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

Materials of the International Conference

Date: August 31

Beijing, China 2019

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

International Conference
“Scientific research of the SCO countries: synergy and integration”

Part 2: Participants’ reports in English

2019年8月31日。中国北京
August 31, 2019. Beijing, PRC

ISBN 978-5-905695-51-3

Materials of the International Conference
“Scientific research of the SCO countries: synergy and integration” - Reports in English. Part 2

(August 31, 2019. Beijing, PRC)

ISBN 978-5-905695-51-3

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。
作者对所引用的出版物，事实，数字，引用，统计数据，专有名称和其他信息的准确性负责

These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines tecnical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

Authors are responsible for the accuracy of cited publications, facts, figures, quotations, statistics, proper names and other information.

ISBN 978-5-905695-51-3

CONTENT

SOCIOLOGICAL SCIENCES

PHILOSOPHICAL SCIENCES

PSYCHOLOGICAL SCIENCES

MEDICAL SCIENCES

BIOLOGICAL SCIENCES

CHEMICAL SCIENCES

TECHNICAL SCIENCE

Foreword

We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 56 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).

This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.

I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.

Fan Fukuan,
Chairman of the organizing committee of the conference
"Scientific research of the SCO countries: synergy and integration"
Full Professor, Doctor of Economic Sciences

前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

范福宽，
教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”

评估该地区投资吸引力的评估
RATING ASSESSMENT OF INVESTMENT ATTRACTIVENESS OF THE REGION

Telegina Natalya Anatolyevna

Teslenko Maxim Aleksandrovich
undergraduates

Zhukov Boris Mikhailovich
Doctor of Economic Sciences, Full Professor
Southern Institute of Management
Krasnodar, Russia

抽象。 文章揭示了作者将该地区的“投资环境”类别理解为投资者可以在其中进行投资活动的一系列政治，社会经济和金融条件的方法。 基于对投资潜力和投资风险的评估，分析了该地区投资环境的组成部分。

关键词：投资环境，投资，投资者，投资吸引力，投资活动，投资潜力，投资风险。

Abstract. *The article reveals the author's approach to understanding the category of "investment climate" of the region as a set of political, socio-economic and financial conditions in the region in which the investor can carry out his investment activities. The components of the region's investment climate are analyzed based on the assessment of investment potential and investment risk.*

Keywords: *investment climate, investments, investors, investment attractiveness, investment activity, investment potential, investment risks.*

The formulation and solution of the scientific problem, expressed in the development of a strategic mechanism to increase the investment attractiveness of the region as a factor in increasing the efficiency of the economy, is due to the urgent need to intensify investment activity in the regions of the Russian Federation against the background of the expansion of economic sanctions of Western countries and, as a consequence, a decrease in investment resources, in general, and especially foreign economic resources, in particular.

The subjects of the federation are doing a lot to attract investors to their regions, however, increasing the investment attractiveness of the regions requires more substantive and effective efforts of regional and municipal authorities, which actualizes the solution to this problem.

While studying the theoretical principles of the formation of the investment attractiveness of the region, various approaches of researchers to determining the categorical basis of the terms “investment climate” and “investment attractiveness” were identified and the author's interpretation of the substantive content of these categories was justified:

- “Investment climate” of a region is a combination of political, socio-economic and financial conditions in a region in which an investor can successfully carry out his investment activity;
- “Investment attractiveness of a region” is a combination of objective economic, social and natural features, means, opportunities and restrictions that determine the inflow of capital into a region, encouraging an investor to invest in the development of a region, industry or an individual enterprise and evaluated by investment activity.
- “Investment activity in the region” consists of such concepts as the investment climate; investment attractiveness of the region; investment activity; investment potential; investment risks. The listed terms of investment activity are interconnected.

Investments in the socio-economic development of the region are the result of investor activity, i.e. investor funds are invested in fixed assets based on the study of the investment climate in the region, consideration of its investment attractiveness and the investor's decision to invest in selected sectors or individual enterprises.

Speaking about the terms “agglomeration” and “cluster”, it should be noted that some authors often use them as synonyms. However, in the definitions of the essence of these terms there is a main difference: “agglomerate” is a combination of heterogeneous, and “cluster” is a combination of homogeneous industries and organizations, although they are united by one goal, enhancing investment attractiveness and competitive advantages of both individual companies and cluster, agglomerate as a whole.

In addition to the above theoretical definitions of the terms used, we consider it possible to offer an author's version of the investment attractiveness assessment of the Krasnodar Territory, based on the methodology of the rating agency "RAEKS-Analytics" with a generalized and ranked rating scale [1]. The essence of the methodology is to assess the constituent structural elements of investment attractiveness (investment potential and investment risk) based on expert (empirical) assessment of the selected components of the investment potential, taking into account the degree of investment risk. In other words, based on the elements of the SWOT analysis, i.e. the positive and negative sides of each component, an assessment of the investment potential and possible risk for each element separately is given, on the basis of which a general assessment of the specific component of the investment attractiveness of the region is derived.

These components are:
- Geopolitical position of the region;
- Natural resource attractiveness;
- Legislative and regulatory field;
- Transport and logistics infrastructure;
- Engineering infrastructure;
- Telecommunication structure;
- Manpower, availability and quality of labor;
- Investment activity;
- Tourism and recreational activities;
- Ecology;
- Profitability of investment attractiveness.

Analysis of the investment attractiveness of the Krasnodar Territory, conducted according to these criteria, showed the following results.

