pedagogically significant relationships for the most effective inclusion in educational environments. In the course of communicative activity, universal attitudes and values, and the humanity of the individual should be formed. Deep understanding and personal acceptance by the students themselves of today's educational activities, a constant desire to explore interactive situations, and to form positive emotional relationships with other students and teachers are necessary for forming a positive outlook of students in relation to socially significant goals. Carrying out communicative activity, the teacher, in turn, conveys his professional qualities, knowledge, skills, and a set of specific

communicative features. All this reflects the communicative culture associated with the ability to apply humane, personal relationships in situations of professional activity. The elements of the culture of communication include: 1) mental presence for the realization of the potential of each student, for creating a comfortable microclimate in the educational process; 2) willingness to cooperate with colleagues; 3) willingness to work with the public; 4) speech culture.

When considering the communicative culture of university students, one cannot help but pay attention to the dialectical unity of morality and ethics of a person, since some of the elements of culture are morality and ethics. Although many theoretical scientists may disagree with this, it is very difficult to imagine in real life a cultured person who is at the same time immoral and (or) amoral. Therefore, "culture" is considered in a broad sense with the presence of many elements.

Analyzing the dialectical unity of morality and ethics, I see some contradictions between these two concepts: morality and ethics. Thus, morality is always a system of norms and rules of a certain social group or era, and therefore a distinction is made between class morality, party morality, professional morality, actors' morality, etc. Morality is understood as rules, requirements that determine how a person should act in a particular situation. According to researcher A.S. According to Tretyakova, a person's morality is revealed not in individual actions, but in their totality, which is assessed primarily through a person's ability to vigorously express a life position [1, p. 85]. That is, morality can run counter to moral principles and, conversely, morality can run counter to moral standards. At the same time, both concepts (morality, ethics) represent a system of norms and rules, a way of regulating the behavior of a certain group of people or an individual. In this regard, knowledge of accepted educational norms and rules of educational communication in society, including at a university, as well as internal moral principles underlying, in our case, the communicative actions of university students, which prioritize the choice of how to act, how to relate to any action, we associate with the moral and ethical teaching of the university students themselves. In this case, the culture of the university teacher will be at the required high level and educational cultural communication will be truly beneficial only if the students' choice is based on moral principles and pedagogical norms.

A special part of the communicative culture is knowledge of the personality and individual characteristics of university students. Structural models of a person proposed by B. G. Ananyev provide a schematic diagram for studying individual-communicative characteristics. The diagrams show the differences in individual, personal, personal and individual characteristics. The first three groups of features determine a person's belonging to a certain type, and the fourth feature - loneliness - focuses on how unique each person is. In general, the particular is inseparable from the individual and can only be described individually based on

the identification of common features that represent a unique combination in each individual case [2, p. 288]. In this regard, at the individual level, attention should be paid to such properties of the nervous system as plasticity and temperamental features rooted in the nervous system, such as activity and emotionality, which play the role of creating communicative abilities. At the subject level, attention should be paid to past communicative knowledge in the form of knowledge about the patterns of communicative activity, communicative skills and abilities. At the personal level, attention should be paid to the focus (on oneself, on another person, on action), social roles, inclinations, ethical qualities, value orientations.

Recently, an important component in the communicative culture of students and teachers of the university has become the transition in the middle of the educational process from the personality of the teacher to the personality of the student, "focusing" on his interests, life ideas, psychological characteristics. The manifestation of all these mental abilities in the personality of a student and teacher are such communicative qualities as intelligence, politeness, attention, hard work, ability to listen, respect, tact, patience, kindness, which means the ability to establish friendly, trusting relationships with students and a creative approach. Therefore, to carry out successful communicative activities, students and teachers must have the following communicative features: at the individual level: natural inclination, plasticity of the nervous system, good key production systems for processing educational information (auditory, visual, productive; restraint; subjective level of communication: knowledge of the rules of educational communication, a high level of development of communicative abilities, stable methods and styles of communicative behavior, conditioned by character traits; individual: social status, social roles, need for communication, direction of communication, inclinations, claims, moral and ethical values, at the individual level: adequate self-esteem, self-regulation.

Changes in the internal structure of the educational setting, balance of power, decentralization of the pedagogical environment, removal of authority, a new fundamental group of connections between thematic and subject elements are actively continuing in the educational environment of higher education. The position (opinion) of a university student has already become a living system of relations between students and teachers. With such a personality-oriented approach to the educational process, university students can achieve better results by organizing educational situations and resolving them together with teachers. Treating a student as a value is the most important part of the teacher's communicative culture.

Another important component of the communicative culture in the education of university students is stimulating their thinking, creating a positive outlook on the educational process. The communicative culture of relations with students is an integral part of the general pedagogical culture, which includes the dominant

idea of another participant in the educational process. Perception of students as a value, as a structured part of the teacher's communication culture, which positively affects the thinking of students. In the theory of relations, V. N. Myasishchev offers three aspects of relations: the inclusion of psychological results of a particular fact; emotional, linking all emotional reactions to what happened; behavior - as an updated response to something [3, p. 356]. Thus, considering the value perspective of the communicative culture of university students, we will highlight its aspects: the mental side includes: examination of the students' mental state, analysis of cause-and-effect relationships of behavior, reactions of inadequacy, family status and life; study of the student as an interconnected value with other values, i.e. his interpersonal relationships in a group, career status, finding the most suitable and comfortable position among peers. The emotional side includes the following elements: the student's inner vision, influencing the system of moral values, the student's global perspective, stating that the student is a part of this system, his views and focus on the student's personality as a value; the emotional side also means the development of relationships over time, which has two sides: the more time the student devotes to communicating with other students and teachers, the brighter the emotional background of the relationship. On the other hand, a student's bad past, known to the teacher, should not form a biased opinion of the student about himself, there should always be faith in changing personality traits for the better and encourage the student to closer and more useful relationships in the educational process. The behavioral side, arising from the two previous ones, is perhaps the most difficult and requires both internal and external efforts from the student. The creation of trusting, respectful, equal partnerships between the teacher and the student depends on such communication qualities.

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在学生中普及体育运动的方法
WAYS TO POPULARIZE SPORTS AMONG STUDENTS

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摘要。本研究旨在确定学生对体育的态度、他们参与体育领域的程度以及对乌拉尔国立医科大学（USMU）体育基础设施的满意度。为了解决提出的问题，组织了一项针对 1-6 年级学生的在线调查。问卷由 9 个关键问题组成。在分析调查结果数据后，提出了旨在改善体育基础设施和让学生参与体育生活的建议措施：增加体育和教育活动的数量；利用社交网络促进学生生活中的体育运动。

关键词：体育、学生、动机、健康。

Abstract. *This work is devoted to determining the attitude of students to sports, the degree of their involvement in the sports sphere and satisfaction with the sports infrastructure at the Ural State Medical University (USMU). To solve the problems posed, an online survey of 1st-6th year students was organized. The questionnaire consisted of 9 key questions. Having analyzed the data obtained as a result of the survey, recommended measures were proposed aimed at improving the sports infrastructure and involving students in sports life: increasing the number of sports and educational events; using social networks to promote sports in student life.*

Keywords: *physical education, student, motivation, health.*

Introduction. The modern rhythm of life requires a lot of energy and strength from us to resist stress and temporary problems. The lifestyle of students is full of mental stress, stress caused by various reasons. To withstand such psychological tests, a strong will, an inner core is needed, which allows you to keep the situation under control and not fall into despair. Sport is one of the ways to educate a person, and not only a means of strengthening a student's health, his physical improvement and useful pastime. Sport is one of the main means of educating movements, improving their fine and precise coordination, developing the necessary motor physical qualities for a person [1]. The effectiveness of playing sports has been proven by science. Playing sports creates high motivation in students, increases their neuropsychic resistance to stress, improves students' mental perfor-

mance and has a positive effect on students' academic performance [2]. Students involved in sports and physical education are distinguished by increased activity in everyday life, they are more decisive, purposeful, assertive, determined, hard-working, responsible and always focused on achieving their goals [3]. That is, the benefits of playing sports are multifaceted, and for a student who wants to have them, there are many ways, since sports include many subspecies and everyone can find something most suitable for themselves, taking into account certain factors and reasons. Since student youth spend most of their time within the walls of a higher educational institution, the determining factor in forming a habit of a sporty lifestyle will be the organization of sports activities in educational institutions, and to a greater extent, the possibility of independent formation of interest in sports activities among students is preserved [4].

The purpose of the study is to find ways to increase students' interest in physical activities, to study the attitude and degree of involvement of students in the sports sphere.

Objectives: to substantiate the need for the presence of sports in the life of student youth, to study, analyze and evaluate the current state of the sports-student relationship, to develop measures to increase students' interest in sports and physical education.

In the course of a sociological study, about 300 USMU students were interviewed using an online survey. Students of 1-6 courses were selected as respondents.

An online survey allows you to find out the opinions of a large number of respondents on the problem that interests the author in a fairly short time (in individual cases, a clear time interval can be set).

This method is quick and easy to use, I believe that in the context of a specific sample and the conditions of the study, the obtained and analyzed data will be useful.

The questionnaire consisted of 9 key questions, with the help of which it was established: the attitude of students to sports, the type of sport that is a priority for them, the opinion of students on the organization of sports activities at USMU, as well as ways to increase interest in sports and physical education.

The study used general scientific methodologies of analysis and synthesis, logical analysis, methods of data collection, description and processing of the obtained results.

Results. According to the survey results, it was found that more than 90% of respondents have a positive attitude towards sports, i.e. there is a high probability of attracting students to sports, especially to game, active sports.

In terms of the distribution of sports based on students' interest, basketball occupies the leading position (177 people - 59%). Basketball is a game that is very

popular among student youth. It is attractive due to its emotionality, the speed of the score change, the skill of technique and the speed of throwing the ball, the spectacle, speed and technique. Basketball is a sports game that develops in players: speed, agility, jumping ability, quickness, coordination, flexibility, endurance. An important skill that is acquired during the game is strategy and the ability to work in a team, effective cooperation. Without a doubt, this is one of the most effective sports.

The answer "other" was in second place. Among the variety of sports offered (swimming 42 students - 14%, various types of fitness 36 people - 12%, athletics 19 people - 6.33%, volleyball 13 respondents - 4.33%, hockey 7 people - 2.33%).

Rare were the answers: snowboarding, figure skating, biathlon, these sports made up no more than 2% of all responses of 6 students.

Formation of motivation for sports and physical education in students is one of the most important tasks in ensuring the educational process in the discipline "Physical Education". Studying at a higher educational institution, a student is faced with a deficit of motor activity, as a result of which emotional and mental fatigue may be observed, which reduces performance. Therefore, motivation plays an important role, it is necessary to look for additional incentives in order to increase interest in sports. Definition of motivation inspires a person and makes it possible to form a need for regular physical exercise [5]. To the question "What motivates you to play sports?" the majority of respondents chose "improving health" (198 people - 66%) and "amateur interest" (54 students - 18%) as a motive, "introduction to a healthy lifestyle" and "I used to do it professionally and want to build a career on it" were distributed among 33 respondents - 11% and 15 people - 5%, respectively. This result is positive, since students realize the need for sports activities and most show amateur interest, and accordingly, it can be assumed that they motivate themselves. As for the problem of the sports infrastructure of the city and USMU, the situation is somewhat tense here. The situation is not critical, but the majority of respondents voted for improving the sports infrastructure of the city (204 people - 68%), and only 39 respondents - 13% of the students surveyed were satisfied with the sports infrastructure, the remaining 57 people - 19% found it difficult to answer. Students show interest and desire to play sports, but due to the lack of proper conditions, there are students who remain in the category of "interest and desire, but no opportunity." A big problem for students is the budget, location of sports facilities, and lack of sports organizations. As possible reasons for the lack of interest in sports, students identified the most priority: lack of time, interested in something else.

From the authors' point of view, the introduction of fitness into the educational process for a long time should be as correct and proper as possible, otherwise a truly positive result cannot be achieved. Thus, it is necessary to use special sports programs, which can also be divided into separate types.

These include: Aerobic fitness programs; Strength fitness programs; Mixed fitness programs; Dance fitness programs; Programs using oriental martial arts.

We should not forget about students of special medical groups who, due to health reasons, are unable to play sports and withstand heavy physical exertion [6]. In such cases, each case should be approached individually and special educational programs should be built that will be suitable for students [7, 8]. In this study, we are trying to find the most optimal solutions to each of the problems. Of course, it is not very reasonable to talk about additional funding for the sports sector, since the university may incur large expenses in other specialized areas.

Based on this, we propose to implement such sports programs that will not require any large financial investments in terms of sports equipment.

Such programs should include, for example: Bodybar training; Conducting classes on a step platform in various formats; Dumbbell gymnastics; Fitness yoga; Pilates; Stretching.

Visually examining the results of the survey in terms of the proportion of responses, we can conclude that at present, most of the surveyed students perceive physical education classes primarily as a way to reduce psychological stress through moderate physical activity. Thus, reducing psychological stress can become an incentive - one of the types of motivation for classes [9]. But what is more important, the main conclusion is that students have a positive attitude to our main ideas. Moreover, some students already had experience in using fitness technologies in independent classes.

Summing up the results of this study, I would like to formulate several conclusions. It is worth noting that students show high enthusiasm for the use of moderate physical activity. Thus, the inclusion of fitness in the classical educational process, as well as team sports games, helps to increase students' interest in physical education [10] and attendance at classes. Fitness technologies can also support and improve the psychophysiological and emotional state of students.

Discussion. In this paper, I tried to consider the issues of popularizing sports activities and active team sports in the educational process of USMU students. Options for reducing the negative impact of the intensive educational process on the psychophysical state of the student are considered, the positive impact of physical activity, fitness classes, especially with an insignificant financial component in organizing competitions, is substantiated.

This study proposes to include certain types of sports programs in the system of physical education classes, as this will contribute to greater interest in sports and improve the health of students.

During the study, a survey of 300 USMU students was conducted in order to identify the students' attitudes to the introduction of sports technologies in the educational process.

Before starting the analysis of the presented topic, it is necessary to pay attention to the fact that the Russian education system is currently undergoing some changes. Thus, relatively recently new standards were adopted. The essence of these standards is that exactly half of the study time a student must devote to independent work. The legislator believes that independent study of educational materials should be attributed to a special type of educational and cognitive activity that will contribute to the personal and, importantly, professional development of the student. In the context of physical education [11, 12], such changes have a negative impact. This is due to the fact that students are practically not interested in independent physical activity, which entails physical inactivity, obesity, lethargy and increased fatigue. On the one hand, this is understandable, since most students spend time studying theoretical applied subjects. In addition, modern higher education is intensive in nature, which is fraught with mental overload, nervous breakdowns, disruption of the student's performance, as well as deterioration in the assimilation of new educational material. This situation is aggravated by the fact that most students do not use their work and rest time rationally, which also negatively affects their psychophysical state. In my opinion, the only painless and most effective way to solve this problem is physical education and sports. At the same time, it is necessary to take into account the fact that rational sports activities can have a truly positive effect on the general health of the student [13, 14]. Regular training develops skills, and the process of forming the human psyche occurs, as there is a process of imitation of life situations that a person tries to overcome or understand how to act, having achieved this or that result, having come to some final goal [15]. In order to increase the interest of students in physical education and sports, it is necessary to consider game programs, entertainment, unifying student groups, as well as fitness classes, leaving the passing of standards in the background, especially for students with health restrictions when studying physical education in a higher educational institution. Thus, according to many experts [16], various types of health activities should be used, which are most attractive to the younger generation. In this case, we are talking about the introduction of fitness programs that combine the effectiveness of training, its result and pleasure from the process. That is why, today, fitness is the most relevant type of physical activity. In addition, it is possible to introduce dance as a means of socialization of the student's personality [17]. It is worth considering the fact that fitness is presented in the form of various types of sports and health activities. Accordingly, a large number of such types give rise to various fitness technologies. Fitness technology should be understood as nothing more than a set of physical exercises, as well as dance elements or steps that are grouped by a special algorithm of actions. As a result, fitness technologies, through a combined, and sometimes chaotic set of actions, are aimed at guaranteed achievement of a positive result, namely, ob-

taining a physical health effect. In addition, fitness is primarily a sport. In addition to the health effect, it carries with it a number of useful effects. Sport teaches a person to be disciplined, responsible, purposeful. Sport forms the best qualities in a person, helping in further self-realization, development as a person. According to the majority of students surveyed, game, spectacular, team sports, inclusion in the classical curriculum, as well as fitness options will increase students' interest in physical education in general. As a result, this will entail an increase in class attendance, which is also positive, since students will not waste their time on irrational rest or, conversely, do not overload themselves with additional educational material. The introduction of fitness technologies should be gradual, as well as the introduction of something new into an old and ingrained system.

Thus, several methods of such introduction can be distinguished:

1. during physical education and student education classes, which is one of the most effective methods of introducing fitness into the curriculum;
2. during optional classes, which are an additional load and are, in a way, a continuation of the educational process, which is reflected in the curriculum; within the framework of extracurricular time, when students can engage in fitness, on the basis of sports grounds and stadiums, in the format of sports sections and clubs;
3. during the period of independent sports activities, a student can engage in fitness either at home or in equipped sports halls. Thus, according to experts, sports training helps improve growth indicators, develop breathing, strengthen the cardiovascular system, and also form a strong musculoskeletal system. The main advantage of fitness is that it has a positive effect on almost the entire body [18].

Conclusions. Thus, as a result of the conducted sociological survey, we found out the attitude of students to sports and established possible reasons for the lack of interest in sports. Having analyzed the data, the authors can suggest the following activities to promote sports and physical education among students: involving the media (coverage of sports events, events, recruitment to sections); increasing the number of sports and educational organizations and sports grounds in the city; using social networks to promote sports in student life; organizing free sports sections, master classes, competitions; material and moral support for beginners and experienced athletes, and most importantly, increasing the number of team sports in physical education classes, which, according to respondents, would better unite sports teams, especially in the initial years of higher education.

At the same time, sports do not require any great effort. The problem of the study is that one of the consequences is a decrease in the general interest of students in independent physical activity. In my opinion, the future lies in the combination of cyber sports (high-tech victories) and active sports (movement in areas

of interest to young people, including students). This was widely demonstrated by the 2024 Games held in KAZAN. From February 21 to March 3, 2024, Kazan hosted a new high-tech tournament of international level - the first ever “Games of the Future”. The competition brought together about 2,000 participants, the number of views on streaming platforms exceeded 150 million [19]. “Games of the Future” is a large-scale sporting event at the intersection of sports, science and technology, a synergy of classical and digital sports. International competitions will be held in 21 innovative disciplines (16 in the main program and 5 in the extended program). Each of them embodies the concept of “phygital” (physical + digital), that is, it combines physical culture and eSports or VR/AR technology, which means it tests the skills of athletes in two previously unrelated dimensions.

The main venue for the “Games of the Future” in Kazan will be the Kazan Expo exhibition complex. It is also planned to use both sports and new facilities (for example, the new IT quarter), as well as Innopolis, to hold the Games.

Kazan’s victory in the bid to host the Games was announced at the St. Petersburg International Economic Forum on June 16, 2022. Four other Russian cities competed for the right to host the games: St. Petersburg, Moscow, Kaluga and Sochi.

QUESTIONNAIRE. WHICH WAY OF POPULARIZATION IS BEST FOR STUDENTS.

QUESTIONS FOR THE SURVEY

1. Moderate physical activity helps me unwind and reduce psychological stress.
2. Regular exercise strengthens my psyche and develops the ability to overcome difficulties.
3. I do/have done sports.
4. I prefer moderate loads in physical education classes.
5. I enthusiastically attend physical education classes at my university.
6. I believe that physical education classes should use moderate, healthy exercises.
7. The introduction of a combination of eSports (new technologies) into physical education classes will increase my interest in them.
8. I would prefer sports games Volleyball / Basketball / Football in physical education classes and other sports (name, underline)
9. What motivates you to do sports?

Answers: Disagree; Agree; Don’t know / does not matter; Clarify / supplement your answer.

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方言词汇中的物质文化（基于词典材料）
MATERIAL CULTURE IN DIALECT VOCABULARY (BASED ON THE MATERIAL OF DICTIONARIES)

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注释。本文分析的材料致力于卡尔梅克语和布里亚特语的方言单位，这些单位是通过连续抽样的方法从 B.D. Muniev 于 1977 年编辑的卡尔梅克语-俄语词典和 L.D. Shagdarov 和 K.M. Cheremisov 于 2010 年重新出版的布里亚特语-俄语词典中提取的。卡尔梅克方言包括 138 个单位，布里亚特方言包括 1127 个单位。从这个列表中，为本文选取了表示无生命物体的方言词，卡尔梅克方言包括 21 个单位，布里亚特方言包括 107 个单位。我们认为，物质文化的分析有助于确定特定民族的重要概念，这些概念在他们的母语中是客观的。方言是根据意义来区分的。结果表明，所分析语言中的词汇组集部分不一致。

关键词：卡尔梅克语、布里亚特语、方言词汇、双语词典、物质文化、物体世界。

Annotation. *The analysis of the material in this article is devoted to dialect units of the Kalmyk and Buryat languages, which were extracted by the method of continuous sampling from the Kalmyk-Russian dictionary edited by B.D. Muniev in 1977 and the Buryat-Russian dictionary by L.D. Shagdarov and K.M. Cheremisov, republished in 2010. Kalmyk dialectisms include 138 units, Buryat - 1127 units. From this list, dialect words denoting inanimate objects were taken for this article, Kalmyk - 21 units, Buryat - 107 units. In our opinion, the analysis of material culture can help to determine important concepts for a particular people, which are objectified in their native language. Dialectisms were differentiated on the basis of meaning. The results indicate that the set of lexical groups in the analyzed languages partially does not coincide.*

Keywords: *Kalmyk language, Buryat language, dialectal vocabulary, bilingual dictionaries, material culture, the world of objects.*

Throughout its history, humanity has surrounded itself with objects, everything that is needed for a certain activity, and it is they that together form the material culture of each specific nation. Being a fairly broad concept, material culture includes everything that is created by human hands. These are clothes, shoes, jewelry, furniture, dishes, weapons, special means for conducting any activity, tools, toys, food, buildings, etc. The natural environment can provide a person with resources, using which he makes objects that satisfy his daily needs.

The world of objects that forms the space mastered by man is a collection of man-made things created by people to perform certain functions.

Man is a being endowed with thinking, we perceive objects of the real world, comprehending their characteristics and purpose, which finds its objectification in linguistic form. That is, a certain fragment of reality is the basis for lexical meaning. The inseparable connection of language - thinking - the surrounding world is most clearly traced in the sphere of material culture.

The goal The purpose of this article is to analyze dialect names of inanimate objects that characterize the material culture of the people. The basis for writing the work were units extracted by the method of continuous sampling from the Kalmyk-Russian Dictionary edited by B.D. Muniev (1977, hereinafter referred to as KRS) and the two-volume Buryat-Russian Dictionary by L.D. Shagdarov and K.M. Cheremisov (2010, hereinafter referred to as BRS, 1 or 2). All lexemes have certain marks indicating their belonging to one of the Kalmyk or Buryat dialects. Here it should be noted that in the BRS there are units with the marks dial. - dialectism, without indicating a specific idiom, obl. - regional, vost. - eastern dialect, zap. - western dialect.

Relevance The present study is determined by the fact that the study of vocabulary helps to identify national and cultural features reflected in the language, to understand universal and specific characteristics. In addition, the actualization of certain material objects in the language is always based on their importance in human life, which is why a set of such objects valuable for the culture of each specific ethnic group always has features that structure a nationally colored picture of the world.

Dialectology, dealing with variants of territorial use of the national language, includes the study of phonetic, word-formation, grammatical, lexical features of dialects. Dialect words are not a separate independent language, they are always characterized by common features with the national literary language. Despite the fact that dialects are an integral part of the language, they have a number of functional differences that justify their specificity [Golubeva, 2023, 92-102].