The Krasnodar Territory has recently been one of the leaders of most inter-regional ratings for attracting investments and increasing investment attractiveness. Kuban is currently investment attractive on a global level. It created an effective investment environment (climate), focused on innovation in traditional and new sectors of the economy, the budget of the Krasnodar Territory is balanced and has a low dependence on the budgets of the federal level. The analysis also showed a positive growth trend in investment potential with relatively moderate investment risk.

Assessment of investment attractiveness of the Krasnodar Territory is determined by the value "good". This value lags behind the “excellent” rating due to the general decrease in the investment attractiveness of the Russian Federation due to the imposed economic sanctions, as well as due to the reduced investment potential in the field of ecology and engineering infrastructure, and, as a result, the increased risk of investment in these sectors of economic activity.

Based on the analysis of the constituent elements of the investment attractiveness of the Krasnodar Territory and their assessment, we have identified a number of problems and shortcomings. Assessing the geopolitical position of the region as a structural element of investment attractiveness, a geopolitical problem was identified.

The actions of state bodies of the Krasnodar Territory to attract investors led to a twofold result: on the one hand, investments stimulating its development began to flow into the region, and on the other hand, the region became extremely attractive for migration, for migrants from other regions of Russia, which led to social tension, problems in social infrastructure. So, in recent years, the official population of Krasnodar has increased from 800 thousand people a decade ago to 1.3 million people in 2017. The overcrowding of the city, in particular, and the

region as a whole, is evidenced by constant traffic jams, increased queues for kindergartens, crowded classrooms in Krasnodar schools, and a sharp deterioration in the environmental situation in the city [2]. This situation significantly worsens the investment attractiveness of Krasnodar and provokes a decrease in investment inflows in the near future.

In order to increase the investment attractiveness of the Krasnodar Territory and solve the identified problems, it is proposed to:

- expand work to increase investment attractiveness among private Russian companies and organizations and foreign non-brand firms that have free financial resources and, above all, among the countries of the Middle and Far East;
- work more closely with the Ministry of Foreign Affairs, foreign economic departments and organizations to promote a positive image of the Krasnodar Territory, both among private Russian investors and non-brand foreign companies, companies with free investment resources;
- create agglomerations and clusters in certain regions of the Kuban that have production, tourism and recreational opportunities, such as Krasnodar, Novorossiysk, Sochi to increase investment attractiveness, both of agglomerations and clusters in general, and their enterprises, firms and companies.

The adoption of the above suggestions will increase the investment attractiveness of the Krasnodar Territory and attract additional investment in the socio-economic development of the Kuban.

References

1. Methodology for compiling the rating of investment attractiveness of Russian regions of the company "RAEKS-Analytics" [Electronic resource]. – URL: https://raexpert.ru/docbank//109/d31/3e8/5564b5d35605a92af9b47c6.pdf.

2. Telegin N.A., Zhukov B.M. Investment attractiveness of a region: problems and limitations // Bulletin of the Academy of Knowledge. № 28 (5). Krasnodar: 2018. - P.123-129.

“New Angarstroy”作为俄中融合贝加尔 – 阿穆尔宏观地区发展的项目，依赖于伊尔库茨克州

"NEW ANGARSTROY" AS A PROJECT OF RUSSIAN-CHINESE INTEGRATION IN THE DEVELOPMENT OF THE BAIKAL-AMUR MACRO-REGION WITH RELIANCE ON THE IRKUTSK OBLAST

Nikolsky Alexey Feliksovich
Doctor of Geographical Sciences, Leading Researcher
The laboratory for geo-resource sciences and political geography of the V.B. Sochava Institute of Geography SB RAS
Irkutsk, Russian Federation
Nikolsky Alexander Alekseevich
Business Consultant, Founder of Wigor international Limited (Hong Kong),

The research was funded by the Russian Fund of Fundamental Researches and Russian Geographical Society in the framework of the project 17-05-41057 RGO_a "Transport-communication factor in the development of Siberia: opportunities, constraints, prospects".

抽象。在俄罗斯和中国非主要合作的背景下，正在考虑创新项目«New Angarstroy»：Baikal-Amur冶金超级联合体。它是俄罗斯工业化新阶段的重要组成部分，包括大规模的跨西伯利亚和贝加尔 – 阿穆尔铁路重建。该项目可以作为进一步增加贝加尔湖地区森林资源开发的替代方案，在这里创建新的对环境有害的纤维素和化学工厂以及贝加尔湖的旅游饭店。该项目承担了国内和国际规模最大的冶金生产的发展，其中包括全周期的优质黑色冶金和钛镁工业。贝加尔湖生态领土的发展是在Lake-Temple子项目的框架内进行的。

关键词：伊尔库茨克州（安加拉地区），俄罗斯和中国经济的非初级一体化，New Angarstroy，贝加尔 – 阿穆尔宏观区域，工业化基地，钛磁铁矿，黑色冶金，钛镁工业。

Abstract. *In the context of non-primary-based cooperation of Russia and China the innovation Project «New Angarstroy»: Baikal-Amur metallurgical super-combine, is being considered. It was developed as a key part of the new stage of industrialization in Russia, including of large scale Trans-Siberian and Baikal-Amur railway reconstruction. The project serves as an alternative to further increasing the exploitation of forest resources in the Baikal region, creating here new environmentally harmful cellulose and chemical plants and tourist hotels on Baikal. The project assumes the development of the largest metallurgy production of national and inter-*

national scale, which will includes high-quality ferrous metallurgy of the full cycle and titanium-magnesium industry. The development of the Baikal ecological territory is assumed within the framework of the Lake-Temple subproject.