The choice of lexicographical publications for this analysis is justified. At present, the Kalmyk-Russian dictionary edited by B.D. Muniev, which was published in 1977 and includes 26 thousand units, is a serious academic work on the lexicographic recording of lexemes of the Kalmyk language. Also, to prepare the article, two volumes of the Buryat-Russian dictionary were studied, A-N (636 pages), O-Y (708 pages), with a total volume of 1344 pages, the dictionary corpus is 60 thousand words. This edition is an expanded and supplemented version of the dictionary of 1973, which in turn was based on the 1951 edition. The dictionary of 2010 (updated version of the BRS of 2006) was significantly replenished with new words and expressions characterizing the traditional life and culture of the Buryats.

There are several significant differences between the dictionaries that affect the quantitative indicators of the analysis. Thus, the thesauri present a different number of words, the volume affects the sample as a whole; the Buryat language has significantly more dialects (although the dialect classification is still ambiguous); the BRS does not have a phonetic transcription; the KRS has a specific indication of the dialect: Torgut. - Torgut, Derb. - Derbet, Buz. - Buzavsky; in the BRS this indication is distinguished by its vagueness, it can be a dialect: Khor. - Khorinsky; it can be a dialect/sub-dialect: Barg. - Barguzin dialect; Zag. - Zagustaysky sub-dialect; it can be other: dialect. - dialectism; zap. - western dialect; vost. - eastern dialect; obl. - regional. In our opinion, such vagueness is explained by the lack of a clear classification.

N.N. Poppe writes on this matter: “When examining the dialects of the Buryat language, one can notice that there is an impossible confusion regarding them in the literature” [Poppe, 1933, 15]. Indeed, in the question of the dialectal division of the Buryat language into dialects remains quite controversial to this day, despite the fact that work on the study of dialectal vocabulary and the description of individual dialects began in the late 19th – early 20th centuries.

The difficulties of studying dialects of national languages in Russia include the lack of uniform use of terms. In works on well-studied Russian dialects, there is inconsistency in the use of terms. The conceptual apparatus of dialectologists includes the terms “adverb”, “sub-adverb”, “dialect”, “speech”, “subverb”, “idiom”. However, their classification lacks clarity and ambiguous differentiation.

In such conditions, conducting a study of dialect vocabulary is associated with certain difficulties, however, in this scientific direction, there is a constant research interest, since dialect studies provide data on a synchronous section of the state of the language system. This is also associated with the desire of linguists to describe, record, preserve and analyze the language that exists in a certain historical period, which, against the background of globalization processes, assimilation and the rejection of native speakers of their native language in favor of a more commonly used and more widespread language, is certainly an important task.

Thus, within the framework of this article, we consider the cognitive characteristics of inanimate objects, the significance of which is fixed in the lexicographic source, since these things form the material culture of the Kalmyks and Buryats. Here, we deliberately refused the lexical-thematic fields/groups “Clothing”, “Footwear”, because, in our opinion, these are quite large classification cells that should be considered separately. Here, we do not enter into a dispute about what to call a lexical-semantic field, a lexical-semantic group, a lexical-thematic group, the terminology in this regard is quite diverse, the differentiation is made on the basis of the purpose of the objects that are selected for analysis.

The preservation, revival and development of national culture are impossible without careful treatment of the knowledge accumulated by many generations of people. The need to study the vocabulary reflecting the material culture of the Kalmyks and Buryats is connected with the possibility of tracking the changes in the daily life of the once united Mongolian people, of which modern speakers of the Kalmyk and Buryat languages are parts.

Kalmyks are part of the Western Mongols, the Oirats, who migrated from Central Asia to the territory of southern Russia in the early 17th century and voluntarily joined it in 1609. According to the 2021 census, there are about 180 thousand Kalmyks in Russia. The Kalmyk language, culture and traditions of the Kalmyks were strongly influenced by the Russian environment. The gradual linguistic influence at the present stage has led to the fact that most Kalmyks do not have a sufficient command of their native language. The current state of the entire system of the Kalmyk language is, if one can say so, in stagnation, the language is on the verge of extinction, its speakers use it less and less in limited areas of communication, i.e. there is no talk of developing the Kalmyk language, now the urgent task of preserving it requires a solution. Scientists distinguish three main dialects in the Kalmyk language, the differentiation is based on territorial and linguistic principles.

Many Kalmyk dialectisms are connected with the peculiarities of economic activity and everyday life of the people. Thus, traditionally the Derbets were engaged in nomadic cattle breeding, for transportation purposes they raised camels, horses, lived on the products of breeding sheep and cattle. The Torguts, in addition to cattle breeding, also had developed fishing. The Buzavas, ethnically being Derbets and Torguts, settled on the Don, led a sedentary way of life, adopted more the traditions and customs of the Russian Cossacks, were often baptized.

The Buryats are a part of the Mongolian people that historically formed and settled in the area of Lake Baikal around the 17th century. Currently, there are just over 460 thousand Buryats in Russia. The Buryat language belongs to the Northern Mongolian group of Mongolian languages and is also under threat of extinction, since speakers often do not speak their native language.

Breeding cattle, horses, camels, sheep and goats is the predominant type of traditional farming among the Buryats. Also, the Buryats, living around Lake Baikal, where nature is rich in forests, hunted, fished, gathered herbs, berries, roots, mushrooms, cones. The people cultivated the land and grain crops. Since ancient times, the Buryats were engaged in crafts, among which the most developed were jewelry, blacksmithing, leatherworking, they made clothes, shoes from fabric and felt, sewed leather goods, made harnesses, horse harnesses, processed bone, wood, metal. The traditional home of the Buryats, like all Mongolian-speaking peoples, is a yurt, a round structure made of wooden poles, covered with felt. However, since about the 19th century, the Buryats began to build wooden log yurts, which were covered with a sloping roof. Later they were replaced by wooden houses built like a Russian hut. The change of the usual Buryat dwelling from a mobile and light yurt to a solid log house indicates a gradual transition of nomadic cattle breeders to a semi-sedentary and sedentary way of life.

Thus, both Kalmyks and Buryats were once part of the Mongolian-speaking society, the peoples separated for various reasons, and settled in remote territories in the south and east of Russia. Having much in common in culture, language, traditions and customs, and economic practices, Kalmyks and Buryats have common roots.

The issue of the quantitative ratio of the vocabulary corpus in the two dictionaries under consideration is not discussed here, since we adhere to the opinion that lexicographic sources include units that are relevant for native speakers, and the final number of all words in any language is unknown. It is believed that the Russian language has from 200 to 400 thousand words, the exact number of words in the Kalmyk and Buryat languages is unknown, since such calculations have not been conducted. The history of the Kalmyk language begins approximately with the introduction of the “clear script”, “todo bichig” by the scientist Zaya-Pandita at the end of the 17th century, which was based on the Old Mongolian vertical script, it existed until the transition to the Cyrillic alphabet in 1924. The Buryat language, also based on the Old Mongolian alphabet, developed somewhere in the 10th-11th centuries, and acquired a literary form in 1923 with the emergence of the Buryat-Mongol ASSR. The history of the formation of the literary Kalmyk and Buryat languages includes different periods, and this is associated with a different number of archaic and borrowed inclusions in lexicographic sources.

Most of the names of objects of Kalmyk material culture are obsolete vocabulary that has gone into passive vocabulary, and therefore are sometimes incomprehensible to modern speakers. Thus, in the explanatory dictionary of the modern Russian language by D.N. Ushakov we find an explanation of some units:

Saddle- part of a horse’s harness, a leather cushion under the saddle strap used to support the shafts [Ushakov, 2005]. A shaft is one of two long beams in a car-

riage, fixed at the ends to the front axle and used to harness the horses. To turn the shafts colloquial; humorous and ironic – to go back, having been refused, without having achieved the goal [Ibid.].

The lexemes cited show traces of the Kalmyks' occupations: fishing, hunting, and arable farming. The units denoting fuel are later inclusions, while dung is an element of an archaic layer. Dung is dried cattle dung, which has been used by nomads since ancient times as fuel and building material. The language has preserved proverbs that indicate its value for cattle breeders: "**Ek kөgshrkhlarn eөҗ boldg, arhsn shatkhlarn үmsn boldg**» – A mother, having grown old, becomes a grandmother, and dung, having burned, turns into ashes [Todayeva, 2007, 36]. Here a parallel is drawn between the mother, who is the beginning of life, and dung, which also gives people warmth and life. «Altyg arkhsar uzdg, arkhsig altar uzdg» – Gold is considered as dung, and dung as gold [Todayeva, 2007, 180]. «Arkhsnas ilch hardg, akhlas tosn hardg» – Dung gives warmth, and work – food [Todayeva, 2007, 255]. Found dung brought good luck to the family, and the smoke from the burning of this natural fuel had a cleansing effect.

Some words denoting objects that have fallen into disuse require interpretation. Thus, according to explanatory dictionaries, a bandage is a strand of twisted straw used to tie sheaves [Ushakov, 2005]; a spear is a fishing (less often hunting) tool like a spear with a tip rigidly attached to a long shaft, the tip is usually metal with two or more teeth, the spear is known among all peoples engaged in fishing [Ibid.]; a cheprak is 1. the densest part of the skin; 2. a cloth, carpet or other lining under the saddle on top of the saddle cloth [Ibid.]; a drawbar is a single shaft between two horses, attached to the front axle to turn the cart when harnessed in pairs [Ibid.]; Caulking is one of the methods of sealing the seams formed when connecting structural elements, which consists of filling the seams with fibrous material, tow, moss, wool; for example, sealing the seams between the logs of a log house [Ozhegov, 2003].

The richest information about historical, socio-political, cultural, linguistic changes is contained in the vocabulary of material culture. From the number of Buryat lexemes, it is evident that the names of dishes, furniture, tools for housekeeping, hunting and fishing in the language are quite diverse compared to the list of the Kalmyk language. There are also groups that are completely absent.

Kalmyk dialectisms		**Buryat dialectisms**	
Dishes	2	Dishes	15
Horse harness	3	Horse harness	5
Items for hunting and fishing	1	Items for hunting and fishing	8
Tools	4	Tools	13
Housekeeping items	6	Housekeeping items	18
Items for movement. Transport	2	Items for movement. Transport	8

Combustible materials, fuel	3	Combustible materials, fuel	-
Objects of worship, religion	-	Objects of worship, religion	2
Furniture	-	Furniture	6
Items related to agriculture, livestock breeding	-	Items related to agriculture, livestock breeding	10
Items related to handicrafts	-	Items related to handicrafts	8
Items related to blacksmithing	-	Items related to blacksmithing	2
Toys	-	Toys	6
Buildings	-	Buildings	4
Items related to leather, wool, felt	-	Items related to leather, wool, felt	2
Total	21 units	**Total**	107 units

Human knowledge of the world, the collective experience of the people is naturally reflected in the language, which is the most important means of categorizing reality. The dialect material selected from the KRS and BRS indicates that the Kalmyk and Buryat languages contain elements of territorially limited vocabulary, which is important in the life of the people. Thus, the Kalmyk dialect material picture of the world does not reflect the traditional crafts of the Kalmyks, while the Buryat language has units indicating developed blacksmithing, leather and felt dressing, handicrafts, and work with wool. The Buryat material contains vocabulary related to toys. It is significant that the Buryat dialect material does not contain units denoting fuel. The natural conditions against which the life of the Kalmyks and Buryats took place determine the specifics of the materials used in the economy. The Kalmyks, who lived in the steppe, heated their homes with dung, while the Buryats, who lived surrounded by forests, used wood for both construction and heating.

In conclusion, it should be said that the Kalmyks and Buryats, being fraternal Mongolian-speaking peoples, once diverged in historical development, which could not but be reflected in the language, traditions, and material culture. Dialectal vocabulary under such conditions is a specific indicator that allows us to discover archaic traces that structure the national-cultural specificity and characterize the worldview of the people.

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俄罗斯和莫尔多瓦创业的社会层面：文化传统的影响
SOCIAL ASPECTS OF ENTREPRENEURSHIP IN RUSSIA AND MORDOVIA: THE INFLUENCE OF CULTURAL TRADITIONS

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摘要。本文致力于研究俄罗斯创业的社会方面，重点研究莫尔多瓦地区。研究考虑了文化传统对创业活动的影响，以及促进或阻碍企业发展的社会因素。研究分析了当地文化特征及其与创业实践的相互作用。结果表明，互助和集体主义的传统有助于创建成功的中小企业。本文还研究了成功将文化遗产应用于商业的案例，这不仅有助于经济发展，也有助于保存该地区独特的特征。研究结果强调，在区域层面制定创业政策时必须考虑文化因素。

关键词：创业、社会方面、文化传统、莫尔多瓦、小企业、经济发展、地区特征。

Summary. *The article is devoted to the study of the social aspects of entrepreneurship in Russia, with an emphasis on the region of Mordovia. The influence of cultural traditions on entrepreneurial activity, as well as social factors that promote or hinder business development, is considered. The study analyzes local cultural characteristics and their interaction with entrepreneurial practices. It is revealed that the traditions of mutual assistance and collectivism contribute to the creation of successful small and medium-sized enterprises. The article also examines examples of successful application of cultural heritage in business, which contributes not only to economic development, but also to the preservation of the unique identity of the region. The results of the study emphasize the need to take into account cultural factors in the formation of entrepreneurial policy at the regional level.*

Keywords: *entrepreneurship, social aspects, cultural traditions, Mordovia, small business, economic development, identity of the region.*

Entrepreneurship in Russia is a complex and multifaceted process that cannot be considered outside the social and cultural context. The specifics of doing business in different regions of the country are determined not only by economic factors, but also by cultural traditions that shape the behavior of market participants. In this article, we will focus on the social aspect of entrepreneurship in Mordovia and examine the influence of local cultural traditions on business development.

1. Social aspects of entrepreneurship.

The social principle of entrepreneurship includes the level of trust between market participants, the presence of social networks, community support and cultural norms of behavior. These factors play a key role in shaping the entrepreneurial climate.

Social responsibility of business includes the obligations of entrepreneurs to follow established norms and rules that affect the quality of life of various social groups and society as a whole. In scientific literature, three main approaches to conceptualizing social responsibility of business are distinguished:

Traditional economic approach. Its principles were formulated by the economist and Nobel Prize winner M. Friedman. He saw the social responsibility of business in increasing profits and satisfying the interests of shareholders [1, p. 32].

Ethical approach. It was introduced by the sociologist and economist P. Drucker and his followers. They believed that companies are responsible not only to shareholders, but also to broader groups of "interested parties" (stakeholders) – customers, employees, business partners, suppliers, trade unions, local communities, etc. [1, p. 33].

Social-ethical approach. It was developed under the influence of the philosophical views of K. Levin, G. Mintzberg and other theorists. They believed that business should bear voluntary obligations to the whole of society and direct part of its resources to its development [1, p. 34].

Social responsibility of business is multi-level.

The basic level includes timely payment of taxes, payment of wages, provision of new jobs where possible, and expansion of the workforce [2].

The second level involves the implementation of social investments of an internal nature: providing workers with adequate conditions not only for work, but also for life, improving the level of personnel qualifications, preventive treatment, housing construction, and development of the social sphere [2].

The third level of social responsibility is focused on the external environment, when the enterprise directs part of its funds to solving the problems of the region where it operates: reducing crime rates, helping children, organizing youth leisure, improving the environmental situation, and charitable activities [2].

These levels highlight the importance of the relationship between entrepreneurship and society, and the role of business in creating a more just and sustainable world.

1.2 Trust level.

Trust between market participants is an important condition for successful business. In regions with high levels of trust, entrepreneurs are more willing to cooperate and exchange information. This creates a more dynamic business environment that promotes innovation and growth.

2. Cultural traditions and their influence on entrepreneurship.

2.1 Features of cultural traditions in Mordovia.

Mordovia is a region with a rich cultural heritage, where various ethnic groups are concentrated. The traditions of mutual assistance and collectivism are an important feature of the local culture, which influenced. In Mordovia, craftsmen and artisans actively use traditional technologies, which contributes to the preservation of cultural heritage and the development of local businesses. Here are some examples:

Weaving in Mordovia is one of the oldest and most traditional types of artistic textiles. From ancient times until the 20th century, homespun materials were used to make clothing and household items. Underwear was made of linen and hemp canvas, outerwear was made of woolen cloth, canvases of the finest yarn were prepared for evening and festive clothing, and onuchi were made of coarse, strong threads for wrapping the legs. Wood carving is one of the popular craft traditions. Craftsmen create unique items, such as wooden toys, interior items, and souvenirs, using traditional patterns and motifs [3, p. 119].

Modern weaving in Mordovia was developed in the early 80s of the 20th century and is associated with the names of V. Fomicheva, O. Kolmogortseva, L. Levina. Traditional weaving in Mordovia is currently being developed by folk craftsmen in cities and in regional Centers of National Cultures, for example, in the village of Terizmorga in the Staro-Shaigovsky District, craftswomen weave cloth, embroider it with an ornament, and then make traditional clothing and towels from it [3, p. 122].

3. Ceramics in Mordovia has a long history. In the territory of Mordovia, pottery was widespread mainly in the Russian villages of the Saransk and Insarsky districts of the Penza province: Monastyrskoe, Unuevsky Maidan. At the end of the 19th - beginning of the 20th century, 200 families in Shishkeevo were engaged in pottery production. The potters' products were distinguished by their diversity: small clay dishes, jugs, bowls, bowls, pots, jugs for storing grain [4, p. 203]. The Mordovian Republican Museum of Fine Arts named after S. D. Erzya presents a collection of molded and circular ceramics, typical of Mordovia.

Souvenir makers create items that reflect local traditions and culture, attracting tourists and promoting small business development. Among such souvenirs are

decorative wood carvings, Tavlin toys, nesting dolls, wooden dolls, and Mordvin Urusov felt boots with national ornaments and embroidery. Also popular are musical instruments such as "Torama" and gastronomic souvenirs, including sweets and cookies from the Lamzur confectionery factory, honey, sausages of the Atyashevo brand, products from the Sarmich and Ichalkovsky cheese factories, as well as goods from the Saransk canning factory (green peas and condensed milk).

Unique are the products made of bog oak by the Rostr company, which is mined in the largest rivers of the republic - Moksha and Sura. In 2023, bog oak products were recognized as a folk craft of Russia with high artistic merit. In June 2024, it became known about the creation of the Black Gold Bog Oak Museum in the Mordovian Reserve.

These traditional technologies not only preserve cultural heritage, but also allow craftsmen to find their niche in the modern market, offering unique products that stand out from the mass production.

2.2 Impact on small businesses.

Mutual aid traditions encourage the creation of small and medium-sized enterprises based on family or community ties. Local entrepreneurs often team up to implement joint projects, allowing them to share resources and expertise.

2.3 Examples of successful use of cultural heritage.

Many local craftsmen and artisans use traditional technologies and materials to create unique products. This not only preserves cultural heritage, but also meets modern market demands.

Mordovia has several successful examples of the use of cultural heritage that contribute to the development of the region and the preservation of traditions.

1. Festival of Mordovian culture and culinary traditions. The region regularly hosts festivals that present traditional crafts, music and dance, which attracts tourists and promotes local culture. Among them are "Kurgona" - a festival of Mordovian hospitality, "Sudosevsky Karp" - dedicated to fishing, "Luchok - Golden Barrel!" - an onion festival, "Kashtom Kurgo" - a gastronomic festival, as well as "Shumbrat, Mordovia!" - a republican festival-competition of folk art and an exhibition of decorative and applied art "Mastery of the Mordovian Land".

2. Museums and exhibitions, such as the Museum of Mordovian Culture in Saransk, play an important role in preserving and showcasing the people's cultural heritage. In this context, special attention is paid to exhibitions dedicated to folk crafts. Important institutions include the S. D. Erzya Museum of Fine Arts, the Mordovian Farmstead ethnographic complex, the M. P. Devyatayev House Museum, as well as Ethno-Kudo in the village of Podlesnaya Tavla and the F. F. Ushakov Temnikov Museum of History and Local Lore in Temnikov. These institutions contribute to the study and popularization of Mordovian culture and history.

Tourism: Creating tourist routes that include visits to historical and cultural sites, as well as master classes on traditional crafts, helps to attract attention to the cultural heritage of the region.

Ecotourism in this region is represented not only by a variety of recreation centers, but also by such significant sites as the Smolny National Park and the Mordovian State Nature Reserve named after P.G. Smidovich. In these places, visitor centers are organized, ecological trails are laid out and guest houses operate. Also worth noting is the Krechet Safari Park, which offers a unique opportunity to observe deer in their natural habitat.

A pilgrimage and tourism cluster are being formed in the Temnikovsky District of the Republic of Mordovia. The Nativity of the Virgin Sanaksar Monastery houses the grave of Admiral Ushakov, and his holy relics are also kept there.

Ethnographic tourism: National villages of Mordovia are becoming centers of attraction for tourists. For example, in the Moksha village of Staraya Terizmorga, there is a cultural center with an open-air museum-estate. In the Erzya village of Podlesnaya Tavla, Tavlin wood carving is actively developing.

These initiatives not only preserve cultural heritage, but also contribute to the economic development of Mordovia, creating new jobs and attracting investment. The influence of cultural traditions on the development of entrepreneurship can be both positive and negative.

Problems and challenges.

Cultural traditions influence the development of entrepreneurship through various aspects.

For example:

- Conservative risk management policy assumes a cautious and precautionary approach to risks. It is aimed at reducing potential losses and includes actions aimed at ensuring financial stability and security. This approach can be beneficial for companies that want to maintain their profits and avoid additional expenses. However, it can lead to low profitability of the enterprise, as it limits the company's ability to participate in new initiatives and promising activities [5].

- Values and attitudes shape work ethic and motivation to achieve material benefits. One culture may emphasize leisure, while another emphasizes hard work.

- Manners and traditions. Cultural norms of behavior, communication, and dress code influence business relationships. For example, Japanese business communities are characterized by the custom of "keiretsu" - purchasing goods and services from each other, ignoring more favorable offers from third-party manufacturers [6, p. 5].

- Social structure influences decision making, location selection, advertising strategies, and business practices and costs.

- Religion. Different religious traditions have different views on work, savings and material values.

The development of entrepreneurship is also influenced by moral norms formed by cultural traditions and customs. These norms serve as an additional regulator for business, establishing certain boundaries and reducing risks.

Some positive consequences of the influence of cultural traditions on the development of entrepreneurship:

- Creation of a competitive economy. Support for local brands, small producers and ethnic production traditions contributes to this process.

- Improving business image. For example, restoring and popularizing historically established moral and ethical principles can have a positive effect on the region's image.

- Development of ethical qualities necessary for entrepreneurship. Honesty, integrity and reliability have always been the basis of a businessman's reputation.

- Formation of ethical characteristics that are important for business culture. Honesty, reliability and trust have always served as a guarantee of a good reputation for a businessman.

- Influence on the ethics of entrepreneurial activity. Ethics puts business in certain limits and reduces risks. For example, Orthodox ethics orients a person not to material gain, but to the moral content of his activity [7, p. 265].

For example, the custom of hospitality and the institution of developing business and friendly relations in the culture of various peoples of Russia and Mordovia contributed to the development of trade and other economic relations.

Ways to address cultural traditions in the development of entrepreneurship.

- Promotion of national and cultural characteristics. This helps improve the image of the region and increase its attractiveness for potential investors.

- Taking into account historical and cultural heritage is an important aspect in the development and implementation of programs in the economic and social sphere. This allows for more effective integration of cultural values and traditions into modern development strategies, promoting sustainable socio-economic progress.

- The development of cultural interactions contributes to a deeper understanding of the mentality and traditions of different peoples, which is an important factor for successful business.

- The influence of the educational system. It can contribute to the formation of certain moral values in entrepreneurs and the creation of a new entrepreneurial ethic.

- Awareness of social responsibility by entrepreneurs. The main feature of national business ethics should be the desire for work, creation and honesty, and not for wealth and consumption.

Adapting support programs to cultural specifics can lead to the creation of more sustainable and innovative business models that contribute to economic development in both Russia and Mordovia.

Conclusion

The social aspects of entrepreneurship in Russia and Mordovia demonstrate a deep connection with cultural traditions and local customs. These factors shape not only the entrepreneurial environment, but also attitudes towards risks, innovation and family values. It is important to note that despite existing limitations such as fear of failure and traditional roles, there is a growing interest in entrepreneurship, especially among young people and women.