Key words: *Irkutsk oblast (Angara region), Non-primary-based integration of Russian and Chinese economies, New Angarstroy, Baikal-Amur macro-region, industrialization base, titanomagnetite ores, ferrous metallurgy, titanium-magnesium industry.*

1. Introduction

The economic growth model which took China to the heights of the world economy in the 1990-2000s cannot combine high economic development rates with building of Chinese socialism, solving of social and ecological problems, eliminate inequality and the construction of a «medium-wealthy society» [1]. According to "The Chinese dream and the world", “the Chinese economy, being the second economy of the world, can influence the whole global economy. Will the economic growth rates in China slow down…? What measures will China take to prevent economic degradation? Will the country be able to realize the goal of doubling the gross domestic product and income of urban and rural residents compared to 2012, set by the 18th Communist Party Congress? These questions are asked by the Chinese and other nations” [1, c. 153].

In [11, p. 276-277], we argued that “the goal of the external policy of Russia is to develop an alternative economic and political world center by integrating economies and policies of Russia, CIS, China, India and developing countries of Latin America, Africa and Asia. … Integration and strategic partnership of Russia and China are crucial. The following forms of integration can be suggested: Russia and China co-develop technologies, and then China, using quality and cheap materials, alloys, articles and parts produced in Russia, manufactures products for the whole world”. A new strategy for Russia, as we imagine it, is, therefore, its non-primary economic integration with China. And for China, then, a new strategy or development model is non-raw integration with Russia.

The primary-based integration model involving exportation of gas, oil, ores, wood is not promising. For Russia, this policy is inefficient since the utility (the full value) of exported natural resources tens of times exceeds their export prices. Instead of providing jobs, cheap production means and generating revenues, this full value contributes to development of foreign economies [11].

The former model of accelerated economic growth of China was based on three sources: on the constant inflows of foreign capital, on cheap labor resources (due to a large number of rural dwellers) and on great world demand for cheap Chines goods. The world crisis of 2008 decreased the world demand which was substituted for the internal one – government investment in the economy and social areas.

However, the development rates dropped twice due to a decrease in foreign capital inflows and cheap labor resources. The foreign capital inflows were affected by the world crisis. Besides, foreign investors are more interested in goods exportation rather than in selling goods for the national currency. The decrease in cheap labor resources is due to the efficient industrialization which decreased the number of rural dwellers, and government measures aimed at increasing per capita income and eliminating inequality. Technologies and natural resources are new – fourth and fifth – sources of development which will help combine the economic growth and social goals. The "Chinse dream and the world" also refers improvement of technologies to key sources of development [1, p. 167].

However, massive implementation of technological innovation products requires natural resources. To become sources of improvement of living standards, new technologies and equipment have to be massive, cheap and long-lasting. The new technologies also have to be appling not only in plants, but in macro-regions – for implementing unique industrial projects – development of territorial production complexes – territorial super-combines. It requires the fifth source of economic growth – large, cheap, high-quality natural resources. China lacks these resources. Only the Soviet Union could provide these resources to China, but their relations suddenly damaged. Socialism won in Russia because Russia possessed and possesses unique natural resources and does not depend on the global capital [3]. It is not about the supply of raw materials to the China, but about the organization of powerful Russian-Chinese territorial production complexes on the basis of natural resources of Russia. Initial and middle links, as an end links too, of these complexes have to be created in Russia. But a massive part of the assembly production for the whole world could be located in China. The New Angarstroy could be initiating this mutually beneficial integration for the benefit of the whole world [12, 14].

2. Methods

The research is based on the methods of territorial production complexes (TPC) and social energy production cycles (SEPC) which have being developed in Russia since 1918 – from the beginning of government electrification plan, proposed by Lenin [8, T. 36, c. 228–231; 2, 5, 6, 4]. In 1918, at the beginning of the period of foreign intervention and civil war, thinking, nevertheless, about the future, V.I. Lenin wrote in the Outline of a Plan for Scientific and Technical Works: “This plan should include: rational placement of industry in Russia in terms of the proximity of raw materials and the possibility of minimal labor loss during the transition from processing raw materials – towards successive stages of processing semi-finished products up to the finished product… Paying special attention to the electrification of industry and transport and the application of electricity to

agriculture. The use of non-first-class fuel grades (peat, coal of the worst grades) to generate electrical energy with the lowest costs for the extraction and transportation of fuel. Water forces and wind turbines in general and applied to agriculture " [8, Vol. 36, p. 228–231].

TPCs of different hierarchical levels (district, national, international) were formed only in the USSR. However, they did not manage to achieve their full potential. TPCs are special social energy production economic systems aimed at transferring the effect of natural resource and technology utilization to the society and nature. They are different from energy absorbing economic systems or objects – transnational and national corporations, financial-industrial groups, clusters, etc, as far as TPCs aim to produce the maximum volume of products at minimum costs and at decreasing prices rather than to get high profit. TPCs have to develop at national (a consolidated national economic complex), regional and international (mutually beneficial cooperation of countries) levels. The latter will be fully possible when Marx's principle of "the free development of everyone as a necessary condition for the free development of all" is established in all countries, replacing the ideology of over profit, domination and subordination [10, Vol. 4, p. 447].

The production chains that make up the TPC – from raw materials to all stages of its final processing, which are formed on the basis of the use of natural resources and energy, N.N. Kolosovskiy called social energy production cycles (SEPC) [5; 6]. Social energy is an end product derived from natural resources. The delivery of social energy at moderate prices within TPCs and SEPC ensures minimum expenses on production ("labor losses") [8, Vol. 36, p. 228; 6, p. 270] and the growth of free time, used for the spiritual and physical development of an individuality, as main society wealth [10, Vol. 23, p. 188–189].