Government support and local initiatives also play a key role in creating a favorable environment for business development. Sustainable development and environmental aspects are becoming increasingly relevant, which opens up new opportunities for entrepreneurs seeking to integrate cultural values into their business models.

Thus, the successful development of entrepreneurship in Russia and Mordovia requires taking into account cultural traditions and social factors, which will create a more harmonious and sustainable business environment.

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七海文化研究史学

HISTORIOGRAPHY OF THE STUDY OF NANAI CULTURE

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摘要。民族文化发展问题研究的现实意义取决于俄罗斯社会的民族和科学兴趣。在俄罗斯史学界，研究人员分析了通古斯-满语族纳奈人传统生活方式的变化。“纳奈”或“纳奈人”这一族名是由 V. A. 图拉耶夫在 20 世纪末的科学著作《俄罗斯联邦北方、西伯利亚和远东土著民族百科全书》中引入的。A. 图拉耶夫在 20 世纪 20 年代末和 30 年代初引入了这一族名。探险队、旅行者和政府官员的民族志成果对纳奈人的历史和文化研究做出了重要贡献。例如，今天，在“复兴民族传统”计划的框架内，对普里亚穆里耶地区的纳奈族文化进行了研究，该计划在哈巴罗夫斯克州所有民族村落的幼儿园和学校实施。

关键词：纳奈族、传统、民族教育、文化遗产、教育、纳奈语。

Abstract. *The relevance of the study of the problems of ethno-cultural development is determined by ethnic and scientific interests of the Russian society. In Russian historiography, researchers have analyzed the changes in the traditional way of life of the Nanai people of the Tunguso-Manchurian language group. The ethnonym “Nanai” or “Nanaians” was introduced in his scientific work Encyclopedia of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation by V. A. Turaev at the end of the 20th century. A. Turaev in the late 20s and early 30s of the twentieth century. An important contribution to the study of the history and culture of the Nanai people was made by ethnographic results of expeditions, travelers, and government officials. Today, for example, the culture of the Nanai people of the Priamurye region is studied within the framework of the program “Revival of ethnic traditions”, which is implemented in all kindergartens and schools of ethnic villages of the Khabarovsk region.*

Keywords: *Nanai people, traditions, national upbringing, cultural heritage, education, Nanai language.*

Academician L.I. Shrenk [1] was actively collecting general knowledge devoted to describing the material culture of the Nanai [1]. Sent to the Far East with an expedition from the Russian Academy of Sciences in 1854-1856, he summarized information about funeral rites, about the send-off of the souls of the dead, about the rites associated with hunting, the ceremony of the bear festival.

Geographer N.M. Przhevalsky [2] in his 1867-1869 expedition to the Ussuriysk region described the daily life of the Nanai, their customs related to marriage, fishing rites, and funeral rites.

Participant of the expedition to the Amur in 1910. L.Y. Sternberg [3], the founder of Russian ethnography, described the Nanai people's ideas about the afterlife. In 1933, in his monograph "Gilyaks, Orochs, Golds, Negidals, Ainu", he described in detail family and marriage relations, hunting and fishing customs and rituals.

In 1914 organized the first expedition of I.A. Lopatin's camp on the Amur [4], Labor, devoted to a comprehensive ethnographic study of the Gold people, their spiritual and material culture, family structure, life, living conditions, the level of development of traditional economy, beliefs, customs, rituals. He paid special attention to the value of native language and folklore.

On the basis of collected field materials of expeditions Yu. A. Sem considered the transformation in the culture and economy of the Nanai during the years of Soviet power. The author's own classification and terminology of Nanai folklore genres are of special significance. Having divided them into myths, mythological stories and legends, into heroic epic, shamanic myths and everyday stories.[5. p.34].

In the works of O.V. Maltseva, the locations of cultural and landscape centers, which are the area of residence of the indigenous Far Eastern ethnic groups, are analyzed. National districts and regions were included in the industrial development zones of the Far East in the 1930s (since 1938 - Khabarovsk Krai). Since 1939, the territory of the Gorin Nanai was within the administrative boundaries of the Komsomolsky District of the Khabarovsk Territory. Since 1962 and 1977, its territory was divided between the newly formed Komsomolsky, Amursky and Solnechny Districts, which became the main industrial hubs of the Khabarovsk Territory. the problem of nature management of the indigenous population.[6]

The problems of ethnic history and social organization of the Nanai are covered in the work of A. V. Smolyak [7]. In his study, the author described some principles of Nanai physical education, the activities of shamans, their attributes, and the peculiarities of their worldview.

The collective monograph by S. V. Bereznitsky [8] studied in detail the spiritual culture, worldview, and folk knowledge of the Nanai people. Ethnogenesis and ethnic history are analyzed.

Materials, reports on traditional Nanai upbringing are presented in the works of O. A. Shaburova. Traditionally, girls were introduced to housekeeping, cutting, sewing and embroidery skills. They were taught knowledge of folk medicine, demonstrated techniques of protective magic, making amulets with rituals. [9, c. 114]

In the study of general issues of Nanai society organization, ways and methods of traditional Nanai upbringing in the works of P. Y. Gontmakher. [10]. Transmission, the transfer from generation to generation of folk culture, remains one of the main problems in education. Professor S.F. Karabanova highlighted the specifics of dances, which fulfill the function of education, upbringing and entertainment. She emphasized the importance of the cult of nature, the beliefs of the Nanai through such subjects as "Native Amur expanses", "shaman's dance." [11. c. 63]. The participants of the groups, their parents and spectators are educated on the repertoire. The transfer of dance art experience to the younger generation now occurs through the choreographer, cultural and educational institutions, where the sense of national pride is developed on the basis of reference to the roots of traditional Nanai culture, language, history, folklore, arts and crafts. The leaders, when creating a new plot, are based on scientific literature describing the customs and rituals of their people. On the basis of folklore, through dance convey compositions devoted to ritual culture. In the works of ethnographer E.A. Gaer such plots as: "Seeing off for hunting", 'fisherman's dance', 'sable dance', 'hunter's dance' carry a traditional meaning. It consisted in bidding fish on fishing, calling birds and animals during the hunting season. [12, c.42]

The peculiarity of Nanai narrative folklore was emphasized by N.B. Kile. She is also the author of the textbook of the Nanai language for children, the organizer of educational and methodical lessons of the Nanai language in the Soviet time. [13]

V. I. Prokopenko dealt with the study of physical education and the specifics of the northern multiathlon. "Games of the peoples of the North are characterized by universality and complexity, develop vital motor abilities, harden and strengthen health, form character" [14, c. 22]

As a result of the study of historiography, we found out that to date, the number of studies devoted to the Nanai national education in the Soviet and modern times is insignificant. The majority of specialists, addressing pre-revolutionary national education, emphasized the descriptive side of the main aspects based on the accumulated data from ethnographic expeditions.

In our opinion, the issues related to comparing the main aspects of the Nanai education system in pre-revolutionary, Soviet and modern times remain insufficiently covered.

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现代社会健康、体育和康复问题解决的问题和选择
QUESTIONS AND OPTIONS FOR SOLVING THE PROBLEM OF HEALTH, PHYSICAL EDUCATION AND REHABILITATION IN MODERN SOCIETY

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相关性。健康改善不仅是一种健康的生活方式，它还意味着身体因受伤和疾病而失去的能力的恢复。在这里，系统的体育锻炼和运动起着主要作用。物理治疗和改变一组甚至简单的练习，逐渐增加负荷，可以让你达到仅通过手术，甚至是高科技手术，或按摩和理疗无法达到的效果。肌肉训练，包括被动体操，可以让肌肉长时间保持活力，从而有恢复的可能性。本文探讨了在多次手术或挫伤后遭受严重伤害、失去肢体功能的患者恢复健康生活方式的可能性。

关键词：体育锻炼、康复、电刺激。

Relevance. *Health improvement is not only a healthy lifestyle, it is the restoration of the body's lost abilities due to injuries and diseases. And here the main role is played by systematic physical education and sports. Physical therapy and a change in a set of even simple exercises with a gradually increasing load allows you to achieve results that cannot be achieved only through an operation, even a high-tech one, or massage and physiotherapy. Muscle training, including passive gymnastics, allows muscles to maintain their viability for a long time, and therefore the possibility of recovery. This paper considers the possibility of returning to a healthy lifestyle in patients who have suffered severe injuries, lost limb function, after repeated surgeries or contusions.*

Keywords: *physical education, rehabilitation, electrical stimulation.*

The field of physical education and sports has countless techniques that can satisfy the various needs of individuals in motor activity, health improvement of the body and psyche. At the same time, an important role is given to such innovations that make learning more accessible and understandable for each person; inclusion of musical accompaniment in classes, which helps to more easily endure physical exertion, systematic training helps to strengthen the muscular system and improve posture, as well as the psycho-emotional state of students. A device that is

always in your pocket or that replaces a regular watch is able to monitor and track our health indicators throughout the entire time of use. The principle of operation is extremely simple, the most important thing is contact with a person [1].

A separate issue covers the physical activity of patients during the period of recovery or rehabilitation. Physical education and exercise therapy are included in the mandatory course of rehabilitation treatment in traumatology departments and centers, specialized health resorts, which is clearly justified.

After all, in recent years there has been a steady increase in the frequency of road accidents, industrial injuries, domestic injuries, accidents and natural disasters, military injuries. Traumatic injuries of the spinal cord and nerve trunks of the extremities occur mainly at a young age, lead to a huge social problem, and rank first in terms of disability. Dysfunction of the spinal cord and nerves against the background of a serious condition of the patient, especially in patients on mechanical ventilation, is often recognized not immediately, but some time after the injury, when restoring vital functions of the body, which delays the process of restoring the patient's lost functions. Comprehensive rehabilitation requires knowledge of multidisciplinary medical specialties, fundamental sciences, especially physiology and anatomy, including all human muscles. The age of digitalization is rapidly accelerating the level of development of information technology in modern society, including in physical education and sports.

Robotized rehabilitation and mechanotherapy complexes allow developing joint contractures, walking skills; "avatars" provide an opportunity for self-realization of the patient to restore the function. The development of bionic prostheses allows us to achieve the almost impossible, but even the most modern prosthesis needs to be adapted to each patient, individual training, comprehensive assistance from a team of specialists and daily physical work aimed at restoring lost functions are necessary. Occupational therapy helps to restore self-care and social adaptation functions. Physiotherapy, massage and therapeutic fusculture are the key to high-quality rehabilitation for the most severe ailments. An example is epidural electrical stimulation and the Lokomat software package for spinal cord injuries or combined electrical stimulation and Arthromot for spinal cord injuries. And most importantly, methodical daily physical education and sports activities in order to maintain passive and active movements in the joints, muscle tone, and the possibility of reinnervation. In order to train denervated muscles, leading rehabilitation centers of the country and foreign clinics use various versions of training complexes [2, 3, 4, 5, 6] to restore motor activity of the legs, containing a weight support system, a suspension system and a system for passive movement of the patient's legs [7, 8]. In modern generations of devices, electrical stimulation of the spinal cord is additionally used, which acts as a low-frequency pulse generator with low-frequency amplifiers connected to implanted electrodes.

To enhance the potentiation of the effect of electrical stimulation, the patient in the middle of the course of exercise therapy on the Lokomat complex underwent simultaneous exposure to mechanotherapy and electrical stimulation (Fig. 1).

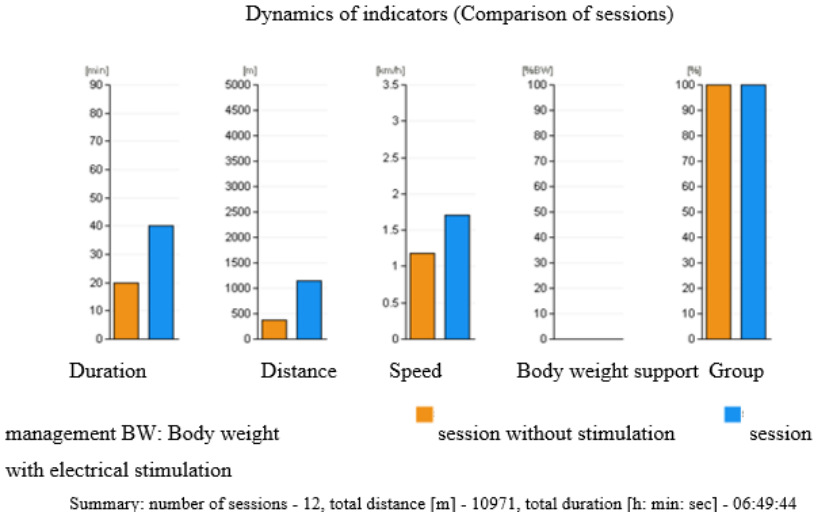
Figure 1. *Photo of the patient Patient L., 67 years old, during rehabilitation treatment on the robotic complex "Lokomat", with one-stage temporary epidural electrical stimulation, with cutaneous leads on the left lower limb in the area of autonomous areas*

With the simultaneous effect of electrical stimulation and mechanotherapy on the "Lokomat" complex, an increase in the duration of exercise therapy from 20 to 40 minutes, an increase in the distance traveled by 3 times, an acceleration of walking by 0.5 km / h (Table 1) were recorded, which clinically manifested itself as an increase in the tone of the muscles of the back and lower limbs, increased tolerance to physical activity, lower distal monoparesis regressed to mild.

Table 1

Overview of the indicators of the first (training on Lokomat without stimulation) and the second session (training on Lokomat in combination with complex electrical stimulation) (the difference shows the second minus the first session)

Load		Training		Difference	Difference in %
		without stimulation	with electrical stimulation		
Duration [min:sec]		19:44	40:13	20:29	103,8
Distance [m]		378	1136	758	201
Average speed [km/h]		1,2	1,7	0,5	44,7
Average body weight Support [%]		0	0	0	0
Average Group leadership [%]		100	100	0	0
Load on hip joint	left	-138,16	+0,94	+139,10	-100,68
	right	-134,87	-105,40	+29,47	-21,85
Load on hip joint	left	-221,18	-43,79	+177,39	-80,20
	right	+137,79	+202,82	+65,02	+47,19



In the middle of the mechanotherapy course, to enhance the potentiation of the effect of electrical stimulation, the patient was offered to perform combined electrical stimulation with the simultaneous effect of the training complex. According to the example above, the average increase in the patient's endurance was 201.3%. The average increase in the distance covered in one training session was recorded at 154.6%, which on average corresponds to an increase in the distance covered by 753 meters, the increase in speed was on average 32.7%.

Group management

The patient's neurological status before and after the treatment allows us to say that with the simultaneous effect of combined electrical stimulation and mechanotherapy on the Lokomat software complex, an improvement in the patient's endurance is determined. The ability to switch from two to one electrical stimulation per day, and as a result, increased independent muscle contractions in patients with severe monoparesis. The appearance of tactile sensitivity in a patient with lower flaccid paraplegia, a decrease in the zone of sensory disorders. This course of complex treatment allows the patient to shorten the rehabilitation period by 1.5 - 2 times. Physical education and sports are an integral part not only of patients, but also of healthy people. Various kinds of gadgets help to collect, use and manage information about physical activity and health status not only by the person who wears it, but also to share this information using applications with medical staff. These technologies are changing a person's usual way of life [9].

The topic of a healthy lifestyle and maintaining health is one of the most pressing topics of our time. Constant monitoring of health indicators is becoming an urgent daily necessity. And here digital technologies in the form of wearable devices, a variety of which are fitness bracelets, mobile applications and programs for monitoring the state of the body come to our aid. They allow not only to monitor the general condition of a person, track changes in the work of organs and systems, but also help in optimizing the training process, and also allow timely detection and prevention of possible problems.

With the help of optical sensors, we can obtain quite reliable data primarily on the heart rate. Due to this function, fitness bracelets are extremely interesting for athletes, as well as healthy people and patients. Bioelectric sensors can additionally measure the fat content in the body, which is of great importance at the stages of preparation for performances in competitions [10].

Physical education and fitness technologies can also help prevent negative attitudes towards physical education lessons, help maintain and strengthen the health of students, and are an effective means of increasing the level of physical activity. There are now fitness trackers that display the number of steps taken by a student, his health, keep a food diary and collect statistics through an application on the physical education teacher's phone. There is also an option with a smart watch with a GPS navigation system (it helps track the student's movement around the city) and a "panic button". Many physical education teachers come from big sports, where the main thing is a constant increase in the load. However, this is not quite the right approach: the main task of physical education is to make the student want to run, want to play sports in his free time and monitor his physical health, that is, to motivate and teach how to do physical exercises correctly [11].

Figure 2. *Exoskeleton. Possibility of walking of a paralyzed patient with the help of mechanical action*

Figure 3-6. *A health event, a traditional race was held in Kurgan in the Ilizarov center, dedicated to the birthday of the scientist academician G.A. Ilizarov for the "Order of a Smile"*

Conclusion. Movement implies the continuation of life, the quality of vital functions for a person, a return to a healthy, full lifestyle (Fig. 2-6).

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俄罗斯远东地区教师眼中的欺凌现象是学校调解的问题
THE PHENOMENON OF BULLYING IN THE PERCEPTIONS OF TEACHERS IN THE FAR EAST OF RUSSIA AS A PROBLEM OF SCHOOL MEDIATION

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摘要。本文介绍了一项关于远东教师对欺凌现象的看法的研究结果。研究方法是问卷调查“你对欺凌了解多少？”（Telminova A.V.、Saygushev N.Ya.、Vedeneyeva O.A.、Tsaran A.A.）。这项研究涉及工作经验为 5 至 50 年的教师（n=93），他们在不同的教育机构工作。研究表明，虽然教师认识到欺凌的某些因素和影响，但他们在理解和应对策略方面仍然存在很大差距。加强培训和提高认识的举措对于使教育工作者能够有效地识别、干预和预防校园欺凌至关重要，为所有学生营造一个更安全、更有利的教育环境。

关键词：欺凌、教师、表现、预防、学童、学校。

Abstract. *The article presents the results of a study of the Far East teachers' ideas about the phenomenon of bullying. The research method was the questionnaire "What do you know about bullying?" (Telminova A.V., Saygushev N.Ya., Vedeneyeva O.A., Tsaran A.A.). The study involved teachers (n=93) with work experience from 5 to 50 years, working in various educational institutions. The study illustrates that while teachers recognize certain elements and effects of bullying, there remains a significant gap in their understanding and response strategies. Enhanced training and awareness-raising initiatives are essential for empowering educators to effectively identify, intervene, and prevent bullying in schools, fostering a safer and more supportive educational environment for all students.*

Keywords: *bullying, teachers, performances, prevention, schoolchildren, school.*

Financial support information. The study was carried out as part of the implementation of the state assignment for a fundamental scientific study on the topic “Prevention of conflicts in the educational environment using mediation technologies” (Supplementary Agreement to the Federal Budget Subsidy Agreement or an Autonomous Institution for financial support of the implementation of the State Assignment for the provision of state services (work performance). No. 073-03-2024-045/4 of August 27, 2024).

Currently, Russia is among the top ten countries where teenagers most often encounter the problem of bullying. It should be noted that bullying is quite widespread in the educational systems of schools in a wide variety of countries, as evidenced by cross-cultural studies of this phenomenon. Scientists note that regardless of the type of culture, this phenomenon has similar features: widespread prevalence among adolescents and a decrease in victimization rates by adolescence [Smith, 2019; Shalaginova, 2019], higher involvement of males in the process of «bullying» [Dakhin, 2015; Slava et al., 2018], a high risk of subsequent social maladjustment of victims of bullying, and the risk of developing behavioral and emotional problems in the future [Kennedy, 2021].

The specifics of teachers’ attitudes towards bullying largely determine the strategies that are chosen in relation to this phenomenon by school management and the parent community: “we solve” or “we avoid and keep silent”. It should also be noted that teachers in the modern domestic education system work in a situation of increased stress: heavy workload, high demands of the parent community, high level of complexity of educational and methodological tasks, insufficient level of public recognition of the profession itself and high demands on the level of personal self-development, as well as psychological well-being, etc. [Kruzhilina, 2019]. For the Russian mentality, the problem of bullying is very significant. Perhaps the spread of various types of bullying in the domestic education system is largely due to the prevalence of subject-object relations between the teacher and the student in the system.

The influence of bullying experience in the personal history of a teacher on the perception of bullying in the present was studied. The position of a victim in the past (bullying type I) is traumatic, often associated with a situation of systematic, repeated harassment, causes difficulties in teachers in differentiating the phenomenon of bullying in the present, leads to its ignoring, fear of clashes in professional activities, does not allow the teacher to adequately and effectively respond in the event of bullying in the present due to the fact that he does not believe in his own strength. The position of an aggressor, associated in teachers in the past with bullying type II, is less traumatic for their personality, practically does not accompany distortions in the idea of bullying in the present. They understand the need to prevent such situations in the children’s environment, believe in the possibility

of their timely prediction and prevention [A.A. Krylova, N.G. Krylova, E.V. Tikhomirova, 2022].

In this study, we were interested in whether teachers can understand that they are witnessing or participating in bullying in the classroom and differentiate its signs. We hypothesized that teachers have vague ideas about bullying and do not always recognize it in school life. Purpose of the study: to study the content of teachers' ideas about the phenomenon of bullying. The study involved 93 teachers (women – 89, men – 4) from various educational institutions. We used the questionnaire "What do you know about bullying?" (Telminova A.V., Saygushev N.Ya., Vedeneyeva O.A., Tsaran A.A.). The results of the survey of teachers are presented in tables No. 1, No. 2, No. 3.

Table 1 describes the teachers' responses; their ideas about bullying are mostly undifferentiated. By bullying, educators mean "harassing children", but the phenomenon of bullying goes beyond the classroom, family and school.

Table 1.

Teachers' responses to the questionnaire question «Describe what you think the term "bullying" means?».

Free answers from teachers (n=186)	Percentage (%)
Don't know	0,5
Gossipping	0,5
Ignoring a person	0,5
Singling out a person based on various characteristics due to their difference from others	0,5
Subordination, inviolable execution	1,1
They offend a person (insults), touching on personal qualities, appearance, family	1,1
Something dangerous	1,1
Intimidation, pressure	2,7
Ridicule	2,7
Beatings, attacks	3,2
Mental abuse of a person, a child	4,3
Humiliation, oppression	4,3
Persecution	6
Aggressive behavior towards the victim	7
Harassment	9,7
Peer victimization among children	9,7
Persecution of one child by a group of people	9,7
Bullying children	35,4

The answers to the second question are presented in Table 2. The teachers selected the answer options from the list; the ready-made options helped the subjects formulate their position in understanding the phenomenon of bullying. For teachers, in most cases, external behavioral signs of children and adolescents who are only suspected of bullying are obvious.

Table 2.

Teachers' responses to the question «Which of the following is related to bullying?».

Multiple selection list (n=539)	Percentage (%)
The student is alone during all breaks	25,8
He always does tasks in small groups alone	15,1
The student comes to class in a disheveled state: torn, dirty clothes, bruises, abrasions - traces of a fight	46,2
An obedient child suddenly began to be late for school or sit in class after lessons, waiting for something	43
The student began to study worse	21,5
He started to feel worse (psychosomatics)	39,8
No one wants to sit with one of the students	59,1
A group of children stand in a tight circle, look around, excitedly discuss something, aggression can be felt	60,2
A group of children are waiting for someone in the school yard after school	64,5
Senior students fuss around the toilets of the junior classes	32,3
In the canteen, someone buys food for someone else with their own money	33,3
Those who are physically stronger or older constantly "ask to borrow" from younger children or demand to be allowed to use their phone	52,7
One student takes away another's sports uniform (sneakers): «asks» to share	47,3
The child asks his parents for money - supposedly the school is collecting money for some needs	38,7

Table 3 shows the teachers' answers to the third question, which finds out what prevention methods the teachers know. They selected options from the list of answers. Most teachers identify the optimal way to prevent bullying, which is comprehensive: collective psychological and pedagogical education of schoolchildren, parents and fellow teachers on the issues of the spread of bullying phenomena in the educational environment.