3. Results

New Angarstroy is a project of creation of the third (eastern) industrial base of Russia (after the Central and Ural-Kuznetsk bases created in the last century). As the area of "New Angarstroy" will be the Baikal-Amur macro-region: Irkutsk oblast, the Republic of Buryatia, Zabaikalye krai, west of the Amur oblast, partially, Krasnoyarsk kray, Republics Tyva and Yakutia, southeast of Kemerovo oblast. And its main territory should be the Irkutsk oblast. The oblast was a pivot of the Soviet Angarstroy (1950-1980s) starting with the construction of Irkutsk, Bratsk and Ust-Ilimsk power stations and energy-intensive enterprises. However, ferrous metal and titanium magnesium industries which could use cheap Angara hydro-energy were not developed [5].

The third (Eastern) Russian base of ferrous metal and titanium magnesium industries will develop in Baikal-Amur macro-region using unique vanadium containing titanomagnetite ores of deposits Chiney and Malotagul (Zabaikalye krai, Irkutsk oblast) [7; 17], Savinsky magnesite deposit (Irkutsk oblast), Kovykta gas (Irkutsk oblast), coal of Irkutsk basin and hydropower of the Angara, Vitim and other rivers (Figure 1).

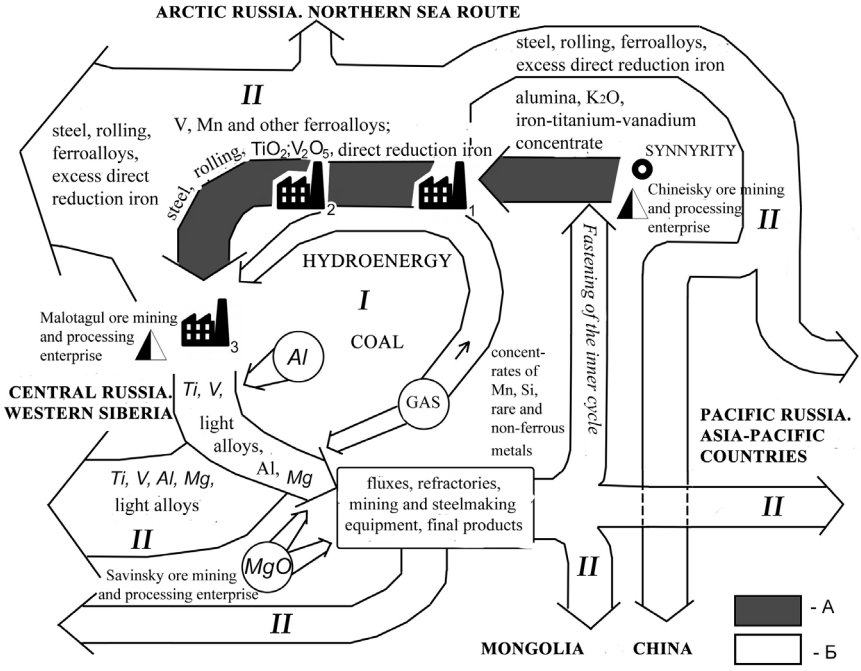


Figure 1. *Metallurgical social energy production cycle of the New Angarstroy.*
A – the flow of products, containing raw materials;
B – high processed and end products, including machine building ones.
Combines of ferrous metallurgy of full cycle: 1 – Ust-Kut combine,
2 – Ilim combine (Zheleznogorsk-Ilimsky), 3 – Taishet combine.
I – internal cycle; II – flows in national and international complexes (cycles)

The justification of potential demand for products of the Eastern Siberian metallurgy industry is based on the assumption about inevitable and rapid economic growth of Russia. In 1988, steel production output was 94 million tons a year; in 1990, it was 90 million tons; in 2008, it was 69 million tons, in 2015 – 69 million tons; i.e. it decreased by 25 million tons since 1988 and by 21 million tons since 1990. On 15% - in accordance with the magnitude of the final decline in the entire industrial production of the country relative to the 1990 level, which confirms the relationship between the scale of the economy and its need for steel and other metals [11]. To recover production volumes, needs and economic growth rates to the level of the middle of 1980s, steel production volumes have to be increased by 25

million tons. Until the crisis of 2007-2008, the volume of imported metal products was 7 million tons, which must replacing by domestic production. The volume of Chinese imported metal products is 22 million tons a year, including 14 million tons of rolled steel (mainly sheet), 2 million tons of ferrous alloys, 5 million tons of scrap iron [16]. Thus, the demand of China for quality metal products is minimum 10 million tons a year and further can be increased. So the possible volume of production of ferrous metallurgy is estimated according to the project in the amount of minimum 42 million tons. Although the New Angarstroy aims at satisfying the internal demand of the Russian economy, the large-scale demand of China for high-quality ferrous metals and titanium magnesium products can be satisfied as well. Speech, thus, is about creating an international Russian-Chinese TPC.

Combines of full cycle ferrous metallurgy (Ust-Kut, Ilim, and Tayshet) of Irkutsk oblast (see Figure 1 and the map in [12]) have to apply a direct ore reduction technology using coal and natural gas and further smelting direct reduction iron in electric furnaces to obtain quality steel, rolled steel and raw materials, in the form of slag, for titanium and vanadium production. To put the combines into operation is supposed in the order of approaching the pipeline to them from the Kovykta gas field, where Ust-Kut is the nearest point, including in accordance with the existing project of the Power of Siberia gas pipeline. From the Ust-Kut to Ilim and Tayshet combines, the gas-pipe line can run along the line "Eastern Siberia – Pacific Ocean" oil pipeline [12].

Ust-Kut is a point where the section of planned "The Power of Siberia" gas pipeline will run from Kovykta deposit (Irkutsk oblast) to China through Yakutia [12]. But, in our opinion, connecting the Kovykta field to this gas pipeline is only advisable for supplying the New Angarstroy regions through it, and not for the purpose of exporting gas to China. According to calculations, the complex of all productions of New Angarstroy (Baikal-Amur Metallurgical Super-combine), not only ferrous metallurgy, may require in total up to 55,8 billion m^3 of gas per year, which is 3 times higher than the planned supply of gas to China from the Kovykta field – 19 billion m^3 per year during forty yeas. Supplies to China will be able to provide Chayandinsky and other deposits of Yakutia, as well as the Krasnoyarsky kray.

The capacity of each of the combines of ferrous metallurgy is proposed for steel – minimal 13 million tons per year, the total – 39 million tons per year. At the same time, the production of titanium and vanadium will be provided on an unprecedented scale, as well as magnesium (90% of the domestic aluminum capacities are already in the region). The source of magnesium will be the largest in the CIS Savinskoye field of magnesites (Irkutsk oblast) [12]. The Golden Age predicted on earth may thus also be the age of titanium, vanadium, and magnesium.

Three combines of ferrous metallurgy have to function simultaneously on the basis of two titanomagnetite deposits – Chiney (Zabaikalye krai) and Malotagul (Irkutsk oblast) of Baikal-Amur and Transsiberian railway main line zones. This will create a pendulum "New Chara (Zabaikalye krai) – Taishet (Irkutsk oblast) and Taishet – New Chara" which is similar to the pendulum of the Ural-Kuznetsk territorial-production complex of the 1930s-1940s. The aim is to reduce transport costs and empty miles [5, 6, 12]. The new pendulum also will reduces loading on the natural and social environment (decreases open ore mining pits sizes) and transport loading on the BAM. However, the pendulum needs to be extended to Irkutsk, Ulan-Ude, Chita, Svobodny for transportation of metallurgy products, raw materials for the titanium-magnesium industry of Irkutsk oblast and rolling and alloys plants of Baikal-Amur macro-region as a whole. In the reverse direction on New Chara will be delivered means of production: coal of the Irkutsk basin, mining and steel making equipment from Irkutsk, regional refractory products, fluxes, manganese, silicon, rare and non-ferrous metals. To outside the macro-region, the products will go their own trains over the large pendulum "Central Russia – North-East China", and through Lena and Enisey on Northern sea route [14]..

The project can be implemented by a large Government Russian company, which, for example, is the Russian Railways company with its branch East-Siberian Railway. Such a company will be able to attract private companies to the project, all the more so if their shares are owned by the state, and after putting the objects of New Angarstroy into operation it will ensure the supply of products for national purposes at low prices.

4. Discussion

Due to rich reserves of titanomagnetite ores, hydropower, gas and coal, application of coal- and gas-based direct iron reduction method ITmk3 is most reasonable for Irkutsk oblast [15]. However, the method might need modification or improvement depending on conditions and scales of the project. According to [15], ITmk3 technology has been developing by Hares Engineering with Nishin, Kobe Steel Ltd, since 1996 when ITmk3 effect was discovered. Coal is used for recovery, while gas is applied for warming up. ITmk3 technology was introduced in 2010 in a Minnesota plant producing 500 thousand tons of iron a year. The project of the second plant was implemented by Hares Engineering at SBS Steel (Kazakhstan, Aktobe). The technology involves the heating of ore-flux-coal pellets using the gas air mixture coming through a gas burner, smelting of pellets in industrial rotary hearth furnaces at 1450° C and division of pellets into cast iron and slag. The slag is finally separated from the cast iron after the final cooling. The process lasts for about 8-12 minutes. Tests in the laboratory Nishin showed that when processing titanomagnetite

ores, almost all titanium falls into the slag. Direct reduced granulated iron (high quality cast iron) and slag TiO_2 are produced. As a result of vanadium containing titanomagnetite ores processing using ITmk3 method, one can obtain high quality vanadium cast iron which, after being smelted in electric furnaces, turns into high-quality steel with separated vanadium slag useful for production of V_2O_5 and ferrovanadium.

The application of ITmk3 non-blast furnaces to the unique titanomagnetite vanadium-containing ores of the Baikal region enable to obtain the above products in two steps (direct reduction of iron + electrometallurgy of steel). At the same time, at the blast furnaces and steel plants of the Ural (on the basis of the ore of the Kachkanar deposit) similar products are planned to obtain in four stages [9]: division of titanomagnetite concentrate into magnetite and ilmenite ones + blast-furnace smelting (production of cast iron and vanadium slag) + smelting of ilmenite concentrate (production of cast iron and titanium slag) + steel making. Besides in the Ural, electricity and fuel are much more expensive as compared with Irkutsk oblast. Therefore, fixation of the Russian ferrous metallurgy and titanium magnesium industries on Ural and Kuznetsk plants puts brakes on the development of the country. Development of metallurgy only in the Urals and Kuzbas now is a dead lock. This is the same as if the development of the country in the 1930s relied only on the resources of the European part of Russia – a dead end version of development, as wrote N.N. Kolosovsky [5].

5. Conclusion

Neither of New Angarstroy facilities will be located in the area of Baikal lake [12]. The lake cannot also be an object of traditional mass tourism. Baikal lake contains 40% of world reserves (ocean) of clean fresh water, has a unique ecosystem. It is known for its natural beauty. For this reason, it is called the Sacred Lake. It has to develop as a Lake-Temple rather than as an object of economic profit. A large share of hydro-energetic rent produced by The Angara river and Baikal lake has to become a source of its development [11, 13]. Facilities located near Baikal Lake have to meet strict ecological and architectural requirements and blend into the natural, cultural and religious landscape of the lake and its future temple system of traditional in region religions. This will turn the New Angarstroy into a source of not only industrial but also spiritual development of Russia.