Table 3.

Teachers' responses to the question «Indicate which of the following methods, in your opinion, are effective for preventing bullying?».

Multiple selection list (n=353)	Percentage (%)
This must be done by a psychologist at the educational institution	59,1
Refer the problem to the parents	16,1
Conduct one-time and short-term events and promotions	47,3
Send the participants of bullying (victim and bully) to the principal, demand an apology from the bully	10,8
Advise the victim to ignore it	5,4
Influence on the aggressor from outside	31,2
Talking to children of primary school age	51,6
Involving an authoritative ally (in working with teenagers). First, you need to try to convince them, explain the inadmissibility and ineffectiveness of bullying	69,9
Collective psychological and pedagogical education of schoolchildren, parents and fellow teachers on the issues of the spread of bullying phenomena in the educational environment	88,2

Key findings. Based on the findings from this study, we can draw several conclusions regarding teachers' understanding and perceptions of bullying at school:

1. Limited Recognition of Bullying: the data indicate a lack of clear and consistent definitions of bullying among teachers. A significant majority (35,4%) described it broadly as "bullying children," yet many definitions provided by teachers lack specificity, suggesting that educators may not fully understand the complexities of the phenomenon.

2. Signs of Bullying: teachers exhibited difficulty in identifying specific behavioral indicators associated with bullying. While there were some recognizable signs, such as physical evidence of fights (46,2%) and social isolation (25,8%), a larger proportion of responses indicated misunderstandings or vague connections to bullying.

3. Awareness of Effects: the respondents acknowledged some psychological and physical effects of bullying, demonstrating awareness regarding the impact on students' well-being (such as a decline in academic performance or psychosomatic symptoms). However, the variability in understanding suggests that educators might not always recognize or respond appropriately to subtle signs of bullying.

4. Perception of Responsibility: a majority of teachers (88,2%) identified the need for collective psychological and pedagogical education involving schoolchildren, parents, and fellow teachers as an essential strategy for addressing and preventing bullying. This indicates an understanding that bullying prevention is a communal responsibility, rather than solely the role of individual teachers or psychologists.

5. Preference for External Intervention: the results showed a tendency among teachers to rely on external professionals (e.g., psychologists) for addressing bullying (59,1%) rather than developing their own strategies. This may highlight a feeling of inadequacy in handling bullying situations effectively or a lack of confidence in their training.

6. Implementing Peer Support: the recommendation to involve authoritative allies, especially in working with teenagers (69,9%), suggests that teachers recognize the importance of social dynamics and peer influence in bullying situations. There seems to be a preference for using established social hierarchies to combat bullying rather than solely addressing it directly.

In conclusion, the study illustrates that while teachers recognize certain elements and effects of bullying, there remains a significant gap in their understanding and response strategies. Enhanced training and awareness-raising initiatives are essential for empowering educators to effectively identify, intervene, and prevent bullying in schools, fostering a safer and more supportive educational environment for all students.

Mediation can play an important role in preventing bullying due to several key aspects. Mediation provides a neutral and safe space for communication, allowing participants to openly express their feelings and opinions without fear of negative consequences. Mediation helps to understand conflicts that may lead to bullying. The mediator can help the conflicting parties find common ground, identify the reasons for the disagreement, and agree on mutually acceptable solutions. It helps to develop effective communication skills in participants. They learn to express their thoughts and emotions, as well as listen and understand each other, which can reduce the likelihood of conflicts.

Mediation helps to develop social skills such as empathy and compromise. Children who participate in mediation can better understand the feelings of others and find ways to interact based on respect and cooperation. By resolving conflicts at an early stage, mediation can prevent the escalation of aggressive behavior and bullying, thereby creating a safer educational environment. Mediation can involve not only the immediate participants in the conflict, but also witnesses, which allows for a common understanding of the situation and promotes collective responsibility for the classroom environment. The mediation process can be used to raise awareness of bullying issues and their consequences. This can contribute to a more active position on the part of schools and parents in the fight against bullying. By using mediation as a bullying prevention tool, educational institutions can create a more supportive and safer environment where students feel protected and can develop healthy relationships.

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汉特–曼西自治区–尤格拉石油污染地区的碳氢化合物氧化微生物
HYDROCARBON-OXIDIZING MICROORGANISMS OF OIL-CONTAMINATED TERRITORIES OF KHANTY-MANSI AUTONOMOUS OKRUG - YUGRA

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注释。本文致力于分离和鉴定栖息在汉特–曼西斯克自治州–尤格拉受石油产品污染的土壤中的碳氢化合物氧化微生物。这项研究的主要目的是确定具有生物降解碳氢化合物能力的微生物的天然菌株，并研究它们的生物多样性和代谢活性。研究结果表明，存在能够有效破坏碳氢化合物的微生物，这为开发汉特–曼西斯克自治州–尤格拉的环保方法清除土壤中的石油和石油产品开辟了前景。

关键词：石油污染地区、石油污染土壤、碳氢化合物氧化微生物、石油产品含量、本土微生物、生物修复、生物降解、汉特–曼西斯克自治州–尤格拉。

Annotation. *The article is devoted to the isolation and characterization of hydrocarbon-oxidizing microorganisms inhabiting soils contaminated with oil products in the Khanty-Mansiysk Autonomous Okrug - Yugra. The main objective of the study is to identify natural strains of microorganisms with the ability to biodegrade hydrocarbons and to study their biodiversity and metabolic activity. The results of the study demonstrate the presence of microorganisms capable of effective destruction of hydrocarbons, which opens up prospects for the development of environmentally friendly methods for cleaning soils from oil and oil products in the Khanty-Mansiysk Autonomous Okrug - Yugra.*

Keywords: *oil-contaminated territories, oil-contaminated soils, hydrocarbon-oxidizing microorganisms, oil product content, indigenous microorganisms, bioremediation, biodegradation, Khanty-Mansiysk Autonomous Okrug-Yugra.*

Extraction, use and processing of hydrocarbon raw materials is an integral feature of our time. Oil production and oil refining are powerful sources of environmental pollution. Pollution occurs at all stages: during the construction and operation of oil wells, transportation and processing of hydrocarbon raw materials. In addition, the oil production industry is one of the leaders in the amount of waste generated.

Oil is one of the most dangerous pollutants, as it has a complex of physical and chemical properties that contribute to the formation of a film on the surface of water and soil environments, a decrease in the intensity of respiration of organisms, and the accumulation of toxic decay products [11].

The use of biopreparations containing hydrocarbon-oxidizing microorganisms allows the activated sludge of treatment facilities to adapt to the constant presence of oil products in wastewater, which results in the formation of sludge resistance to the toxic effects of oil and increases the effectiveness of biological treatment [11].

Hydrocarbon-oxidizing microorganisms are part of the heterotrophic community that is present in both polluted and unpolluted ecosystems. They are distinguished by the presence of a complex of enzymes that oxidize hydrocarbons and the ability to absorb hydrophobic substrate.

In soils, the most common types of hydrocarbon-oxidizing microorganisms include [12]: Pseudomonas, Arthrobacter, Mycobacterium, Brevibacterium, Rhodococcus, Bacillus, Nocardia, Achromobacter, Micrococcus, Klebsiella, Enterobacteriaceae, Beierinckia, Alcaligenes, Corynebacterium, Xanthomonas and others.

The Khanty-Mansiysk Autonomous Okrug – Yugra is located in the central part of the West Siberian Plain and belongs to the Tyumen Region. The area of the okrug is 534.8 thousand sq. km. There are about 350 fields in the Khanty-Mansiysk Autonomous Okrug, of which 84% are oil fields, 4% are oil and gas fields, 6% are oil and gas condensate fields, 5.5% are gas fields, and less than 0.5% are gas condensate fields.

In the course of this work, a soil sample from several deposits of the Khanty-Mansiysk Autonomous Okrug was used: Priobskoye deposit (swampy area); Priobskoye deposit (forest area); Fyodorovskoye deposit (swampy area); Territory of the main oil pipeline (MOP) Kholmogory – Klin on the section 232–260 km.

Microorganisms were isolated from oil-contaminated soil using the Koch plate method using appropriate dilutions (from 10-2 to 10-4) and nutrient media: nutrient agar (NA) for isolating heterotrophs (GM) and organoheterotrophs, King's medium for isolating hydrocarbon-oxidizing microorganisms (HOM) [5]. Microorganisms were identified according to [7, 8].

The hydrolytic acidity (HA) value was determined according to GOST 26212-2021 by the volume of alkali that was spent on titration [1]. The sum of exchange-

able bases was determined according to GOST 27821-2020 [2] and estimated according to Table 1 [10].

Table 1

Soil grouping by the content of the sum of exchangeable bases

Rating category	**The sum of the exchange bases, mg·eq/100 g of soil**
Very low	Less than 5.0
Low	5.1 … 10.0
Average	10.1 … 15.0
Increased	15.1 … 20.0
Tall	20.1 … 30.0
Very high	More than 30.0

The mass fraction of oil products in the soil was determined using Fluorator-02, according to the methodology [9].

According to the results of Table 2, we see that the hydrolytic acidity values of oil-contaminated soil samples are in the range of < 2 mg·eq/100 g. According to GOST 26212–2021 [1], the soil belongs to the neutral degree of acidity class VI.

Table 2

Hydrolytic acidity and the sum of exchangeable bases of soils of the studied deposits

Name of the soil sample	**Hydrolytic acidity, mg·eq/100 g of soil**	**Sum of exchangeable bases, m·eq/100g of soil**
Priobskoye deposit	1.31	35.4
Priobskoye deposit (forest area)	0.88	34.7
Kholmogory – Klin oil pipeline	1.53	41.1
Fedorovskoye deposit	1.75	43.0

The sum of exchangeable bases of the soil (or the sum of exchangeable cations) is an indicator that characterizes the total amount of cations retained on the surface of soil particles and available for exchange. It includes cations such as calcium (Ca^{2+}), magnesium (Mg^{2+}), potassium (K^{+}), and sodium (Na^{+}). According to the data obtained in the studied areas, the range was from 34.7 to 43.0 m·eq per 100 g of soil (Table 2). The highest value was in the area from the Fedorovskoye deposit, two samples from the Priobskoye deposit did not differ much and had values of 34.7 - 35.4 m·eq/100 g. All values, according to Table 1, are very high, this indicates that the samples have a large accumulation of organic and mineral colloids, which contributes to an increase in the total cation absorption capacity [3].

The permissible content of petroleum products in soils, according to the regulatory document "Procedure for determining the amount of damage from chemical pollution of lands" [3], at low concentrations is <1 mg/g, at average concentrations – 1 mg/g – 10 mg/g.

During the study it was found that all soils were within the permissible limits (Table 3).

In terms of oil product content, the soil sample from the Fyodorovskoye field is less polluted and belongs to the low pollution class. The other soil samples are classified as moderately polluted.

Table 3

Content of petroleum products in the studied soils and grounds

Name of the soil sample	Concentration of petroleum products in the sample, mg/g
Priobskoye deposit	3.43
Priobskoye deposit (forest area)	4.89
Kholmogory – Klin oil pipeline	9.35
Fedorovskoye deposit	1.16

During the microbiological analysis it was revealed that the number of microorganisms on King's medium is higher compared to the number on nutrient agar (NA). This is quite natural, since King's medium is usually used to identify hydrocarbon-oxidizing microorganisms (HOM), while NA is more often used to identify the total microbial count (TMC) (Fig. 1, 2). The qualitative composition of the dominant microflora is also not the same (Table 4).

Table 4

Microbial diversity on nutrient media

Wednesday/ soil-ground	Priobskoye deposit	Fedorovskoye deposit	Kholmogory - Klin	Priobskoye deposit (forest area)
	1	2	3	4
PA	Sphingobacterium; Azotobacter; Rhodococcus.	*Azotobacter Rhodococcus Sphingobacterium*	*Rhodococcus; Sphingobacterium Azotobacter*	*Azotobacter; Rhodococcus*
Kinga	*Rhodococcus; Pseudomonas; Candida; Azotobacter*	*Azotobacter; Rhodococcus; Pseudomonas*	*Candida; Azotobacter; Rhodococcus*	*Achromobacter Azotobacter; Rhodococcus; Pseudomonas*

It has been shown in the literature [4] that when introducing Azotobacter bacteria of various species into oil-contaminated soil, the rate of soil self-purification

increased. Bacteria are capable of assimilating oil hydrocarbons as the sole source of carbon and energy both in the presence of bound nitrogen and during nitrogen fixation. An activating effect has been revealed *Azotobacter chroococcum* on the growth of hydrocarbon-oxidizing bacteria included in the preparation Devoroil.

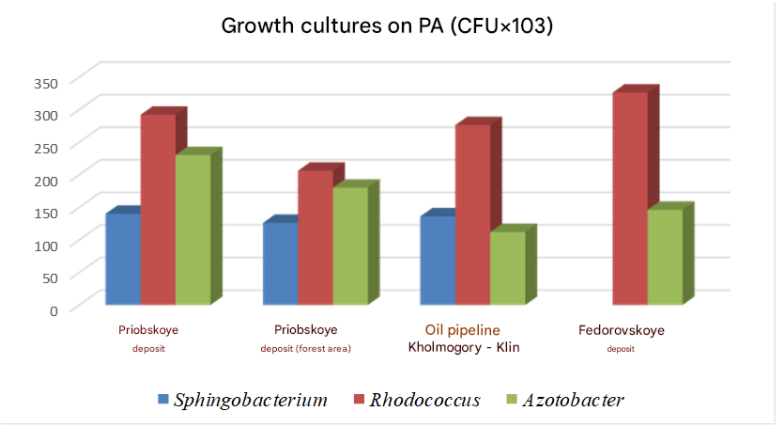

Figure 1. *Total microbial population of oil-contaminated soils on nutrient agar (CFU/g)*

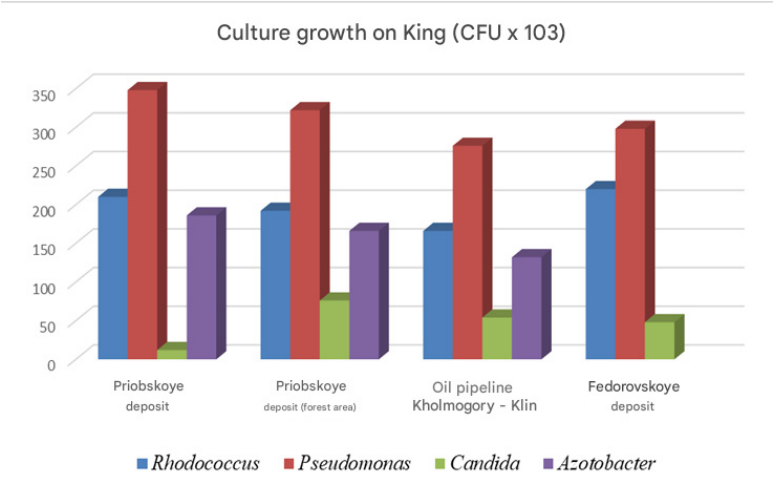

Figure 2. *Total microbial population of oil-contaminated soils on King's medium (CFU/g)*

According to these results (Fig. 1), it is evident that on King's medium, the majority of microorganisms belong to the genus Pseudomonas, while on nutrient agar (NA), Rhodococcus predominates in all samples of the studied soil (Fig. 2).

In the territory of the Priobskoye deposit (Fig. 3 A), microorganisms of the genus Rhodococcus predominated. They accounted for 32.7% of the total number of microorganisms, Azotobacter occupied 27.1%, Pseudomonas – 22.7%, the genus Sphingobacterium – 9.1% and Candida only 8.2%.

At the Fyodorovskoye deposit (Fig. 3B), the following percentage ratio of microorganisms was determined: genus Sphingobacterium – 25.1%, Azotobacter – 27.8%, Pseudomonas – 43.8%, Rhodococcus – 29.8%, Candida – 9.8%.

Fig. 3B shows the distribution of isolated genera of microorganisms from the soils of the main oil pipeline: Azotobacter – 21.1%, Sphingobacterium – 11.8%, Pseudomonas – 23.9%, Rhodococcus – 38.3%, Candida – 4.6%.

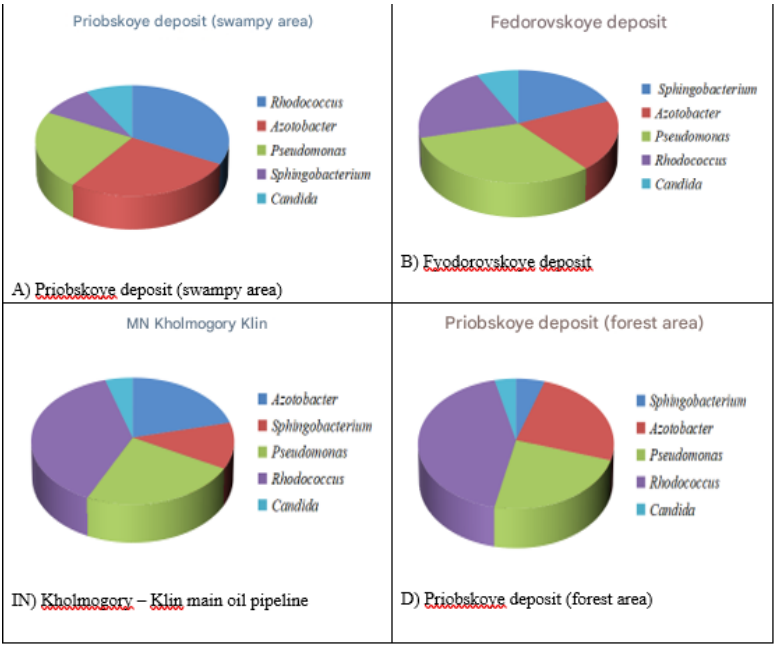

Figure 3. *Distribution of genera of microorganisms isolated from oil-contaminated soils of different deposits*

The following microorganisms were isolated from the soils of the Priobskoye deposit (forest area) (Fig. 3G): Sphingobacterium – 5%, Azotobacter – 24.9%, Pseudomonas – 23.3%, Rhodococcus – 42.8%, Candida – 3.7%.

The results of calculating the percentage of microorganisms show that the percentage of yeast of the genus Candida in the soil from the Priobskoye and Fyodorovskoye deposits is twice as high as in other samples. This may be due to the fact that these deposits are more contaminated with gasoline fractions.

The genus Rhodococcus in soil samples from the Priobskoye field (forest area) and the territory of the Kholmogory main oil pipeline (MOP) slightly exceeds the amount in samples from the Priobskoye and Fyodorovskoye fields. This indicates that a higher concentration of crude oil fractions is possible in these areas [6].

Based on the data obtained, we can conclude that the soils of the Khanty-Mansiysk Autonomous Okrug-Yugra have high hydrocarbon-oxidizing activity of microorganisms and there is a possibility of creating a preparation for bioremediation of oil-contaminated soils based on them.

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改变多发性硬化症病程的药物对患者先天性和适应性细胞免疫指标的影响
THE EFFECT OF DRUGS THAT ALTER THE COURSE OF MULTIPLE SCLEROSIS ON THE INDICATORS OF INNATE AND ADAPTIVE CELLULAR IMMUNITY IN PATIENTS

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摘要。在本研究中，我们研究了不同组多发性硬化症患者的先天性和适应性细胞免疫参数：未接受治疗的 BPMS 患者，并分析了改变多发性硬化症 (DMTMS) 进程的药物（干扰素药物、那他珠单抗）对细胞免疫联系参数的个体影响，使我们能够评估这种疗法在 MS 患者转用 Ocrelizumab 时的有效性。单次使用 Ocrelizumab 后，T 和 B 淋巴细胞亚群组成以及淋巴细胞和 PC 单核细胞膜上 HLA-DR 分子表达特征的变化可能表明不仅 B 淋巴细胞的抗原呈递能力受到抑制，而且单核细胞-巨噬细胞免疫联系也受到抑制。

关键词：多发性硬化症、那他珠单抗、干扰素、奥瑞珠单抗、先天和适应性免疫、流式细胞术。

Abstract. *In this study, we studied the parameters of innate and adaptive cellular immunity in different groups of patients with multiple sclerosis: «naive» patients with BPMS who did not receive treatment, and also analyzed individual effects of the drugs used that modify the course of multiple sclerosis (DMTMS) (Interferon drugs, Natalizumab) on the parameters of the cellular link of immunity, allowing us to evaluate the effectiveness of this type of therapy in patients with MS when switching to Ocrelizumab. The revealed changes in the subpopulation composition of T- and B-lymphocytes, as well as the features of the expression of the HLA-DR molecule on the membrane of lymphocytes and monocytes of PC after a single administration of Ocrelizumab may indicate suppression of the antigen-presenting ability of not only B-lymphocytes, but also the monocyte-macrophage link of immunity.*

Keywords: *Multiple sclerosis, Natalizumab, Interferon, Ocrelizumab, innate and adaptive immunity, flow cytometry.*

Introduction. Multiple sclerosis (MS) is an autoimmune neurodegenerative disease of the central nervous system (CNS), characterized by demyelinating processes and having a progressive nature with periods of exacerbations and remissions [1]. Over the past decades, many drugs that modify the course of multiple sclerosis (DMARDS) have been developed, but in many cases the disease cannot be completely controlled. The main DMTs used in the treatment of MS are interferon drugs, Natalizumab and Ocrelizumab.

Interferons are a family of cytokines that have antiviral, antiproliferative and immunomodulatory effects [2, 3]. The mechanism of action of IFN-β is mediated through the activation of the JAK/STAT pathway by binding to the IFNAR-2 receptor, which leads to the expression of various genes [4].

Natalizumab (Tysabri) is a humanized recombinant monoclonal IgG4 antibody directed against the α4 chain of integrin [5]. The action of the drug virtually eliminates the migration of autoreactive cells to the central nervous system, and long-term use of Natalizumab can also affect their function [6]. Ocrelizumab (Ocrevus) is a glycosylated humanized monoclonal IgG1 antibody against CD20 [7]. The drug reduces the number and suppresses the function of B cells expressing CD20. Ocrelizumab is administered intravenously every 6 months.

According to the latest data, not only CD4+ T cell subpopulations are considered to be the central component of MS pathogenesis, but also B cells, which present antigens to T lymphocytes and produce cytokines that act as inflammatory mediators, and produce specific autoantibodies to myelin. Ultimately, the end point of DMT therapy is the transfer of patients with exacerbation of MS to Ocrelizumab, approved for the treatment of MS, which leads to the rapid removal of B cells from the blood. In this regard, it seems particularly relevant to study the initial parameters of innate and adaptive cellular immunity in patients with MS who have previously received DMT courses and are candidates for Ocrelizumab therapy. The aim of our study was to evaluate the effect of different groups of DMTs on the parameters of innate and adaptive cellular immunity in patients with multiple sclerosis.

Materials and methods. A total of 42 patients with MS were examined: the first group included 8 patients with rapidly progressive MS (RPMS) who had not previously received DMTs therapy. DMTs therapy was administered to 34 patients with relapsing-remitting MS (RRMS) (10 men and 24 women):

- 12 patients with RRMS who took IFN-β drugs: 75% of patients experienced an exacerbation of the disease.
- 10 patients with highly active MS (HAMS) who received Natalizumab; 80% of patients experienced a clinical exacerbation of the disease.
- 12 patients with RRMS who received 1 infusion of Ocrelizumab. Immunological analysis was performed 6±1 months after the first infusion of

Ocrelizumab, before the 2nd administration. As a control group, 12 practically healthy individuals, comparable in gender and age, were examined for similar indicators.

As a control group, 12 practically healthy individuals, matched for gender and age, were examined for similar parameters.

The parameters of cellular immunity in MS patients were assessed using flow cytometry with a panel of monoclonal antibodies (Becton Dickinson, USA) to differentiation antigens of PC lymphocytes. The population and subpopulation composition of lymphocytes were studied: CD3+, CD3+CD4+, CD3+CD8+, CD3+CD16+CD56+, CD3-CD16+CD56+, CD3+HLA-DR+, CD19+, CD20+, CD19+HLA-DR+. The population of PC monocytes expressing the HLADR molecule (CD14+HLADR+) and its mean fluorescence intensity (MFI), expressed in conventional units, were also studied. Statistical processing was performed using the programs «SPSS Statistic» («IBM», USA) and «Prizm10» («GraphPad Software», USA). Quantitative data are presented as median and quartiles (Me [Q0.25; Q0.75]. Normality of distribution was assessed using the nonparametric Mann-Whitney U-test. The level of statistical significance was taken to be 0.05.

Results. The indicators of the subpopulation composition of lymphocytes in patients with MS are presented in Table 1.

Table 1.

Indicators of cellular immunity in patients with MS depending on the DMTRS (% of cells within the gate of CD45+ lymphocytes)

Index	Almost healthy faces N=12	«Naive» patients with BPRS N=8	Patients receiving Interferon beta N=12	Patients treated with Natalizumab N=10	Patients treated with Ocrelizumab N=12	P
Total lymphocyte count, 10^9/l	2,100 [1,800; 2,800]	1,450 [1,300; 1,900]	1,520 [1,450; 1,985]	1,900 [1,635; 2,080]	1,711 [1,300; 1,905]	P1-2 0,017; P1-3 0,048; P1-5 0,02
T-lymphocytes (CD3+), %	68,5 [63,7; 74,3]	76,5 [70,1; 78,7]	75,1 [70,5; 77,4]	75,6 [71,6; 78]	86,9 [82,9; 90]	P_{1-2} 0,045; P_{1-3} 0,03; P_{1-4} 0,019; P_{1-5} 0,0001; P_{2-5} 0,0004
T-helpers (CD3+CD4+), %	39,5 [37,2; 42,9]	46,2 [38,9; 48,8]	46,7 [40,1; 54,2]	49,7 [46,3; 55,1]	54,5 [50,4; 58,8]	P_{1-2} 0,03; P_{1-3} 0,018; P_{1-4} 0,0006; P_{1-5} 0,0001; P_{2-5} 0,001

T-cytotoxic. (CD3+CD8+), %	30,1 [23,3; 32,6]	26,7 [22,7; 36,6]	24,2 [22,2; 27,1]	23,7 [20,6; 30,3]	31,1 [24,2; 41]	P_{1-3} 0,019
NK-lympho-cytes (CD3-CD16+56+), %	11,5 [8,9; 17,0]	12,7 [9; 15,9]	9,9 [6,3; 14,3]	10,8 [7,7; 14,8]	13,9 [8,5; 16,6]	P>0,05
NKT-lymphocytes (CD3+CD16+ 56+), %	7,7 [76,1; 10,8]	9 [4; 10,4]	5,5 [2,6; 9,9]	1,2 [0,7; 3,2]	8,3 [5,2; 11,4]	P_{1-4} 0,019; P_{2-4} 0,02
B-lymphocytes (CD19+), %	10,8 [8,7; 12,4]	8,9 [8,5; 13,7]	14,1 [10,9; 18,1]	13,5 [11,6; 26]	1,5 [0,4; 3,9]	P_{1-3} 0,042; P_{1-4} 0,02; P_{1-5} 0,0001; P_{2-5} 0,0001
B-lymphocytes (CD20+), %	10,4 [8,2; 12,7]	9,6 [7,4; 14,7]	11,6 [10,5; 17,3]	12 [9,8; 22,9]	0,5 [0,05; 1,2]	P_{1-5} 0,0001; P_{2-5} 0,0001
Activated T-lymph. (CD3+HLA-DR+), %	11,2 [9; 21,9]	11,4 [4; 11,6]	5,1 [4; 7,3]	8,2 [5,8; 10,7]	7,8 [6,2; 8,7]	P_{1-3} 0,012; P_{1-5} 0,012
B-lymphocytes (CD19+HLA-DR+), %	9,2 [8,8; 11,6]	8,8 [7,8; 13]	14 [7,3; 16,4]	12,3 [10,6; 20,4]	0,9 [0,3; 2,2]	P_{1-4} 0,02; P_{1-5} 0,0001; P_{2-5} 0,0001

In «naive» patients with BPMS who did not receive treatment with DMTMS, significant disturbances in the T- and B-cell immune systems were revealed, expressed in an increase in the content of the total T-lymphocyte population (CD3+) due to the T-helper subpopulation (CD3+CD4+) against the background of pronounced absolute lymphopenia. These disturbances are of immunopathogenetic significance in the development of this form of MS. The effect of INF-β was expressed in a significant increase in the content of the total T-lymphocyte population (CD3+) due to the T-helper subpopulation (CD3+CD4+) against the background of pronounced absolute lymphopenia, as well as in a decrease in the content of the cytotoxic T-lymphocyte subpopulation (CD3+CD8+) and activated CD3+HLA-DR+ cells in circulation. These changes may indicate that this therapy regimen has a selective effect on blocking cell migration processes in the CNS - it does not affect the ability to migrate subpopulations of activated and cytotoxic effector T cells.

The effect of Natalizumab demonstrated a marked decrease in the content of the effector subpopulation of NKT lymphocytes, an increase in the proportion of CD19 + cells, including those capable of antigen presentation (CD19 + HLA-DR +), which may also indicate increased migration of the effector subpopulation of

NKT lymphocytes in the CNS and a correlation with a high risk of exacerbation of the disease. The detected decrease in the content of activated HLA-DR + T cells in the circulation may be associated with the redistribution and penetration of these cells into the CNS. It is especially worth noting that after therapy with IFN-β and Natalizumab, the proportion of CD20+ B-lymphocytes was preserved, indicating that these groups of patients retain targets for the action of Ocrelizumab when changing therapy.

For patients receiving Natalizumab, an increase in the total population of T-lymphocytes (CD3+) due to the subpopulation of T-helper lymphocytes (CD3+CD4+) and an increase in the proportion of B-lymphocytes in peripheral blood are explained by the mechanism of action of the drug: by binding to the α4-integrin molecule on lymphocytes, it prevents the penetration of cells into the central nervous system, due to which T-lymphocytes can accumulate in the peripheral blood [8, 9]. According to other studies, patients taking Natalizumab also had an increase in the content of CD3+CD4+ T-lymphocytes in peripheral blood, but a decrease in them in the cerebrospinal fluid [10, 11]. It is possible that the decrease in NKT cells during Natalizumab administration is explained by the fact that, being an effector subpopulation, they go to the central nervous system, penetrating the BBB. This is probably due to reduced expression of the α4β1 integrin molecule, since this molecule is expressed predominantly on CD4+ T lymphocytes and B lymphocytes [11].

In patients taking Natalizumab, an increase in the proportion of B cells capable of presenting antigen was observed compared to the group of patients with BPMS. It is possible that after interruption of treatment with Natalizumab or change of therapy, this can contribute to a relapse of the disease, which is observed in approximately a third of cases [11, 12]. An increase in the content of the total population of T lymphocytes (CD3+) was observed in all study groups due to the subpopulation of T helper lymphocytes (CD3+CD4+) compared to the control group. It should be noted that patients receiving Ocrelizumab showed a significant increase in T-lymphocytes (CD3+) in all study groups due to the subpopulation of T-helper lymphocytes (CD3+CD4+) both in comparison with practically healthy individuals and with «naive» patients. This occurs due to a compensatory increase in the content of T-cells due to the depletion of B-lymphocytes.

A decrease in the relative level of CD19+, CD20+, as well as the content of B-lymphocytes expressing histocompatibility antigens of class 2 (CD19+HLA-DR+) compared with healthy individuals and patients without therapy when taking Ocrelizumab is explained by the fact that about 90% of the population of all B-lymphocytes are mature CD20+ B-cells, which are the target of this drug. It should be noted that 6 months after the first Ocrevus infusion, the pattern of B-lymphocyte recovery varied among patients. Thus, only 15% of patients had the

proportion of B cells reached normal values and ranged from 6 to 7.5%; in 38% of patients, the proportion of B lymphocytes was detected in the range of 2–4%; and in 47% of patients – up to 1%. Thus, 85% of MS patients did not experience normalization of the B-lymphocyte count by the time of the second Ocrevus administration.

Macrophages and microglia can act as antigen-presenting cells (APC) in neuroinflammation and CNS damage in MS, promote the activation of effector lymphocytes, thereby initiating a specific immune response [13]. The participation of macrophages in the pathogenesis of MS may be another factor influencing the progression of the disease. PC monocytes are innate immune cells that, upon migration into tissues, differentiate into tissue macrophages and are specialized APCs due to the expression of MHC class 2 antigens on them, which increases with cell activation. Antigen presentation is a central event in the immune response, linking the reactions of innate and adaptive immunity [14]. That is why the study of the antigen-presenting ability of monocytes is relevant for expanding knowledge about the immunopathogenesis of MS. The features of the expression of the HLA-DR molecule on PC monocytes are presented in Table 2.

Table 2.

Expression indices of the HLA-DR molecule on PC monocytes in patients with MS (within the CD45+ gate).

Indicator	**Almost healthy faces N=12**	**«Naive» patients with BPRS N=8**	**Patients receiving Interferon betaN=12**	**Patients treated with Natalizumab N=10**	**Patients treated with Ocrelizumab N=12**	**P**
Monocytes CD14+HLA-DR+, % of cells	95,4 [93,1; 100]	96,1 [89,7; 97,1]	94,8 [90,4; 96,7]	92,4 [86,9; 96]	91 [81,4; 94,6]	*P*>0,05
MFI HLA-DR+, c.u.	230,4 [198; 261,7]	186,1 [115; 256,3]	207,3 [83,8; 263,3]	160,2 [126,1; 227,6]	111,6 [100,4; 139,5]	$P_{1\text{-}5}$ 0,0008

As can be seen from the table, no significant change in the number of PC monocytes expressing the HLA-DR antigen was detected with any type of DMTRS. And only after the first administration of Ocrelizumab, a significant decrease in the average fluorescence intensity of the HLA-DR molecule on PC monocytes according to the MFI parameter was detected, which may indicate suppression of the antigen-presenting ability of the monocyte-macrophage immune link. Conclusion. In this study, we have identified some general patterns of change in the parameters of innate and adaptive cellular immunity in «naive» patients with BPMS, which have immunopathogenetic significance in the development of this disease. We

also analyzed the individual effects of the DMTRS used on the parameters of the cellular immune link, allowing us to assess to some extent the effectiveness of this type of therapy in patients with MS when switching to Ocrelizumab. A significant increase in the content of total T-lymphocytes due to the T-helper subpopulation in the group of patients with BPMS is a pathogenetically significant factor in the underlying disease; in patients after taking IF and Natalizumab, it may be associated with a decrease in the migratory ability of such cells to enter the central nervous system; in the group after treatment with Ocrelizumab, it is a compensatory response of the immune system to the depletion of B-lymphocytes. The identified changes in the subpopulation composition of T- and B-lymphocytes, as well as the features of the expression of the HLA-DR molecule on the membrane of lymphocytes and monocytes of PC may indicate suppression of the antigen-presenting ability of not only B-lymphocytes, but also the monocyte-macrophage link of immunity. This allows us to conclude that even the first administration of Ocrelizumab has a high degree of impact on the key mechanisms of cellular immunity underlying the development of the autoimmune nature of MS.

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关于提高城市供热系统可靠性
ON INCREASING RELIABILITY OF THE CITY'S HEAT SUPPLY SYSTEM

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摘要。对该国的地热资源进行了全面审查，提供了与研究地壳温度相关的当前分析数据，对现有类型的热泵进行了热能传递类型、热源类型、冷却剂类型的分析，并确定了其中最有效的热泵。提供了关于研究鄂木斯克市地热资源的实际当前数据。对西西伯利亚城市 GSOP 标准值进行了比较。得出了在西伯利亚条件下改善地热热变压器运行的必要措施的结论。

关键词：地热能、地热变压器、冷却剂、收集器、土壤中性区、热泵系统。

Abstract. *A complete review of geothermal resources in the country is carried out, current analytical data related to the study of the earth's crust temperature is provided, an analysis of existing types of heat pumps by the type of thermal energy transfer, by heat source, by type of coolant is carried out and the most effective of them is identified. Practical current data on the study of geothermal resources in the city of Omsk are provided. A comparison of the standard values of the GSOP in the cities of Western Siberia is carried out. Conclusions are made on the necessary actions to improve the operation of geothermal heat transformers in Siberian conditions.*

Keywords: *geothermal energy, ground heat transformer, coolant, collector, neutral zone of the soil, heat pump system.*

The economic development of any country is closely related to the introduction of energy-saving technologies. The use of non-traditional energy sources, such as geothermal energy, seems promising. Geothermal resources of the upper soil layers can cover a significant part of the region's need for heat. Heat pumps allow efficient use of this heat. Systems with closed loops and vertical heat exchangers are the most efficient, although more expensive to install. Despite the wide choice of heating equipment on the market, it is necessary to take into account the main features: climatic conditions, availability of territorial heat resources, transportation options to the consumer. The success of the economic development of our country largely depends on the rapid implementation of modern energy-saving technologies in all areas of activity. In terms of increasing the efficiency of production and consumption of thermal energy in autonomous heat supply systems, technologies based on the use of non-traditional renewable energy sources (NRES) are very promising. Currently, almost all well-known foreign and domestic companies engaged in the production of equipment for autonomous heat and power supply are actively looking for the most rational schemes and economically feasible engineering solutions in the field of NRES. This is due to the fact that the use of NRES, in addition to significant savings in organic fuel, also reduces environmental pollution, meets the needs of consumers located both far from centralized heat supply systems and near them. It also solves the problem of heat deficit in conditions of intensive development and ensures a gradual return on investment in capital construction projects. The south of Western Siberia of the Russian Federation is characterized by high insolation and good wind potential, as well as the presence of a large amount of alternative heat source - low-potential geothermal energy of the upper soil layers. The most common depth of use of thermal energy of the soil is 50-100 meters, due to the fact that with an increase in the length of the probe device, the thickness of the compressible soil layer increases, leading to the complication and high cost of field installation work. The graphs of the distribution of the temperature of the upper soil layer for the Russian Federation are presented in Fig. 1 [1].

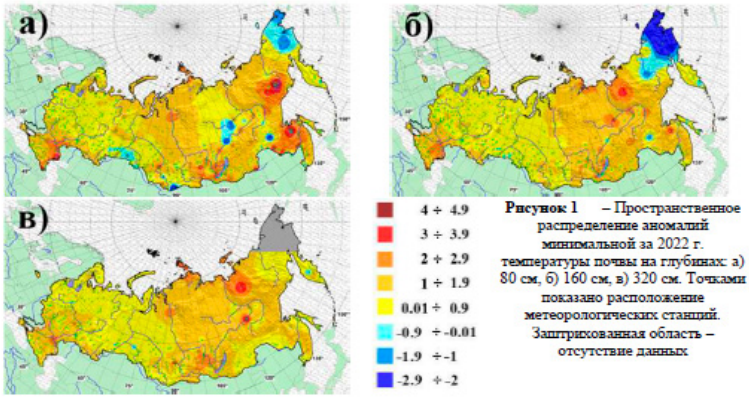

Figure 1. *Spatial distribution of minimum soil temperature anomalies for 2022 at depths of: a) 80 cm, b) 160 cm, c) 320 cm. The dots indicate the location of meteorological stations. The shaded area indicates no data [1].*

After analyzing the available published materials, it was determined that the amplitude of seasonal soil temperature fluctuations approaches minimum values at a depth of 6 to 12 meters [2]. With increasing depth, a slight increase in temperature is observed, varying depending on the region from + 1 ° C to + 8 ° C [6]. Based on the results of research by the Trofimuk Institute of Petroleum Geology and Geophysics SB RAS [6], average crustal temperature values up to 5 km were compiled and published (Table 1), which make it possible to obtain preliminary data for survey work.

Table 1.

Average values of the earth's crust temperature (up to 5 km) of the main geological structures of Siberia

№	Geological structure	Temperature (°C) at depths, km				
		0,5	1	2	3	5
Platforms						
1	West Siberian	13	29	60	92	140
2	Siberian	8	15	30	47	82
Folded areas						
4	Altai-Sayan	15	25	47	70	100
5	Transbaikal	11	22	42	62	100
6	Verkhoyansk-Kolyma	5	27	57	81	130
7	Baikal reef zone (excluding Baikal)	16	27	50	73	115
8	Baikal depression	20	75	75	110	150

Seasonal changes in soil temperature are determined by the neutral zone of the soil, which is the maximum depth of solar radiation influence, after which the temperature of the soil mass does not decrease) [2]. A heat pump is used to create a heat supply system using the thermal energy of the soil or thermal waters.

The most effective are closed circuits with vertical heat exchangers, which are capable of extracting geothermal heat from a great depth. However, their device has a higher cost than circuits based on horizontal ground heat exchangers, with equal power. Circuits with horizontal heat exchangers require a larger area, which can limit their use in the case of high building density.

The basic diagram of an autonomous heat supply system based on a heat pump station with a closed circuit and vertical ground heat exchangers is shown in Fig. 2.

Figure 2. *Schematic diagram of an autonomous heat supply system based on a closed-loop heat pump station with vertical ground heat exchangers*

Currently, the domestic market offers many offers from Russian companies producing heat pump equipment. Analysis of the activities of companies in 2019 that produce Russian-made heat pumps shows that the share of domestic components in the products in question averages from 5 to 15%, locally 40-60%. The study shows a high percentage of imported components [2].

Due to the change in attitude towards the Russian market on the part of European and American companies against the backdrop of geopolitical events, the presence of domestic manufacturers significantly simplifies the adaptation of systems using heat transformers. The departure of leading global companies from the equipment market will not affect the overall situation, since the use of ground heat

pump systems (GHS) in the West Siberian regions of the Russian Federation is associated with geological and climatic conditions that differ significantly from the average European ones. Here, a lower soil temperature is observed (for example, to a depth of 8-10 meters, 1÷9°C instead of 10÷15°C), and the integral indicators of the heating period are 1.5÷2.0 times higher than in European countries. For a quantitative assessment of the characteristics of the heating period, the GSOP (the sum of the average daily differences in indoor and outdoor air temperatures during the heating period) is used. The following formula is used for the calculation:

$ГСОП = (t_в - t_{ср}) \times z$, *where*

tв — standard room temperature (for residential buildings is 18 °C),

tcp — average temperature for the heating season,

z — duration of the heating season in days (equal to the number of days when the temperature is below +8 °C).

Table 2.

Standard indicators of the GSOP in the cities of Western Siberia

SP 131.13330.2020 (ed. 3 of 06/30/2023)	**Average daily air temperature during the heating period, °C**	**Standard indoor temperature, °C**	**Duration of the heating period, days.**	**GSOP (sum of average daily differences between indoor and outdoor air temperatures during the heating period)**
Omsk	-8,1	18	216	5637,6
Novosibirsk	-7,9	18	222	5749,8
Tomsk	-7,8	18	233	6011,4
Barnaul	-7,5	18	214	5457

The climatic conditions of Omsk are characterized by the GSOP indicator = 5637.6° s·day at an internal temperature of 18 °C (see Table 2). This is the average value for the region, which turned out to be slightly higher than the average value for all of Russia (GSOP = 5106° s·day) [5]. If we consider the changes in the standard GSOP indicators, we can trace a decrease in the average duration of the heating period every year, which shows the impact of global warming on our region (see Fig. 3).

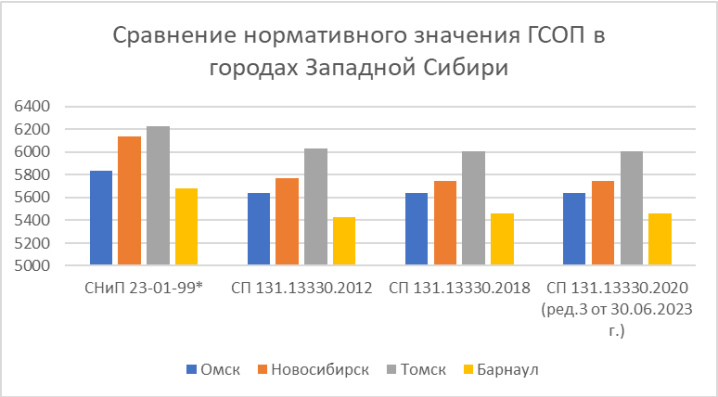

Figure 3. *Comparison of the standard value of the GSOP in the cities of Western Siberia*

Comparing the data of the cities of our region with similar indicators of foreign cities, we can see the following: in London, the GSOP is 2085°C·day, in Berlin 2604°C·day, in Stockholm 3345°C·day. Based on the above, we can conclude that the heating season characteristic in the Omsk region is 60% higher than in Stockholm, one of the northernmost European cities. And compared to Berlin, the heating season characteristic indicator in our region exceeds the indicator by 2 times. (see Fig. 4)

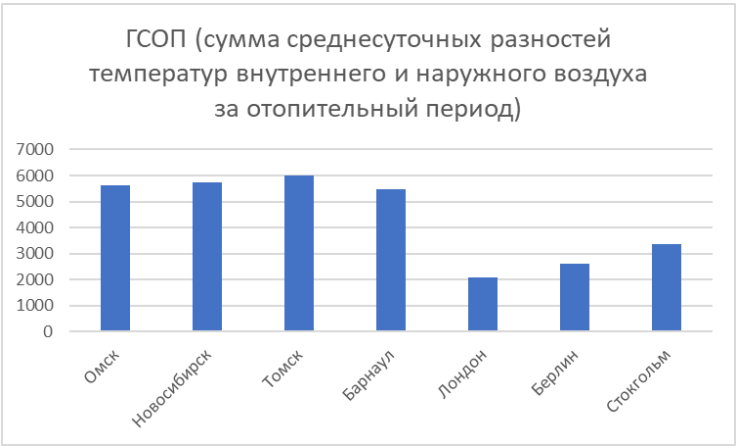

Figure 4. *Comparison of GSOP in cities of Western Siberia and European cities*

Having analyzed and compared the initial data for the use of geothermal heat pumps in foreign countries and Western Siberia, we can conclude that for local conditions it is necessary to increase the total annual heat output of the heating system in a ratio of at least 1.62 to the Norwegian indicator and 2 to the German indicator. In addition, it is also necessary to increase the installed capacity of the heat pump system, which depends on the temperature of the coldest five-day period.

Due to the poor study of the soil massif, the high cost of research and the enormous labor intensity, the implementation of such projects in Western and Eastern Siberia will require additional developments to improve the parameters of ground heat exchangers and the entire autonomous heat supply system based on heat pump stations. These studies should take into account the real geological, climatic and economic-price conditions characteristic of various regions of Siberia.

In order to advance research in the field of ground heat transformers, there are the most pressing engineering and technical issues that require study, improvement and refinement of existing solutions:

• develop a system for regional assessment of energy resources and ranking of geothermal heat potentials taking into account real geological and climatic conditions;

• improve the shape, material, design of ground heat exchangers and other elements of the heat supply system as applied to Siberian conditions;

• develop an applied computer program based on a physical and mathematical model of heat transfer in the near-surface soil layer with heat exchangers of various sizes, shapes and installation directions taking into account the influence of the neutral zone of the soil;

• study a method for periodically switching on and off one of the parallel installed working collectors for natural regeneration of the corresponding soil zone from where heat is extracted;

• study additional energy sources, for example, of man-made origin, such as thermal emissions from supply and exhaust ventilation;

• study the use of cold accumulated in the soil during the heating season for direct cooling of premises from wells in the summer;

• explore various options for thermal support using other renewable energy sources, such as obtaining heat for hot water supply using solar collectors.

Conclusions based on the results of studying the relevance of using ground heat transformers in Siberia:

Based on a comparative analysis of available open sources, it was established:

1. The duration of the heating period is decreasing every year (see Table 2) due to global warming, which increases the relevance of implementing developments in the field of ground heat transformers.

2. Comparison of the thermal performance of the heating system in European countries and Siberia proves the need to improve existing solutions in this area, as well as the relevance of further research of the soil massif to determine reliable (actual) temperature conditions necessary for use in thermal calculations of the heating system of buildings and structures using renewable sources of thermal energy of the soil.