References

1. The 18th Chinese Communist Party Congress. The Chinese dream and the world / Ed. by Khuan Khuaguan and Luan Tsyanchzhan. Pekin, 2013, 432 p.

2. Baranskiy N.N. Development of the Soviet Economic Geography. Moscow: Mysl, 1980. 287 p.

3. Bezrukov L.A. Continental oceanic dichotomy in international and regional development. Novosibirsk: Geo, 2008. 369 p.

4. Ishmuratov B.M. Regional systems of productive forces. Novosibirsk: Science, 1979, 238 p.

5. Kolosovskiy N.N. Territorial organization of production forces of Siberia. Novosibirks: Nauka, 1971. 176 p.

6. Kolosovskiy N.N. Theory of economic zoning. Moscow: Mysl, 1969. 336 p.

7. Korkyshko G.S., Babun R.V. Management of metallurgy in the Chiney deposit // Mining facilities of Siberia and their mineral raw material base. Novosibirsk, 1990. Vol. 2. P. 71–76.

8. Lenin V.I. Complete collection of works. Vol. 1-55. Moscow: Politizdat, 1967–1975.

9. Manzor D.E., Tleugabulov B.S. Development of complex vanadium containing titanomagnetite processing technologies // Juvenis scientia. – Vol. 1 – 2016. – P. 13–15.

10. Marx K., Engels F. Works. Vol. 1–39. Moscow: Politizdat, 1955–1966.

11. Nikolskiy A.F. Theory of sustainable development and issues of global and national security (fundamentals of the modern socialism theory). Irkutsk: Sibirskaya kniga, 2012. 358 p.

12. Nikolskiy A.F. New Angarstroy as a key project of future industrialization in Russia // Geography and natural resources. Vol 4. – 2017. P. 143–153.

13. Nikolskiy A.F. Assessment of the conditional cost of «Irkutskenergo» company by the volume of hudroenergetic rent // ECO. Vol. 6, 2017. P. 115–120.

14. Nikolsky A.F. 21st Century Pendulum: the organization of the largest metallurgical production based on ores of the Chinei and Malotagul deposits / A.F. Nikolsky, A.F. Shupletsov // Bulletin of the Baikal State University. – 2018. – T. 28, No. 1. – C. 44–55.

15. Razaz Y., Opryshko I.A., Loboda P.I. Analysis of direct metal oxide reduction using furnaces with revolving hearths // Bulletin of the National Technical University of Ukraine. Kiev Polytechnic Institute, 2001. P. 184–192.

16. Khokhlov A.V. Reference materials on world economy geography – 2015 (Issue 1). – Electronic resource // https://www/vlant-consult.ru.

17. Khrenov P.M., Kuzmin I.Y., Aleksandrov A.L. The role of mineral resources in development of the Eastern Siberian economy // Mining facilties of Siberia and their mineral raw materials base. Novosibirsk, 1990. Vol. 1. P. 56–65.

公私合作伙伴关系：加强上合组织国家经济合作的前瞻性工具
PUBLIC-PRIVATE PARTNERSHIP: A PROSPECTIVE TOOL TO ENHANCE THE SCO COUNTRIES' ECONOMIC COOPERATION

Oleg V. Ivanov
Doctor of Economics
Professor of the Department
of economic policy and public-private partnership
of MGIMO University

抽象。上合组织国家经济发展面临的主要问题之一是其基础设施条件。为了克服这个问题，该组织的许多国家采用了公认的公私伙伴关系（PPP）世界惯例机制。中国，印度，俄罗斯，哈萨克斯坦已经积累了两种方法经验（PPP公共治理，公共支持系统等）以及PPP实施基础设施项目实际使用经验。

上合组织国家的PPP发展仍然主要基于“纵向”模式，将国家和企业的努力结合在国家框架内。转向“横向”PPP，即赋予其超国家多边性，可能对上海合作组织国家不仅在国家基础设施发展方面，而且在扩大相互经济合作领域，结合实施有益的努力方面都有用。跨国基础设施项目，以及在实现联合国可持续发展目标方面的合作。

关键词：基础设施差距，公私伙伴关系，跨国基础设施项目，可持续发展，区域连通性。

Abstract. *One of the key problems faced by the SCO countries in their economic development is condition of their infrastructure. To overcome this problem, many countries of the organization adopt a well-proven in world practices mechanism of public-private partnership (PPP). China, India, Russia, Kazakhstan have already accumulated both methodological experience (PPP public governance, system of public support, etc.) and experience in practical use of PPP mechanisms for the implementation of infrastructure projects.*

PPP development in the SCO countries is still based mainly on the "vertical" model, combining efforts of the state and business within the national framework. Moving to "horizontal" PPP, i.e. giving it a supranational, multilateral character could be useful for the SCO countries not only in terms of national infrastructure development, but also in terms of expanding the field of mutual economic cooperation, combining efforts in implementation of beneficial transnational infrastructure projects, as well as cooperation in achieving the UN sustainable development Goals.

Keywords*: infrastructure gaps, public-private partnership, transnational infrastructure projects, sustainable development, regional connectivity.*

One of the world economy's specifics are the so-called infrastructure gaps, which refer to the mismatch between the required and actual levels of infrastructure provision. McKinsey Global Institute estimates global financial needs for infrastructure development at 57 trillion dollars (1). Calculations of Oxford Economics show that even under the most favorable development scenarios until 2040 it will not be possible to fill the gap created by the chronic shortage of infrastructure investments (2).

The problem of infrastructure is quite acute today in the SCO countries too. According to authoritative international experts, the condition of infrastructure in the major sectors is estimated to be no more than "medium" and "lower-medium" (see table 1).

Table 1. *Quality of infrastructure in SCO countries*

Country	Quality of overall infrastructure Rank/137	Quality of roads (Score 1-7)	Quality of railroad infrastructure (1-7)	Quality of air transport infrastructure (1-7)	Quality of electricity supply (1-7)
China	47	4.6	4.8	4.9	5.0
Kazakhstan	68	2.9	4,1	4,0	4,6
Kyrgyz Republic	109	2.7	2,4	3,1	3,6
Russia	35	2.9	4,5	4,6	5,1
Tajikistan	99	4.1	3.7	4.3	3.7
Uzbekistan	No data available				
India	46	4.3	4.4	4.6	4.7
Pakistan	82	3.9	3.3	4.0	2.9

Source: compiled on the basis of World Economic Forum (2017). The Global Competitiveness Report 2017–2018.

Public-private partnership (PPP) has proved to be an effective tool to help solve infrastructure problems in the world practice. Under PPP mechanism the state involves a private partner in financing, construction, operation, maintenance, reconstruction and modernization of public infrastructure facilities on the terms of long-term cooperation, risk-sharing and responsibility.

PPP is beneficial to all parties involved in it. It gives the state the opportunity to provide better quality of service, to complete projects on time and within budget, to access improved technology and innovation, to ensure the proper allocation of risk, optimization of resources and greater service coverage for users, to promote lower tariffs for users, to achieve clear separation between regulation and operations and to increase foreign investment in the economy (3).

The private sector considers it beneficial to participate in PPP, given the expansion of business opportunities and access to new, previously inaccessible market segments. Attractive for business are the long-term of PPP and the possibility of acquiring an "anchor client" (i.e. the state), providing the amount of work for the long term not to say about direct public support and state participation, which reduce the risks for the private entrepreneur (4).

Since the early 2000s, there has been a "PPP boom" in the Asia-Pacific region, which continues to this day. In a relatively short time, PPP has become firmly embedded in the economic policies and practices of the Asia-Pacific countries and has become an effective tool for infrastructure development. Launched projects are numbered in tens of thousands, billions of dollars have been invested and the results of the partnership have visual embodiment in transport infrastructure, energy, utilities, telecommunications, public administration, health, education and culture. The Asia Pacific region has one of the lowest rates of failed PPP projects or projects that are in a state of temporary difficulties. It is also quite remarkable that PPP is increasingly becoming a means of international cooperation in the region, combining the efforts of the Asia Pacific countries in implementation of multilateral projects, deepening integration processes and strengthening regional connectivity. Multilateral regional institutions are deeply involved in PPP infrastructure and provide technical and financial assistance. These include, first of all, the UN Economic and Social Commission for Asia and the Pacific (ESCAP), Asia-Pacific economic cooperation forum (APEC) and Asian development Bank (ADB) (5)

Many SCO countries are familiar with PPP and widely and actively use it in the interests of their infrastructure development and economic modernization.

China today is one of the most active advocates of PPP in the Asia-Pacific region. As of the end of 2018, China was in the process of implementing a 4691 PPP project with an investment of $ 1 trillion (6, p.18). International experts highly appreciate efforts made in recent years in China to strengthen regulatory framework of PPP and the build a more coherent system of PPP public administration. There is improvement in coordination of work of state and local bodies, specialized PPP units started functioning bodies of the PPP. All this reduces legal uncertainty and risks for investors. (7, p.28)

Over the past decade, PPP has become an effective tool to attract private investment in the once chronically underdeveloped infrastructure of *India*. System energetic efforts for the use of PPP mechanisms have enabled India to achieve great success – according to estimates of the Economist Intelligence Unit, India has become the first developing economy to join the group of"PPP-mature" countries in the Asia-Pacific region (7, p.30). PPP projects are implemented in a wide range of industries – from the construction of roads and Railways, ports, airports, energy, water supply and sanitation, irrigation and utilities to the social sphere and information and communication technologies. Currently, the total portfolio of PPP projects in the national database includes 1877 projects (7).

The effective system of public support plays a significant role in supporting PPP and facilitating implementation of PPP projects in India. Specialized PPP support financial such as Viability Gap Funding (VGF), India Infrastructure Project Development Fund (IIPDF), India Infrastructure Finance Company Limited, IIFCL) received high appraisal of international experts (8).

Public-private partnership attracts increasing interest in the post-Soviet space, especially in *Russia, Kazakhstan, Kyrgyzstan.* These countries see PPP as an effective tool for infrastructure development, solving many socio-economic problems, promoting sustainable economic growth, improving living standards of the population. All of them significantly strengthened PPP regulatory framework, adopted PPP laws, developed long-term programs of PPP development (9).

Russia and Kazakhstan have accumulated quite an experience in practical implementation of PPP projects in various sectors. In general, more than 3400 PPP projects with a total volume of private investment of 2,2 trillion rubles are being implemented in Russia, and 473 projects worth 90 billion rubles – in Kazakhstan (5).

Recently, there has been a growing interest in PPP in Uzbekistan too (10).

At the same time, it is impossible not to see that today the level of PPP development in the SCO countries differs significantly. The SCO countries have started using PPP mechanisms at different times, on different scales and with different legal and institutional frameworks. India and China are significantly ahead of other countries by degree of maturity of PPP institutional environment. Russia and Kazakhstan have advanced in PPP development in recent years and moved from "emerging" stage to "formation and establishment". Some countries that started to develop PPP later (Kyrgyzstan) are trying to force the formation of its legal framework and institutional framework. Some (Tajikistan) are at the very beginning of the road and are only taking the first steps.