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宽臀青铜火鸡肉的工艺特性
TECHNOLOGICAL PROPERTIES OF MEAT OF TURKEYS OF THE BROAD-BREECHED BRONZE BREAST

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注释。本文研究了青铜宽胸火鸡肉的工艺特性。介绍了胴体和羽绒原料的初加工工艺流程。对火鸡胴体进行了合理的切割、去内脏和去骨。在研究过程中，研究了合理的切割方式、皮肉比、肉骨比等指标。

本研究的目的是确定青铜宽胸火鸡胴体切割时解剖区域的产量和肉质特性。

关键词：工艺特性、火鸡肉、品种、去内脏、质量测量。

Annotation. *The article examines the technological properties of turkey meat of the Bronze Broad-Breasted breed. The technological processes of primary processing of carcasses and feather-down raw materials are presented. Rational cutting, evisceration and boning of turkey carcasses are carried out. During the study, such indicators as rational cutting by cuts, the ratio of skin and meat, meat and bones were studied.*

The aim of the work is to determine the yield of anatomical areas and meat properties when cutting carcasses of the Bronze Broad-Breasted turkey breed.

Keywords: *technological properties, turkey meat, breed, evisceration, mass measurement.*

Turkey consumption in the Russian Federation has increased by 2 kg per capita over the past 7 years. By 2025, it will grow by at least another 5 kg per capita. Turkey exports in 2023 amounted to 26 thousand tons and 1 thousand tons of finished products, in 2024 the figure is projected to grow by 15...20% [6]. The increase in demand for semi-finished products from turkey meat is due to the population's transition to healthy eating, as well as the dietary properties, biological value and hypoallergenicity of meat [4,9,11].

An important factor influencing the consumption of turkey meat is its availability on the market [10]. Modern technologies allow manufacturers to effectively organize the production and distribution of this product, which makes it available to a wide range of consumers [1]. In addition, the variety of ready-made dishes made from turkey meat and their exquisite taste provide additional opportunities for the development of this market segment [14,8].

Turkey meat has balanced proteins and fats and is dietary [9,13].

The main breeds of turkeys used for meat production can be divided into: English - black, white; Dutch - white; American - bronze, white Beltsville; Russian - white, bronze, black.

Breed "Bronze Broad-chested"- A popular egg breed of turkeys. Bronze males have a black chest and upper neck, and a bronze stripe on their dark back. There are white stripes on their wings and thighs. The whitish-blue heads contrast with the bright scarlet growths. The females are not as richly colored. A characteristic feature is the white edging on their back, chest, and wings. The females' bodies are the most graceful and do not have growths on their heads like the males. The average age of males of average weight is 18 kg, females - about 10 kg. A female can lay a hundred eggs a year. Turkeys of this breed can be kept in open-air cages if the climate conditions of the area are moderate. To the exterior features of North Caucasian bronze turkeys include: strong constitution: compact body, elongated and wide; medium-sized head; deep, wide, rounded chest; bronze plumage color. Two populations of turkeys have been selected in the breed - heavy and light.

Feed costs per kg of live weight gain for bronze turkeys are 3.2...3.4 kg [3].

The study of the technological properties of turkey meat was carried out in the laboratories of the Department of Technological and Food Processing Plants, the Research Institute of Biotechnology and Certification of Food Products of the Kuban State Agrarian University, the North Caucasus Research Institute of Animal Husbandry and the Department of Technology of Food Products and Organization of Catering of the Maykop State Technological University, in order to determine its quality characteristics.

The object of the study was three carcasses of 10-month-old Bronze Broad-Breasted turkeys. The turkeys' feed base consisted of: grain, roughage, greens, fish and meat scraps, oilcake, grain flour, and fermented milk products.

Figure 1. *Bronze Broad Breasted Turkey [3]*

The results of the weight indicators are presented in Table 1.

Table 1

Weight of turkeys

Weight before plucking, kg	Weight after plucking, kg	Weight of down and feather raw materials, g
8365	8005	360
7325	7005	320
7422	7126	296

As shown in Table 1, the average weight of ten-month-old turkeys before plucking is 7704 kg, after plucking 7379 kg, and the weight of down and feather raw materials is 326 g.

There are the following methods of slaughtering poultry - external and internal, one-sided and two-sided. During the work, the external one-sided method was used, in which the bird is taken by the head and 15 mm below the earlobe, the skin, jugular vein, carotid and facial arteries are cut with a knife, then bleeding is performed [2].

After bleeding, the plumage is removed, large feathers are removed, the carcasses are heat treated to further remove the remaining plumage using hot water at a temperature of 51...54 ºC for 1.5 minutes. To remove stumps, the carcasses are waxed, then eviscerated.

The processing of feather and down raw materials is carried out by dehydration, rinsing, squeezing and drying. It is then used to fill down jackets, pillows and blankets.

Gutting includes semi-evisceration and evisceration. When semi-evisceration, the carcass is placed on the table with the head away from you and the belly up, and a longitudinal incision is made in the wall of the abdominal cavity in the direction from the cloaca to the keel of the sternum. Then the intestines are removed together with the cloaca and the end of the duodenum is carefully separated from the stomach, without allowing the intestines to rupture.

Gutting begins with separating the legs, then through an incision in the abdominal cavity, place your fingers under the internal organs and move your hand forward along the back of the carcass. Pull the internal organs out of the cavity and leave them hanging on the left side of the carcass. First, separate the heart, liver, internal fat, stomach, kidneys, adrenal glands, and testicles. Remove the cuticle from the separated stomach. After evisceration, remove the head up to the second cervical vertebra. To remove the crop, trachea, and esophagus on the left side of the carcass (3...5 cm, above the junction of the neck with the back), make a longitudinal incision in the skin of the neck, separate the trachea and esophagus with the crop. Separate the skin from the neck and tuck it onto the wing. Separate the neck at the level of the shoulder joints, then wash the carcass [12-15]. The weight of the internal organs is presented in Table 2.

Table 2

Weight of internal organs of turkeys

Item No.	Name of the internal organ	Weight, g		
		1 sample	2 sample	3 sample
1	Liver	139.50	120.30	127.42
2	Stomach	233.50	212.67	226.9
3	Heart	48.34	30.21	36.01
4	Lungs	33.11	30.15	32.79
5	Kidneys	6.62	6.54	5.95
6	Adrenal glands	5.54	5.44	5.01
7	Testicles	23.2	20.8	21.3
8	Subcutaneous fat	94.64	92.52	180.37
9	Gallbladder	8.42	7.98	7.42

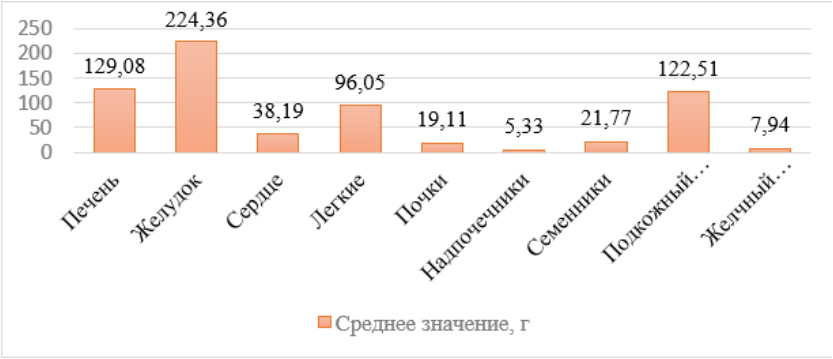

Figure 2. *Average value of the mass of internal organs of turkeys*

Analysis of Figure 2 shows that the stomach has the greatest weight and the adrenal glands the least.

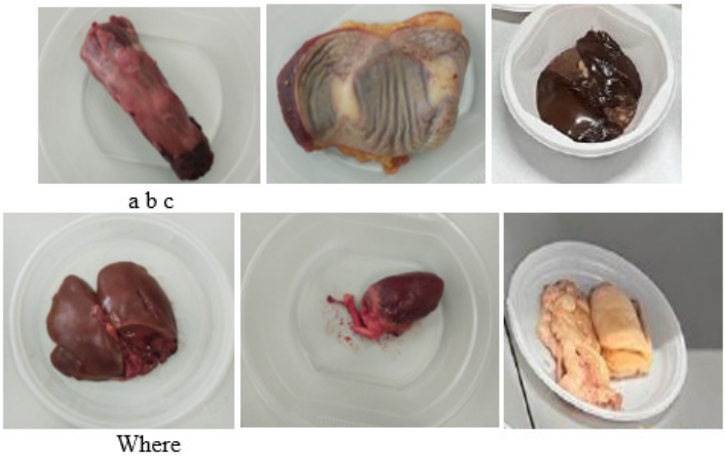

Figure 3. *Internal organs of a turkey: a – neck, b – stomach, c – liver, d – kidneys, d – heart, e – subcutaneous fat.*

Table 3

Intestinal length

Length, cm		
1 sample	2 sample	3 sample
255	220	234

As shown in Table 3, the average length of the intestine is 236.34 cm.

After evisceration, the carcass was divided into cuts. First, the wings were removed (separated into the shoulder and shoulder parts), the leg (thigh and drumstick), then the fillet was separated from the body. Figure 4 shows the mass of anatomical sections with and without skin.

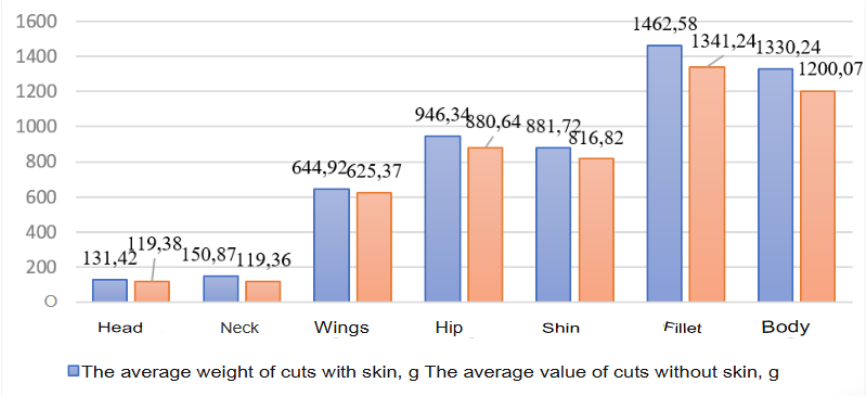

Figure 4. *Mass of anatomical areas with and without skin*

The data in Figure 4 show that the highest average weight of cuts with and without skin is found in fillet.

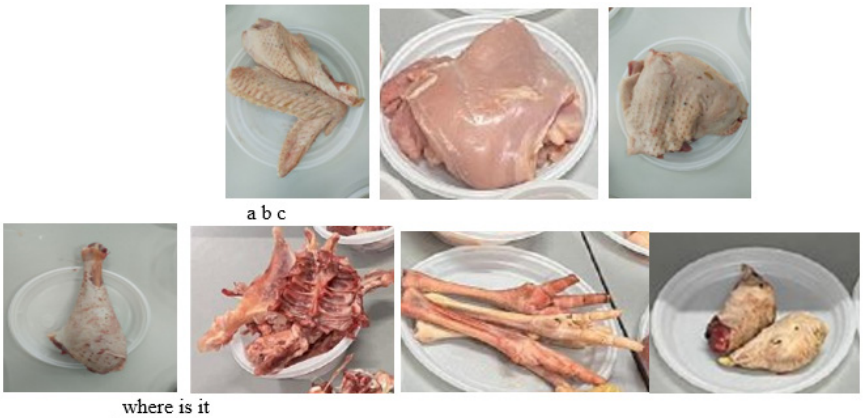

Figure 5. *Turkey cuts: a – wing, b – fillet, c – thigh, g – drumstick, d – body, e – legs, y – head.*

Table 4

Weight of turkey skin

Weight, g		
1 sample	2 sample	3 sample
1035.84	1000,0	1194,0

Analysis of the data in Table 7 shows that the average weight of turkey skin is 1076.62 g.

After cutting and removing skin from the cuts, we debone them. Table 5 shows the weight of the cuts after deboning.

Table 5

Weight of cuts after boning

Name of the cut	Weight with bone, g			Weight of boneless meat, g			Bone weight, g		
	1 sample	2 sample	3 sample	1 sample	2 sample	3 sample	1 sample	2 sample	3 sample
Head	122.02	120.07	116.03	53.2	40.25	65.73	75,78	68.82	50.3
Neck	226.2	236.7	201.6	129.0	123.0	117.03	97.2	113.5	84.57
Wings	539.6	654.4	682.1	331.7	452.3	472.1	207.9	202.1	210,0
Hip	1185.38	706.0	948,0	1047.98	612,0	795.7	137.40	94.0	152.3
Shin	978.64	770.2	896.3	862.36	653.72	784.6	116.28	99.7	111.7
Frame	1424.6	1338,0	1228.1	574.1	536.8	582.6	850,5	801.2	645.4

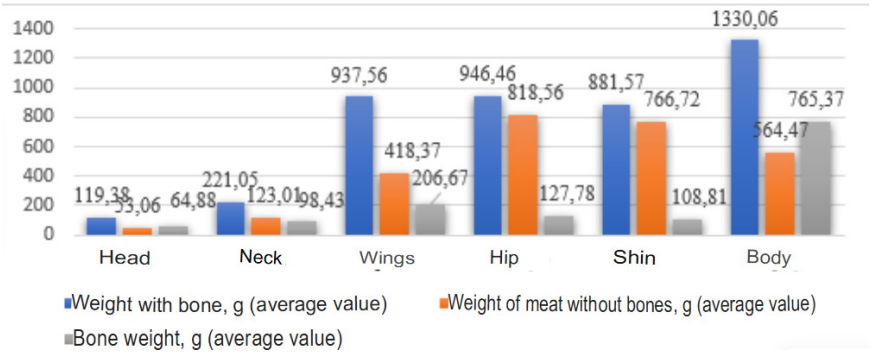

Figure 7. *Average weight of cuts after deboning*

The data in Figure 7 show that the average values of the greatest weight of cuts with bone and the bone itself are in the body of the carcass, and the greatest value of boneless meat is in the thigh.

Table 6

Weight of boned turkey meat

Weight, g		
1 sample	2 sample	3 sample
4353,58	3920,05	3919,66

Analyzing the data in Table 6, we can conclude that the average weight of boned meat is 4064.43 g.

Table 7

Bone mass

Weight, g		
1 sample	2 sample	3 sample
1485,06	1460,05	1254.27

As shown in Table 7, the average weight of bones obtained after deboning is 1399.80 g.

Figure 8. *Turkey meat after deboning*

Analyzing the mass-metric characteristics of the products of the proposed turkey cutting, we can say that they are objects for further study and their application in modern food production technologies.

An important feature of the meat of the Bronze Broad-Breasted turkey breed is its high quality and taste. This breed is distinguished by its ability to accumulate muscle mass, which makes the meat more tender and juicier.

In general, the study of the technological properties of the meat of turkeys of the Bronze Broad-Breasted breed allows us to conclude that it has high nutritional and organoleptic characteristics, which makes it a popular ingredient in the food industry and the preparation of dishes of the new line. The results obtained can be useful both for food manufacturers and for consumers seeking a healthy and balanced diet.

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含有硅灰石和透辉石的以碳化稻壳为基础的环氧聚合物填料

WOLLASTONITE AND DIOPSIDE CONTAINING FILLERS OF EPOXY POLYMERS BASED ON CARBONIZED RICE HUSK

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摘要：稻壳碳化产物用于合成含硅灰石和透辉石填料的前景广阔，因为其组成中含有无定形二氧化硅，具有很高的反应活性和特殊的孔表面结构。

以此为基础合成的硅酸钙主要含有β-硅灰石和硅灰石杂质，钙镁硅酸主要为透辉石和微量的结晶二氧化硅。含硅灰石的填料的总孔容是含透辉石填料的8倍，这可能是由于合成温度较低造成的。同时，这些填料的平均孔径大致相同。合成的硅酸盐对环氧聚合物的热稳定性、硬度、耐磨性和与钢的粘结性都有大致相同的提高。

因此，以碳化稻壳为基础合成的含透辉石和硅灰石的填料可有效用于改性环氧聚合物。同时，含硅灰石填料的合成能耗较低，但工艺复杂，需要从石灰石中初步生产氧化钙，需要两个阶段，耗时较长。

关键词：环氧聚合物、相组成、孔隙率、硬度、附着力、耐磨性、合成透辉石和含硅灰石填料、稻壳。

Abstract. *The prospects for using rice husk carbonization product for the synthesis of wollastonite and diopside containing fillers are due to the presence of amorphous silicon dioxide in its composition, which has high reactivity and specific pore surface structure.*

The calcium silicate synthesized on its basis contains mainly β-wollastonite and larnite as an impurity, and calcium magnesium silicate is mainly diopside and trace amounts of crystalline silicas. The total pore volume of the wollastonite-containing filler is 8 times greater than that of the diopside-containing filler, probably due to the lower synthesis temperature. At the same time, the average pore diameter of these fillers is approximately the same. Synthesized silicates increase the thermal stability of epoxy polymers, their hardness, wear resistance and adhesion to steel, to approximately the same extent.

Therefore, diopside and wollastonite containing fillers synthesized on the basis of carbonized rice husk can be effectively used for modifying epoxy polymers. At the same time, the synthesis of wollastonite-containing filler is less energy-consuming, but more complex, two-stage and time during, since it requires the preliminary production of calcium oxide from limestone.

Keywords: *epoxy polymers, phase composition, porosity, hardness, adhesion, wear resistance, synthetic diopside and wollastonite containing fillers, rice husk.*

Introduction

Of scientific and practical interest, due to the shortage of these natural minerals on the market, is the synthesis of wollastonite and diopside from a mixture of lime and siliceous raw materials [1, 2], especially when using waste from large-scale production [3].

At the same time, the phase composition and properties of synthesized calcium magnesium silicates (CMS) will be determined by the ratio, degree of crystallinity and dispersion of the initial components, their mixing time, heating rate, firing temperature and isothermal exposure duration [4].

The main advantage of using the product of carbonization of rice husk (RHC) for the synthesis of CMS is the presence of a so-called X-ray amorphous phase, which has a high reactivity and specific pore surface area, presented in the form of non-crystalline silicon oxide.

In this regard, it is rational to compare the effectiveness of using RHC to obtain wollastonite (SW) and diopside (SD) containing fillers using the solid-phase method and their use for modifying epoxy polymers.

Experimental part

CMCs were obtained by the solid-phase method by isothermal exposure of rice husks heat-treated at 500 °C for 3 hours and:

- calcium oxide from limestone (GOST 23671-2020) during the synthesis of SW [5], at a temperature of 900 °C and a CaO:SiO_2 ratio of 1.2:1

- dolomite (GOST 23672-2020) for the synthesis of SD [6] , at a temperature of 1100 °C and the ratio of $CaMg(C0_{3)2}$: SiO_{2-} - 1.9:1 and the addition of flux-boric acid (GOST 18704-78), in an amount of 5%.

We studied epoxy compositions filled with them based on ED-20 (GOST 10587-84), cured with aminoalkylphenol AF-2, (TU 2494-052-00205423-2004) for 7 days at 25 °C.

To assess the phase composition of SW and SD, the method of X-ray quantitative analysis (XQA) was used using a Rigaku SmartLab multifunctional diffractometer.

The porosity of silicates was determined using mercury porosimetry and the BJH gas absorption method. (ISO 15901-2:2006) on a Quantachrome Nova 1200e.

The wear resistance of SW and SD filled epoxy materials was assessed by the degree of abrasion on a Taber machine ISO 3537 (DIN 52347, ASTM D1044, and hardness was determined on a portable hardness tester using the Shore method (GOST 24621-91, ISO 7619).

Determination of adhesion to steel by the peel method was carried out in accordance with GOST 32299-2013 (ISO 4624:2002, MOD) on a Shimadzu A G -50 kNX device, using Shimadzu Trapiziumx software.

The thermal stability of materials was assessed by the temperature of 50% of their mass loss, based on thermograviometric analysis data obtained on a synchronous thermal analyzer STA 6000 PerkinElmer in accordance with GOST 33403-2015, in an inert nitrogen environment.

Results and Discussion

Calcium silicate synthesized on the basis of RHC contains mainly β- wollastonite and larnite as an impurity [7]. SD contains mainly diopside [8] and trace amounts of crystalline silicas (Table 1).

Thus, we can conclude that when using RHC , a higher content of the target product is achieved with SD than with SW (Table 1).

However, the process of producing SD is more energy-intensive, since it requires a higher temperature of the solid-phase reaction. At the same time, to ensure the content of β- wollastonite in the SW in the quantity described above, it is necessary to first obtain silicon oxide from limestone [7], that is, the process of synthesizing SW with a high yield of the target product is a two-stage process.

Table 1.

Phase composition and porosity of synthetic wollastonite and diopside containing fillers.

Type of filler, its component composition and properties	**SW**	**SD**
β- Wollastonite	78	--
Larnit	22	-
Diopside	-	97
Cristobalite	-	2

Tridymite	-	1
Average pore diameter, nm	4,0	4,1
Total pore volume, cm ^{3} /g	0.08	0,01

The total pore volume of SW is 8 times larger than that of SD, probably due to the lower temperature of its synthesis. At the same time, the average pore diameter of these fillers is approximately the same (Table 1).

An analysis of the influence of synthetic silicates on the performance characteristics of epoxy polymers showed that they have the same effect on the hardness, wear resistance and adhesion to steel of epoxy materials, improving these properties in the field of optimal compositions.

Synthesized silicate fillers also increase the thermal stability of epoxy polymers, as indicated by an increase in the temperature of their 50% weight loss (Table 2).

Table 2.

Performance characteristics of epoxy materials filled with 10 wt.h SD and SW.

Filler type	**SW**	**SD**	**without filler**
Hardness, c.u.	43	48	36
Adhesion to steel, MPa	3,2	3,4	3,0
Wear, 10^{-6} m	11,9	12,5	17,8
Temperature 50% mass loss, C	418	426	406

SD provides greater hardness of epoxy materials filled with it, since the hardness of diopside (6.5-7 Mohs) is higher than that of wollastnite (5-5.5 Mohs) [9].

Consequently, diopside and wollastonite containing fillers synthesized on the basis of carbonized rice husk can be effectively used for modifying epoxy polymers [10].

The difference in the characteristics of epoxy materials filled with SD and SW is not significant, amounting to approximately 10%.

Conclusion

Wollastonite and diopside-containing fillers synthesized using carbonized rice husks can be effectively used to develop wear- and heat-resistant epoxy materials with increased hardness and adhesive ability.

When using silicon dioxide from rice production waste, the synthesis of wollastonite-containing filler is less energy-consuming, but more complex, two-stage and time-consuming.

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以高对比度双层板自由振动为例对等效单层板模型进行对比分析

COMPARATIVE ANALYSIS OF EQUIVALENT SINGLE-LAYER PLATE MODELS USING THE EXAMPLE OF FREE VIBRATIONS OF TWO-LAYER PLATES WITH HIGH-CONTRAST PROPERTIES

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Introduction.

Double-layer plates and beams are an integral part of many thin-walled engineering structures. The use of materials with high-contrast mechanical properties allows creating layered structures with many properties, such as thermal insulation, sound insulation, high load-bearing capacity, vibration resistance, etc. Existing models of layered beams and plates can be divided into three main groups:

- Models based on the expansion of unknown functions in series by plate thickness.
- Models based on the introduction of hypotheses describing the change in displacements and stresses by the thickness of the plate.
- Models based on the asymptotic integration of 2D or 3D equations by the thickness of the beam/plate.

Each of these models has both advantages and disadvantages.

The first group of models concerns the expansion of the required functions (displacements and/or strains and stresses) in power series or Legendre polynomials with respect to the transverse coordinate (Lo et al., 1977; Vekua, 1982; Kienzler, 1982; Touratier, 1991; Kienzler and Schneider, 2019). The advantage of this approach is that it is free from any a priori assumptions, and the disadvantage is that the construction of a more accurate theory inevitably leads to a large number of equations for the coefficients in the series. The second group of models is based on the engineering concept of accepting kinematic hypotheses for the displacements for each layer and/or for the entire package with boundary conditions at the interfaces. The simplest hypotheses proposed by Kirchhoff (1850) and neglecting the transverse shear strain lead to classical models and, in particu-

lar, to Bernoulli-Euler (BE) type models. The introduction of hypotheses taking into account transverse shear leads to more accurate and complex theories. They can be divided into first-order shear strain theory (FSDT) or Timoshenko-type theories (see Timoshenko (1921); Reissner (1944, 1945)), and higher-order shear strain theory (HSDT) (see Whitney and Sun (1973); Reddy (1984); Librescu et al. (1987)). Application of classical theory or FSDT and HSDT theories based on any hypotheses usually leads to equivalent single-layer (ESL) models for layered beams and plates, which contain a limited number of equations independent of the number of layers.

The third group of models is based on the expansion of all functions of the 2D/3D elasticity equations into series in powers of a small parameter (Goldenweiser, 1962). Depending on the class of the designed solutions and their properties, the ratio of the beam/plate thickness to the characteristic wavelength, the ratio of the moduli of softer and harder layers, the ratio of the amplitudes of in-plane and transverse displacements, etc. are taken as a small parameter (among many others, see the works of Agalovyan (1997); Schwab (1996); Tovstik (2014); Morozov et al. (2016); Mikhasev (2022)). The advantage of the asymptotic method is that its application and step-by-step integration allows us to construct theories corresponding to various hypotheses and obtain the corresponding equations of an equivalent single-layer plate.

The aim of this work is to perform a comparative analysis of three models of equivalent single-layer plates using the example of free vibrations of two-layer rectangular plates with high-contrast mechanical parameters.

1. Models of equivalent single-layer plates.

Here we will consider two models: the Grigolyuk-Kulikov model (hereinafter referred to as Model I) of layered transversely isotropic plates, based on the adoption of generalized kinematic hypotheses of Timoshenko for tangential displacements and taking into account transverse shears in layers [1]; the Timoshenko-Reissner type model (hereinafter referred to as Model II), proposed by Tovstik [2] for shells with an arbitrary distribution of elastic properties across the shell thickness. Model I. In accordance with this model [1], a two-layer plate is replaced by an equivalent single-layer plate with the given characteristics, which are introduced as follows:

$$E=\frac{1-\nu^2}{h}\left(\sum_{k=1}^{2}\frac{E_k h_k}{1-\nu^2}\right),\quad \nu=\sum_{k=1}^{2}\frac{E_k h_k \nu_k}{1-\nu_k^2}\left(\sum_{k=1}^{2}\frac{E_k h_k}{1-\nu_k^2}\right)^{-1}. \tag{1}$$

The reduced modulus of elasticity and Poisson's ratio are determined by formulas (1).

We will also introduce into consideration the reduced cylindrical rigidity D, the rigidity of each layer γ_k and the shear parameters β and θ:

$$D=\frac{Eh^3}{12\left(1-\nu^2\right)},\quad \gamma_k=\frac{1-\nu^2}{Eh}\frac{E_k h_k}{1-\nu_k^2},\quad \beta=\frac{12\left(1-\nu^2\right)q_{44}}{Eh\eta_1},\quad \theta=1-\frac{\eta_2^2}{\eta_1\eta_3}, \tag{2}$$

where

$$q_{44}=\frac{\left[\sum_{k=1}^{2}\left(\lambda_k-\frac{\lambda_{k0}^2}{kk}\right)\right]^2}{\sum_{k=1}^{2}\left(\lambda_k-\frac{\lambda_{k0}^2}{kk}\right)G_k^{-1}}+\sum_{k=1}^{N}\frac{\lambda_{k0}^2}{kk}G_k,$$

$$\lambda_k=\int_{\delta_{k-1}}^{\delta_k}f_0^2(z)\,dz,\quad \lambda_{kn}=\int_{\delta_{k-1}}^{\delta_k}f_k(z)f_n(z)\,dz,\quad (n=0,k), \tag{3}$$

$$\eta_1=\sum_{k=1}^{2}\frac{\pi_{1k}\gamma_k}{\xi_k}-3c_{12}^2,\quad \eta_2=\sum_{k=1}^{2}\frac{\pi_{2k}\gamma_k}{\xi_k}-3c_{12}c_{13},$$

$$\eta_3=4\sum_{k=1}^{2}\left(\xi_k^2+3\zeta_{k-1}\zeta_k\right)\gamma_k-3c_{13}^2,\quad h\xi_k=h_k,\quad h\zeta_n=\delta_n,\quad (n=0,k),$$

$$c_{12}=\sum_{k=1}^{N}\xi_k^{-1}\pi_{3k}\gamma_k,\quad c_{13}=\sum_{k=1}^{N}(\zeta_{k-1}+\zeta_k)\gamma_k,$$

$$\pi_{1k}=\frac{12}{h^3}\int_{\delta_{k-1}}^{\delta_k}g^2(z)\,dz,\quad \pi_{2k}=\frac{12}{h^3}\int_{\delta_{k-1}}^{\delta_k}zg^2(z)\,dz,\quad \pi_{3k}=\frac{2}{h^2}\int_{\delta_{k-1}}^{\delta_k}g^2(z)\,dz.$$

Here $G=q_{44}/h$ - reduced shear modulus [1] – continuous functions on each layer, defined as follows:

$$f_0(z)=\frac{1}{h^2}(z-\delta_0)(\delta_N-z)\quad если\quad z\in[\delta_0,\delta_N],$$

$$f_k(z)=\frac{1}{h_k^2}(z-\delta_{k-1})(\delta_k-z)\quad если\quad z\in[\delta_{k-1},\delta_k], \tag{4}$$

$$f_k(z)=0\quad если\quad z\notin[\delta_{k-1},\delta_k].$$

Let w be the normal deflection of the shell (in the direction of the Oz axis), F be the Airy stress function, $\rho_0=\sum_{k=1}^{2}\rho_k\xi_k$ - reduced density of the entire sand-

wich package, t is time. We will further investigate the oscillations of the medium-length plate. Then the equations of motion of the two-layer plate in the accepted notations take the form (5) for the Grigolyuk model [1]:

$$D\left(1-\frac{\theta h^2}{\beta}\Delta\right)\Delta^2\chi+\rho_0 h\frac{\partial^2 w}{\partial t^2}=q_n(\alpha_1,\alpha_2,t), \tag{5}$$

where Δ – Laplace operator, w - plate deflection, χ - shift function, $q_n(\alpha_1, \alpha_2, t)$ - normal load, t - time.

Model II. Let us now consider the Timoshenko-Reissner type model (hereinafter referred to as Model II), proposed by Tovstik [2] for shells with an arbitrary distribution of elastic properties across the shell thickness. In this model, the given parameters of the "equivalent" single-layer shell are determined as follows:

$$K_0=\int_0^h E(z)dz,\quad D=\int_0^h E*(z)(z-a)^2dz,\quad K=\int_0^h E*(z)dz,$$
$$E*(z)=\frac{E(z)}{1-\nu^2(z)},\quad g=\frac{1}{R^2D}\int_0^h\frac{\Theta^2(z)}{G(z)}dz,\quad \Theta^2(z)=\int_0^h E*(\zeta)(\zeta-a)d\zeta, \tag{6}$$
$$a=\frac{1}{K}\int_0^h E*(z)zdz,\quad \rho_0=\frac{1}{h}\int_0^h\rho(z)dz.$$

Here $E(z), G(z), \nu(z), \rho_0(z)$ - given piecewise continuous functions, defined at each layer by their value. For example,

$$E(z)=\begin{cases}E_1, 0\le z\le h_1\\ E_2,\ h_1<z<h\end{cases}$$

The motion of the plate is described by the equations [2]:

$$D\Delta^2\chi+\rho_0 h\left(1-gR^2\Delta\right)\frac{\partial^2\chi}{\partial t^2}=q_n(\alpha_1,\alpha_2,t). \tag{7}$$

We will consider only one variant of boundary conditions. Let all edges be hinged and equipped with a diaphragm preventing transverse shifts. Then

$$\chi=\frac{\partial^2\chi}{\partial\alpha_k^2}=0 \text{ при } \alpha_k=0, L_k,\quad k=1,2. \tag{8}$$

2. Model based on asymptotic integration of three-dimensional elasticity theory equations (model 3).

Using the method of asymptotic integration of three-dimensional elasticity theory equations over the plate thickness, article [3] obtained a series of relationships for all displacements and stresses in both layers as functions of the spatial

coordinates of the plate points, as well as a formula for determining the complex frequency for a multilayer square plate, which for a two-layer plate will have the following form [3]:

$$\frac{\pi^2\left(n^2+m^2\right)\ I_r^{1/2}}{L^2\sqrt{\sum_{k=1}^{2}\rho_k h_k+\rho_1 h_1^3\left(\frac{1}{5}+\frac{1+\nu_1}{12(1-\nu_1)}\right)\left(\frac{\pi}{L}\right)}},\ m,\ n=1,2,3,$$

where

$$I_r=\frac{1}{12}\left(\frac{E_2h_2^3}{1-\nu_2^2}+\frac{E_1h_1}{1-\nu_1^2}\left(4h_1^2+6h_1h_2+3h_2^2\right)\right)\cdot$$

3. Free oscillations of a two-layer plate

Let us analyze free oscillations ($q_n = 0$). The solution to the boundary value problem (5) - (8) has the form:

$$\chi=\chi_0\sin\frac{\pi n\alpha_1}{L_1}\sin\frac{\pi m\alpha_2}{L_2}e^{i\Omega t},\qquad(9)$$

where n, m – number of half-waves in directions α_1 and α_2 respectively, Ω - complex natural frequency.

Substituting equality (9) into equation (5) yields a simple formula for the desired complex eigenvalue

$$\Omega=\Omega_{nm}=\sqrt{\frac{\pi^4Eh^3\eta_3}{12\left(1-\nu^2\right)\rho_0hL_1^4}}\Lambda^{1/2},\qquad(10)$$

where

$$\Lambda=\Lambda_{nm}=\frac{\delta_{nm}^2\left(1+\theta K\delta_{nm}\right)}{1+K\delta_{nm}},\quad K=\frac{\pi^2h^2}{\beta L_2^2},\quad \delta_{nm}=n^2+e^2m^2,\quad e=\frac{L_1}{L_2}.\qquad(11)$$

Formula (10) gives two complex eigenvalues. We need to choose only one value with a positive imaginary part, since the second value does not satisfy the energy dissipation condition.

For model 2, we obtain the following formula for the complex frequency

$$\Omega=\Omega_{nm}=\sqrt{\frac{\pi^4D}{\rho_0hL_1^4}}\Lambda^{1/2}\qquad(12)$$

where

$$\Lambda = \Lambda_{nm} = \frac{\delta_{nm}^2}{1+\frac{\pi^2 g}{L_1^2}\delta_{nm}}, \quad \delta_{nm} = n^2 + e^2 m^2, \quad e = \frac{L_1}{L_2}. \tag{13}$$

4. Example. Let us consider a square two-layer plate with sides $L_1 = L_2 = 1$ m. The first layer is made of ABS plastic SD-0170 with parameters $E_1 = 1.5 \cdot 10^3$ MPa, $\nu_1 = 0.4$, $\rho 1 = 1.4\ 10^3$ kg / m^3. The thickness of the first layer is 0.5 mm. The second layer with thickness $h_2 = 10$ mm is made of MRE1 with the properties specified in [4]. The number of waves in the direction α_1 $n = 10$. The number of waves m in the other direction varies. The calculation results are presented in Tables 1 and 2. It is evident that the larger the wave numbers m and/or n, the stronger the influence of the magnetic field on the characteristics of the eigenmodes of the sandwich plate. The frequencies and decrements for the same m, constructed using different models, are almost identical.

Table 1.

Natural frequency ω= RΩ (Hz) of a two-layer plate with an MRE1 core as a function of the magnetic field induction B (mT) for modes with n = 10 and different numbers m

m \ B	0	200	400	600	800
model 1					
m=1	63.08	87.7	89.14	89.138	89.138
m=7	93.05	129.38	131.497	131.491	131.491
m=10	124.9	173.64	176.49	176.48	176.48
model 2					
m=1	62.88	87.37	88.799	88.795	88.795
m=7	92.76	128.8	130.951	130.946	130.946
m=10	124.5	172.87	175.7	175.695	175.695
model 3					
m=1	62.87782394	87.717163	89.1892	89.186	89.186
m=7	92.76	129.40	131.576	131.570	131.570
m=10	124.51	173.696	176.611	176.604	176.604

Table 2.

Decrement of oscillations $\alpha = \Im\Omega$ of a two-layer plate with an MRE1 core as a function of the magnetic field induction B (mT) for modes with n = 10 and different numbers m

m \ B	0	200	400	600	800
model 1					
m=1	0	4.27	4.29	4.219	4.219
m=7	0	6.45	6.33	6.22	6.22
m=10	0	8.65	8.49	8.35	8.35
model 2					
m=1	0	4.35	4.27	4.20	4.20
m=7	0	6.41	6.29	6.187	6.187
m=10	0	8.6	8.44	8.3	8.3
model 3					
M=1	0	4.469	4.39	4.31	4.31
M=7	0	6.59	6.48	6.37	6.37
M=10	0	8.85	8.7	8.55	8.55

Conclusion.

The paper considers two models of layered plates that take into account shears: model 1 of Grigolyuk-Kulikov [1], based on the introduction of generalized kinematic hypotheses of Timoshenko, and model 2 of type Timoshenko-Reissner [2], as well as the asymptotic model [3]. Based on the three models, free viscoelastic vibrations of a two-layer plate of medium length, one layer of which is made of MRE, are studied. It is shown that the magnetic field induction affects the viscoelastic properties of the plate and, as a consequence, its dynamic characteristics.

The performed comparative analysis of natural frequencies and decrements of vibrations found on the basis of three models allows us to conclude that all the considered models give very good agreement of the results.

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向量三角形的代数表示
ALGEBRAIC REPRESENTATION OF A VECTOR TRIANGLE

Apartsev Oleg Rolenovich

摘要。本文提出了一种技术，使我们能够将最简单的二维对象（矢量三角形）的描述从矢量形式转换为代数形式。实现此目的的主要工具是引入特殊坐标，这些坐标比全局坐标更有效。求解矢量方程的过程简化为考虑具有部分非线性元素的代数方程组，这为应用矩阵代数开辟了机会。

关键词：矢量三角形，全局坐标局部坐标，矢量方程，代数方程，三角剖分处理器。

Abstract. *In this paper, we propose a technique that allows us to transform the description of the simplest two-dimensional object-a vector triangle-from a vector form to an algebraic one. The main tool for this is the introduction of special coordinates, which are more efficient than global. The process of solving vector equations is simplified to considering systems of algebraic equations with partially nonlinear elements, which opens up opportunities for applying matrix algebra.*

Keywords: *Vector triangle, global coordinates local coordinates, vector equation, algebraic equation, triangulation processor.*

A technique for transforming an arbitrary vector triangle, a fundamental two-dimensional geometric figure, into an algebraic representation is presented.

The research is an attempt to apply the philosophical concept of Ambivalent Generalization [1] to abstract mathematical forms, in particular, to the vector triangle. Our goal is to give a new description of its properties.

The study of the attributive interaction of objects is a key topic that the above-mentioned theory of behavior studies. Although the study of attributes is the basis of any science, it is particularly difficult to analyze the properties of abstract objects. When they are created, they use the attributes set by the human mind, but as a result, objects with incredible characteristics are generated.

Mathematics is an ideal environment for such research. It is precisely because of the quirkiness of the objects created that mathematics is considered the most complex science. In such “speculative” constructs that do not have a material embodiment, completely unexpected substantial properties are often found, which leads to the manifestation of unpredictable attributes.

When studying abstract objects, it is very useful to use methods for mathematically correct conversion of the original parameters. This is the main idea of this paper.

In this study, we propose a method that consists of two steps:

1. Defining suitable local coordinates: In this article, we create unique local coordinates that help avoid problems associated with using standard global coordinates.
2. Implementation of the concept: We transform a vector object into its algebraic representation.

You can read more about this in the article.

1. A triangle in a special extended locality coordinate system

Consider an arbitrary vector triangle in the plane **Φ** (Fig. 1), represented by vectors $\bar{a}, \bar{b}, \bar{c}$:

$$\bar{a} + \bar{b} = \bar{c}. \qquad (1)$$

Let's determine the general direction for the entire plane **Φ** using an arbitrary vector $\bar{e}$ that will not be fixed at any particular point in this plane. In other words, we will not specify its coordinates.

This vector will represent something like the direction of the "wind", which seems to blow over the entire plane **Φ** of the Phases. So, formally, this vector $\bar{e}$ will be present at every point in the plane.

Thanks to this arrangement of the field **Φ**, we can avoid using the standard global coordinates.

Avoiding them will allow us to achieve maximum individualization in the description of the properties of the object under study, that is, to present its attributes independently of each other.

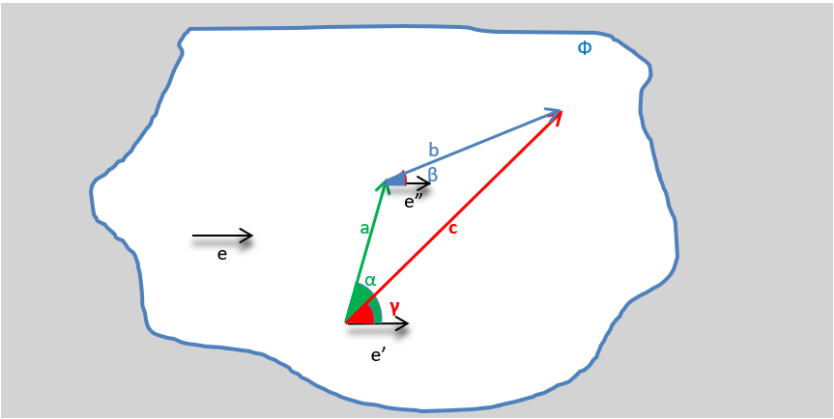

Figure 1

On the other hand, it will help to avoid subjectivity and complexity in describing the properties of an object by an external observer, who can choose the global coordinate system "for himself", perhaps sometimes to the detriment of the completeness of taking into account the properties of local objects.

Of course, the choice of direction and amplitude of the vector $\bar{e}$ can also be attributed to the will of some virtual external observer. However, as we will see later, this problem disappears due to the invariance of the properties of the vector triangle, which are preserved for any chosen direction $\bar{e}$. In addition, the results of switching to individual local coordinate systems linked to each individual triangle will be presented.

For any vector $\bar{\rho}$ on the plane Φ, we enter individual local coordinates: $(\rho; \phi)_{\Phi}$, **where** $\rho \geq 0$ is the modulus of the vector, and ϕ is the angle between the vector and the global vector, which can take values in the range $-\pi < \phi \leq \pi$. The positive direction of an angle is defined as the rotation of the vector with respect to ϕ counter clockwise.

So the coordinates are defined as follows:

$$\bar{e} = (|\mathbf{e}|; \mathbf{0})_{\Phi}.$$

Let's call the coordinate representation described above polar non-global two-dimensional vector coordinates, or extroverted vector coordinates. The vector $\bar{e}$ will be named **"plane polarization vector".**

In general, such coordinates can be described as "extended locality coordinates".

To describe a triangle using standard trigonometric functions, we derive the algebraic relations. **Figure2** shows additional constructions: line segments parallel and perpendicular to the vector that pass through the ends of the vectors $\bar{e}$ of the triangle.

By considering orthogonal and parallel projections of vectors on these segments, we can obtain a complete and unambiguous description of the triangle.

$$\begin{cases} a\cos\alpha + b\cos\beta - c\cos\gamma = 0, \\ a\sin\alpha + b\sin\beta - c\sin\gamma = 0. \end{cases} \quad (2)$$

The system (2) describes only the vector diagram shown in Figure. When changing the direction of any vector in this triangle, the sign before the amplitude value of the corresponding vector in the upper and lower equations changes the same. This is because the rotation of any vector by the angle π occurs in accordance with the formulas:

$$\cos(\alpha + \pi) = -\cos\alpha,$$
$$\sin(\alpha + \pi) = -\sin\alpha.$$

In what follows, we will use the uppercase Greek letters **α, β, γ to denote angles** relative to the direction of polarization. These angles are directly related to the sides of the triangle – vectors $\bar{a}, \bar{b}, \bar{c}$, respectively.

At any time, we can return to the traditional values of the internal angles ∟A, ∟B, ∟C of the triangle **ΔABC** in **Fig. 1**, which are expressed in terms of the angles α, β, γ.

$$\begin{aligned} \angle \mathbf{A} &= -\alpha + \gamma, \\ \angle \mathbf{B} &= \pi - \beta + \alpha, \\ \angle \mathbf{C} &= -\gamma + \beta. \end{aligned} \qquad (3)$$

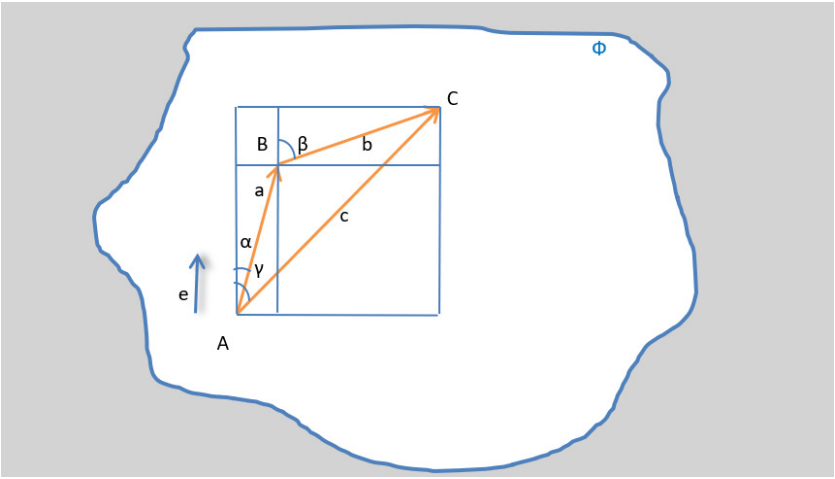

Figure 2

Let's translate the system of equations **(2)** into a matrix representation [2]:

$\bar{l}(a,b,c) = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$ - a vector consisting the amplitudes of the vectors of the triangle. **(4)**

$\hat{T}(\alpha,\beta,\gamma) = \begin{pmatrix} \cos\alpha & \cos\beta & -\cos\gamma \\ \sin\alpha & \sin\beta & -\sin\gamma \end{pmatrix}$ – matrix of angular coordinates. **(5)**

The system of equations **(2)** will take the following form:

$$\begin{pmatrix} \cos\alpha & \cos\beta & -\cos\gamma \\ \sin\alpha & \sin\beta & -\sin\gamma \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = 0. \qquad (6)$$

In a short matrix representation, an arbitrary triangle on a plane with polarization can be expressed as follows:

$$\hat{T}_e \bar{l} = 0. \qquad (7)$$

2. Invariant transformations

Let's look at operations that do not change the value of the expression **(7)**, that is, they are immutable transformations of.

✓ Multiplication by a scalar [2] **k**: $k * \bar{l}\,\hat{T} = 0$,

$$\hat{T}\,\overline{l(ka,kb,kc)} = 0, \qquad (8)$$

$$or$$

$$\begin{pmatrix} k\cos\alpha & k\cos\beta & -k\cos\gamma \\ k\sin\alpha & k\sin\beta & -k\sin\gamma \end{pmatrix} \overline{l(a,b,c)} = 0.$$

Rotate the entire triangle by an arbitrary angle ϕ relative to the direction $\bar{e}$.

$$\widehat{T}(\alpha_1,\beta_1,\gamma_1)_i = \widehat{T}((\alpha+\phi),\ (\beta+\phi),\ (\gamma+\phi)). \quad (9)$$

The proofs of these statements are so simple that they can be omitted.

3. Local coordinate system of a triangle

We suggest that you go one step further and exclude from the description of the triangle everything that is connected with the extrovert coordinate system. To do this, divide the equation by the value of the amplitude c, and then subtract the angle γ from the values of all the angles of the triangle. As a result, we get the following expression:

$$\bar{l}(a/c, b/c, 1) * \widehat{T}(\alpha-\gamma, \beta-\gamma, 0) = 0. \quad (10)$$

This means that the triangle description problem (**Fig.2**) at the local level reduces to solving the system of equations, $c \neq 0$:

$$\begin{cases} a\cos\alpha + b\cos\beta - 1 = 0, \\ a\sin\alpha + b\sin\beta = 0. \end{cases} \quad (11)$$

The system is restored to its original designations by replacing:

$$a/c \Rightarrow a, \quad b/c \Rightarrow b, \quad c \Rightarrow 1,$$
$$\alpha - \gamma \Rightarrow \alpha, \quad \beta - \gamma \Rightarrow \beta, \quad \gamma \Rightarrow 0.$$

It is worth noting that we have moved on to a special coordinate system, which can be called the polar local two-dimensional coordinates of the vector triangle or the introverted coordinates of the triangle. This coordinate system is not unique, and each triangle can be described in three ways-by the number of its sides.

Locality also implies that the amplitudes of the vectors of the triangle under consideration are expressed in terms of the amplitude of one of its proper sides, which is taken as one. In addition, the same vector serves as the basis for determining the angle of rotation of the other two vectors.

The above approach not only opens a new page in trigonometry, allowing you to represent an arbitrary triangle in algebraic form, but also opens up new horizons in solving triangulation problems.

This method allows you to move from a global triangulation system to local problems related to finding the parameters of a single triangle, and back again. In addition, such a representation can become a basis for studying problems of three-dimensional and multidimensional triangulation.

One of the advantages of the proposed algebraic method is the simplicity of composing systems of equations that accurately describe any closed vector constructions. These constructions are easily converted to algebraic equations, and then back again.

An additional advantage of the method is its matrix capabilities. This allows you to use the principle of operational uniformity, which significantly speeds up the process of calculating the parameters of vector objects.

This technique uses special objects based on triangles. We suggest calling them a "triangulation set" or a "triangulate". This is any object consisting of a set of triangles, in which each triangle has at least one side in common with another triangle from the same set. The simplest triangulate is a single triangle.

4. Algebraic approach to vector problems

Let us examine a few instances that vividly illustrate the benefits of the algebraic method.

Transformation of vector shapes

Let's consider a vector polygon, such as a quadrilateral.

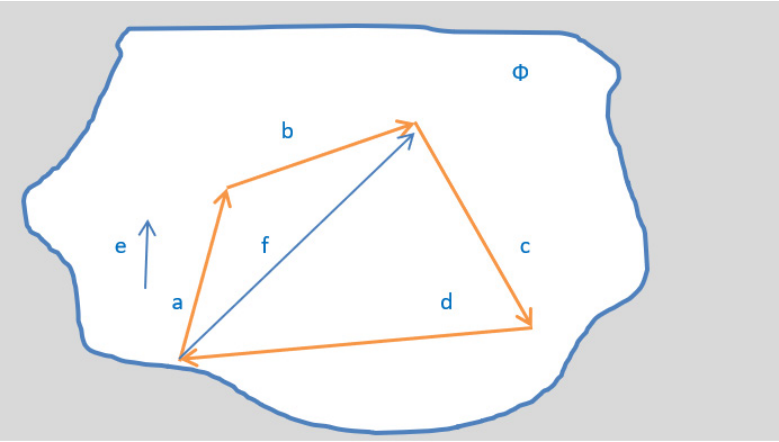

Figure 3

$$\bar{a} + \bar{b} + \bar{c} + \bar{d} = 0. \qquad (12)$$

Correspondence to a vector equation in algebraic form:

$$\begin{cases} a\sin\alpha + b\sin\beta + c\sin\gamma + d\sin\delta = 0, \\ a\cos\alpha + b\cos\beta + c\cos\gamma + d\cos\delta = 0. \end{cases} \qquad (13)$$

Finding solutions in this system of equations does not differ from solving the systems described above (2) and (11).

Obviously, for a system of two equations, the number of required variables cannot exceed two.

The advantage of the vector approach lies in the simplicity of replacing several related vectors with a single vector, as well as the ease of converting problems from a visual vector form to an algebraic form and back again.

In the case of this task:

$$\bar{a} + \bar{b} = \bar{f} \Rightarrow \bar{f} + \bar{c} + \bar{d} = 0. \quad (14)$$

Or in algebraic form: system **(13)** is converted to **(15).**

$$\begin{cases} f \sin\phi + c \sin\gamma + d \sin\delta = 0, \\ f \cos\phi + c \cos\gamma + d \cos\delta = 0. \end{cases} \quad (15)$$

By the way, the simplicity of the method makes it easy to perform the inverse operation: one vector can be represented as the sum of several vectors.

Finding the lengths of intersecting vectors

Consider a problem in the plane in which we want to find the lengths of parts of two vectors up to the point of their intersection, if they rest on the ends of the third vector **(Рис.4)**:

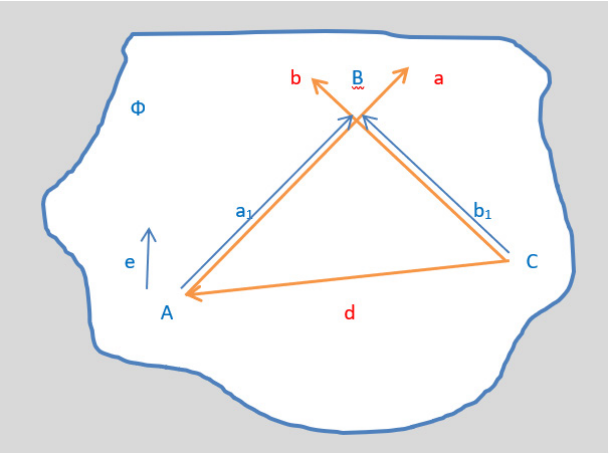

Figure 4

The problem takes the following form in the algebraic notation:

$$\begin{cases} a1 \sin\alpha - b1 \sin\beta + d \sin\gamma = 0, \\ a1 \cos\alpha - b1 \cos\beta + d \cos\gamma = 0, \end{cases} \quad (16)$$

Where **a1 and b1** are the desired fractions of vectors up to the intersection point.

5. "Triangulation processor"

Pending future research and development aimed at creating efficient iterative methods that can quickly solve the equations **(11)**, in this paper, we present a list of algebraic formulas for the conditions presented in **Table 1**. These formulas allow us to obtain fixed solutions, but it should be noted that not in all cases the solutions can be unambiguous.

Table 1

List of triangulation problems

	Specified variables	*Required variables*
1	**a (b)*, α, β**	**b (a)***
2	**a, α (β), b**	**β (α)**
3	**α, β**	**a, b**
4	**a, b**	**α, β**
5	**a, α (b, β)**	**b, β (a, α)**
6	**a, β (α, b)**	**α, b (a, β)**

***** – Alternative variables are indicated in parentheses, which can be used instead of the current ones, while maintaining the structure of the equations unchanged.

1. Calculating b

Using the first expression from **(11):**

$$b = -\frac{a \sin \alpha}{\sin \beta}. \qquad (17)$$

2. Calculating β

$$\beta_1 = arcsin(-\frac{a \sin \alpha}{b}) \text{ или } \beta_2 = \pi - arcsin(-\frac{a \sin \alpha}{b}). \qquad (18)$$

✓ *It is important to note that the resolution of this issue is inherently uncertain, and the uncertainty stems from the ambiguity of the function «**sin(α)**».*

3. Calculating a,b

From the system of equations **(12):**

$$a = \frac{sin\,\beta}{sin(\beta - \alpha)}, \qquad (19)$$

$$b = \frac{sin\,\alpha}{sin(\alpha - \beta)}. \qquad (20)$$

4. Calculating α,β

Squaring the second equation from **(11):**

$a^2 sin^2 \alpha = b^2 sin^2 \beta$,

let's use the formula:

$$\sin \alpha^2 + \cos \alpha^2 = 1:$$

$$a^2 - a^2 cos^2 \alpha = b^2 sin^2 \beta,$$

$$a^2 cos^2 \alpha = a^2 - b^2 sin^2 \beta.$$

We express from the second equation **(11)** by squaring:

$$a^2 cos^2 \alpha = (1 - b\, cos\beta)^2.$$

By equating the right-hand sides of the last two expressions:

$$a^2 - b^2 sin^2 \beta = (1 - b\, cos\beta)^2,$$

$$a^2 - b^2 sin^2 \beta = 1 - 2b\, cos\beta + b^2 cos^2 \beta,$$

$$2b\,cos\beta = 1 + b^2 - a^2.$$

By virtue of the parity of the function $cos(\alpha)$:

$$\beta_{1,2} = \pm arccos\left(\frac{1+b^2-a^2}{2b}\right). \quad (21)$$

✓ *The formula contains the sign ±, which indicates the existence of two solutions to. Choose between them, based only on the initial data of the system of equations (11), in the general case, it is not possible to use.*

And, similarly, for α:

$$\alpha_{1,2} = \mp arccos\left(\frac{1+a^2-b^2}{2a}\right). \quad (22)$$

5. Calculating β, b

From the previous issue:

$$b = \sqrt{1 + a^2 - 2a\,\cos\alpha}.$$

Taking into account **(17)**:

$$\sin\beta = \frac{-a\,sin\,\alpha}{\sqrt{1+a^2-2a\,\cos\,\alpha}},$$

$$\beta = arcsin\left(\frac{-a\,sin\,\alpha}{\sqrt{1+a^2-2a\,\cos\,\alpha}}\right) \text{ или } \beta = \pi - arcsin\left(\frac{-a\,sin\,\alpha}{\sqrt{1+a^2-2a\,\cos\,\alpha}}\right). \quad (23)$$

6. Calculating α, b

From the previous issue:

$$2b\,cos\beta = 1 + b^2 - a^2,$$

Leading to a complete square:

$$b^2 - 2bcos\beta + (\cos\beta)^2 = a^2 - 1 + (\cos\beta)^2,$$

$$(b - \cos\beta)^2 = a^2 - (\sin\beta)^2,$$

$$b_{1,2} = \cos\beta \pm \sqrt{a^2 - (\sin\beta)^2}, \quad (24)$$

$$\cos\alpha = \frac{1 + a^2 - b^2}{2a},$$

$$\cos\alpha = \frac{1 + a^2 - (\cos\beta \pm \sqrt{a^2 - (\sin\beta)^2})^2}{2a},$$

$$\cos\alpha = \frac{1 + a^2 - (\cos\beta)^2 \pm 2\cos\beta\sqrt{a^2 - (\sin\beta)^2} - a^2 + (\sin\beta)^2}{2a}$$

$$\cos\alpha_{1,2} = \frac{(\sin\beta)^2 \pm \cos\beta\sqrt{a^2 - (\sin\beta)^2}}{a},$$

$$\alpha_{1,2} = arccos\left(\frac{(sin\beta)^2 \pm cos\,\beta\sqrt{a^2-(sin\beta)^2}}{a}\right). \quad (25)$$

✓ *In problem 6), as in problems 2) and 4), there are two possible solutions, and it is impossible to choose between them based on the initial conditions.*

We leave a detailed study of the areas of definition and acceptable values of the presented formulas to the inquisitive reader.

However, if you introduce some restrictions on acceptable solutions:

- ✓ Select only the front or back half-plane to place the desired vector;
- ✓ Restrict the direction of the desired vector to the right or left half-plane,

then you can get unambiguous answers.

6. Conclusions

1. In this paper, we discovered and proved the relationship between the vector and algebraic ways of representing vector triangles. This discovery makes it possible to easily convert vector problems to algebraic problems using simple mnemonic rules and vice versa.
   This technique not only simplifies trigonometric calculations, but also makes operations with vector objects more visual.
2. To describe vector objects on a plane, a unique coordinate system was developed: polar non-global two-dimensional vector. It can be applied not only on a plane, but also on curved surfaces, such as a sphere, without using global coordinates.
3. The next step towards a simpler description of an arbitrary vector triangle was the introduction of a polar local two-dimensional coordinate system designed exclusively for this particular vector triangle.
   This system makes it possible to significantly simplify the algebraic description of a vector triangle and, at the same time, opens up new opportunities for rationalizing calculations of triangulation parameters in systems of connected triangles..
4. In this work, we developed a new methodology that allows us to take a fresh look at vector objects. It opens up new horizons for creating a universal mathematical tool that simplifies triangulation calculations. Such a device could be called a «triangulation processor».
5. The development of vector methodology based on special two-dimensional local coordinate systems opens up new horizons for its use in three-dimensional space and in higher-dimensional spaces.

Obviously, this methodology can be applied to curved flat surfaces, such as spherical ones, as well as to surfaces that may be in the process of curvature.

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车里雅宾斯克州森林草原带和草原带土壤和植物中硒浓度的测定
DETERMINATION OF SELENIUM CONCENTRATION IN SOIL AND PLANTS IN THE FOREST-STEPPE AND STEPPE ZONES OF THE CHELYABINSK REGION

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注释。作为工作的一部分，研究了车里雅宾斯克州乌韦利斯基、特罗伊茨基和切斯门斯基地区的土壤和植物。使用电感耦合等离子体光谱法分析了土壤和植物样品中的硒含量。

研究结果表明，车里雅宾斯克地区土壤和植物中的硒含量受土壤类型、地下水可用性和化学肥料使用等多种因素的影响。

建议进一步研究，以制定有效的策略来调节环境中的硒水平并改善人类健康。

关键词：硒、土壤、植物、车里雅宾斯克地区。

Annotation. *As part of the work, soils and plants in the Uvelsky, Troitsky and Chesmensky districts of the Chelyabinsk region were studied. Selenium content in soil and plant samples was analyzed using inductively coupled plasma spectrometry.*

The results of the study show that the selenium content in the soil and plant in the Chelyabinsk region is influenced by various factors such as soil type, groundwater availability and the use of chemical fertilizers.

Further research is recommended to develop effective strategies for regulating selenium levels in the environment and improving human health.

Keywords: *selenium, soil, plant, Chelyabinsk region.*

Introduction

The Chelyabinsk Region is a region characterized by a significant number of industrial enterprises that, in the course of their activities, can emit harmful substances into the atmosphere that pose a potential threat to public health.

Selenium deficiency can lead to health problems. This trace element is involved in the work of the immune, nervous and endocrine systems, in the synthesis of thyroid hormones, the protection of cells from oxidative stress and the excretion of heavy metals. Selenium surplus is also dangerous, its excess causes poisoning with symptoms of nausea, vomiting, diarrhea, abdominal pain, hair loss and liver and kidney damage. It is important to monitor the level of selenium and not exceed the recommended amount.

Currently, in many regions of the world there is a shortage of various substances necessary to maintain human health. The Chelyabinsk region is also experiencing a shortage of selenium, so it is necessary to conduct research to determine its content in soil and plants.

The purpose of the study: to determine the selenium content in soil and plants in the steppe and forest-steppe zones of the Chelyabinsk region.

Materials and methods of research

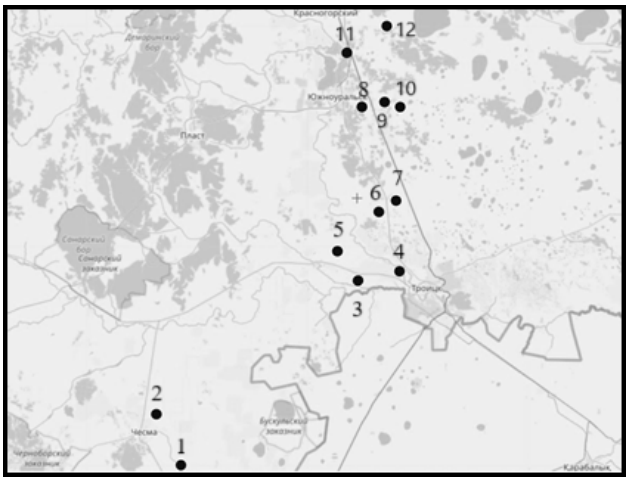

Figure 1. *Soil and plant sampling sites in the Chelyabinsk region*

In September 2023, soil and plant samples were taken in the Chelyabinsk region. The forest-steppe zone in the Uvelsky district and the steppe zone in the Troitsk and Chesmensky districts were studied.

A total of 24 soil and plant samples were taken from 12 sites. The soils in these places were of different types: ordinary chernozem (medium loamy and heavy loamy), meadow-chernozem saline (heavy loamy) and leached chernozem (medium loamy and heavy loamy).

Among the plants were cereals (wheat and buckwheat) and oilseeds (sunflower), which are grown in agriculture.

The research was conducted in the laboratory of environmental monitoring, which is located at the Institute of Earth Sciences of Tyumen State University.

An analysis of soil and plant samples for selenium content was carried out in the accredited testing laboratory of FSBI "TsLATI for the Ural Federal District" in the Tyumen region. For this purpose, the method of inductively coupled plasma spectrometry was used, and the HDPE F 16.1:2.3:3.11-98 "Methodology for measuring the metal content in solid objects by inductively coupled plasma spectrometry" was used.

Standard statistical methods using Microsoft Excel software were used to analyze the data.

Results and discussion

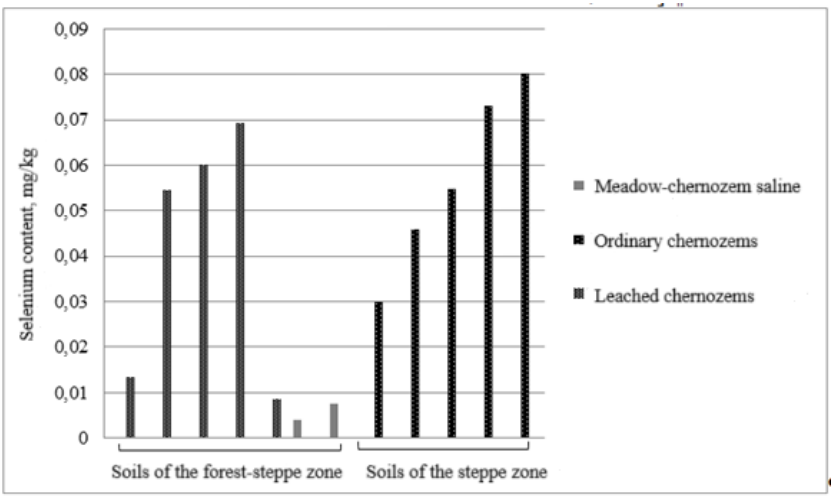

Figure 2. *Selenium content in the soils of the steppe and forest-steppe zones of the Chelyabinsk region*

The study revealed that the selenium content in soil samples varies from 0.004 to 0.080 mg/kg. To assess the level of selenium in the soil, the following threshold values of trace element concentration were determined:

less than 125 micrograms/kg (less than 0.125 mg/kg) is an area of selenium deficiency;

125-175 mcg/kg (0.125–0.175 mg/kg) — marginal insufficiency;

175-3000 micrograms/kg (0.175–3 mg/kg) — the optimum area;

more than 3000 micrograms/kg (more than 3 mg/kg) is an area of excess.

According to this classification, all the studied soils are in the area of selenium deficiency. Data analysis showed that increased selenium content was detected in soil samples at sites No. 4 (0.069 mg/kg) in the forest-steppe zone and at sites No. 11 (0.072 mg/kg) and No. 12 (0.080 mg/kg) in the steppe zone.

The average values of selenium content were recorded in soil samples at sites No. 2 (0.054 mg/kg), No. 3 (0.060 mg/kg) in the forest-steppe zone and at sites No. 8 (0.029 mg/kg), No. 9 (0.046 mg/kg), No. 10 (0.055 mg/kg) in the steppe zone. The lowest selenium content was found in soil samples at sites No. 1 (0.013 mg/kg), No. 5 (0.008 mg/kg), No. 6 (0.004 mg/kg) and No. 7 (0.007 mg/kg) in the forest-steppe zone.

It can be assumed that the low content of selenium in the soil is due to the fact that the studied area is located near the valley of the Uvelka River. This may indicate the presence of groundwater, which may affect the elemental composition of the soil.

In addition, the low selenium content in soil samples at sites No. 6 and No. 7 may be associated with intensive farming and the use of chemical fertilizers such as nitrates, phosphates and potassium salts. These fertilizers can reduce the level of selenium in the soil, as they are able to displace other elements from soil minerals and reduce their availability to plants. However, this is not a specific effect only for selenium, but may also affect other elements.

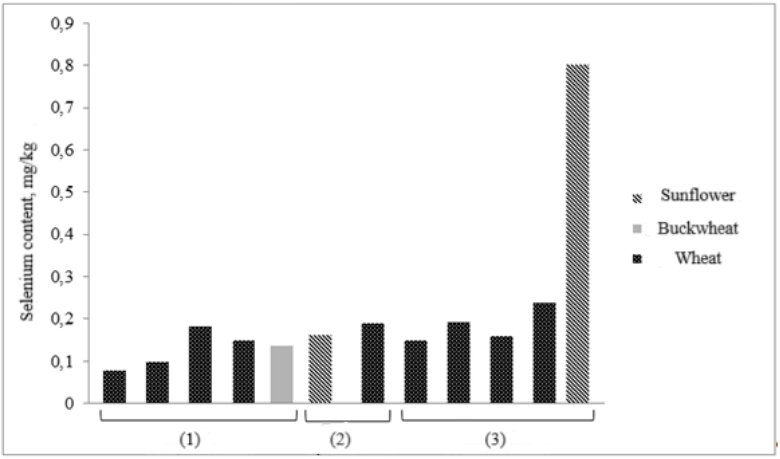

Figure 3. *Selenium content in plants growing on leached chernozems (1), meadow-chernozem soils (2), ordinary chernozems (3) in steppe and forest-steppe zones of the Chelyabinsk region*

During the study, it was found that the highest selenium content (0.802 mg/kg) was recorded in a sample of sunflower plants taken at site No. 12, located in the steppe zone.

The smallest amount of selenium (0.076 mg/kg) was detected in a sample of wheat plants taken at site No. 1, which is located in the forest-steppe zone.

It was also noted that the selenium content in the soil varied at different sites. However, it was not possible to find a correlation between the selenium content in soil and plants.

The results of the study showed that the selenium content in plants does not always correlate with its content in the soil. This may be due to various factors, including the bioavailability of selenium, the ability of plants to absorb it, as well as soil characteristics such as pH, organic matter content and the presence of other elements.

According to the data obtained, the highest bioabsorption coefficient was recorded in sunflower plants. This may be due to the peculiarities of the physiology of this crop. For example, sunflower plants have specialized transport systems that allow them to efficiently absorb and distribute elements, including selenium.

The results of the study showed that the absorption of selenium by plants strongly depends on its bioavailability in the soil. At site No. 6, where the bioabsorption coefficient was the highest, the concentration of selenium in the soil was relatively low (0.004 mg/kg). However, most of the selenium in the soil was in a form that is easily absorbed by plants..

Thus, the results of the study confirm that the absorption of selenium by plants depends not only on the total concentration of selenium in the soil, but also on its bioavailability. This means that in some areas there may be a high concentration of selenium in plants, but not in the soil. This circumstance should be taken into account when assessing the risks of selenium deficiency or excess in specific territories.

Conclusion

As a result of the study, it was found that the concentration of selenium in the soils of the forest-steppe and steppe zones of the Chelyabinsk region ranges from 0.004 to 0.080 mg/kg. This indicates a lack of selenium in these soils.

To solve this problem, additional application of selenium to the soil is necessary. One way is to use organic fertilizers such as compost or humus. They contain microorganisms that can convert selenium into a form accessible to plants.

Another option is the use of special selenium—containing fertilizers. They are made on the basis of selenium-containing minerals such as sodium selenite or potassium selenite.

The selenium content in soils and plants of the steppe and forest-steppe zones of the Chelyabinsk region depends on the type of soil and natural conditions of the region.

Relatively high levels of selenium were found at site No. 4 of the forest-steppe zone and at sites No. 11 and No. 12 of the steppe zone. Low values are associated with the proximity of the river valley and intensive farming using chemical fertilizers.

Differences in selenium content between steppe and forest-steppe zones may be due to climatic features affecting soil formation. The findings indicate the need for further research to fully understand the factors affecting selenium content and its effects on human health in the region.

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