Nevertheless, it seems that public-private partnership could become an effective tool for enhancement of economic cooperation of the SCO countries, primarily in the field of infrastructure. There are a number of objective prerequisites for this, including: substantial interest in PPP in almost all SCO countries, rich experiences of many countries in this field, common aspiration and political will for multilateral cooperation in implementation of major transnational infrastructure projects, primarily in the field of transport, availability of a rich methodological database related to PPP, developed by international institutions and forums, in which majority of SCO member countries participate, availability of a number of powerful financial institutions, which could assist implementation of joint infrastructure projects (Asian Infrastructure Investment Bank – AIIB, New BRICs Development Bank, Asian Development Bank).

The interconnection of PPP with achievement of the Sustainable Development Goals also should not be underestimated in the context of PPP cooperation between SCO countries. Adoption in 2015 of the UN "Agenda for sustainable development to 2030" ("Agenda 2030") marked the transition to a new paradigm of financing development in which the PPP aims to play an important role as a tool of mobilization of knowledge, technology, know-how and financial resources with the aim of creating and developing sustainable energy, infrastructure, transport and information and communication technologies (11).

Some SCO countries have already started practical activities in this direction. In particular, in 2017 China and ESCAP signed an agreement on strengthening public-private partnership (PPP) in the Asia-Pacific region, with a view to focusing on improving access to infrastructure services in the field of water, energy and transport. Considering that China has become the largest PPP market in the region, the partnership of ESCAP and the PPP Center of China could help the SCO countries to expand the exchange of PP best practices, to facilitate the choice of PPP models for creating infrastructure networks and ultimately to promote regional connectivity in the framework of the UN Agenda for sustainable development until 2030 and in the context of the SCO activities (12).

We believe that the movement of the SCO countries towards establishment of PPP cooperation could have the following vector: formation (jointly with the SCO Business Council) of a PPP expert group consisting of representatives of government and business - initiation of discussion platforms - exchange of information on PPP development at the national level to disseminate best practices, facilitate training of personnel in the public sector and improve methodical work - developing the "road map" of PPP cooperation - drafting the list of PPP pilot projects that have the maximum effect for mutual economic cooperation.

Contemplating on joint pilot projects could possibly rely on elaboration of the "Silk road Economic belt" initiative of China. Although a clear route of the Silk road has not yet been developed, according to preliminary data, the project is based on the construction of three transport corridors which will connect the Eastern provinces of China with most SCO countries (13,14).

Given the interest shown by the majority of SCO countries in PPP as an instrument for development of infrastructure and modernization of economy, and taking into consideration both methodological developments and practical experience of implementing infrastructure projects on PPP existing in many of the countries, as well as the desire and readiness to deepen economic cooperation declared in the statutory documents of the organization, PPP could become another promising area of economic cooperation between the SCO countries and an effective tool for implementation of transnational infrastructure projects of mutual interest.

References

1. McKinsey Global Institute (2013). How to save $ 1 trillion a year.

2. Oxford Economics (2017). Global Infrastructure Outlook.

3. APEC, USAID (2017). Public-Private Partnerships for Transportation in the APEC Region. An Analysis and Literature Review. January 2017.

4. Ivanov, O. (2016). Theory and world practice of public-private partnership. Moscow, MGIMO-University.

5. Public-Private Partnership in Asia-Pacific countries. Moscow, MGIMO_ University, 2019

5. National PPP Center (2019). Analytical review. Simply and honestly about investments in infrastructure and PPP in Russia. ROSINFRA. PPP Development Center. URL: http://pppcenter.ru/assets/files/obzor240419.pdf. (Accessed 24 August 2019).

6. Economist Intelligence Unit (2015). Evaluating the environment for public-private partnerships in Asia-Pacific. The 2014 Infrascope.

7. Government of India. Department of Economic Affairs Ministry of Finance (2017). List of Infrastructure Projects). URL: https://www.pppinindia.gov.in/infrastructureindia/project-list?id=1&searchType=Government%20Infrastructure%20Projects%20(PPP) (Accessed 24 August 2019).

8. Government of India. Ministry of Finance Department of Economic Affairs (2013). Scheme and Guidelines for Financial Support to Public Private Partnerships.

9. Ivanov O. et al. Public-private partnership in the countries of the Eurasian Economic Union // CENTRAL ASIA AND THE CAUCASUS. English Edition, Volume 20, Issue 2 2019. Pp. 33-47

10. Akobirov S. PPP development in Uzbekistan. URL: http://www.lib.knigi-x.ru/23ekonomika/645499-1-so-akobirov-sardor-odilovich-akobirov-aspirant-kafedri-ekonomicheskoy-teorii-ekonom.php (Accessed 24 August 2019).

11. Transforming our world: the 2030 Agenda for Sustainable Development. https://documentsddsny.un.org/doc/UNDOC/GEN/N15/285/75/PDF/N1528575.pdf?OpenElement. (United Nations, 2015). (Accessed 24 August 2019).

12. Eurasia Review, November 1, 2017

13. 习近平提战略构想：″一带一路″打开″筑梦空间″. 人民网. 2014年08月11日 *(XI Jinping: "One belt and one road" will open new horizons of dreams URL:http://politics.people.com.cn/n/2014/0811/c1001-25439028.html*

14. 习近平″一带一路″构想战略意义深远 *(XI Jinping: "One belt and one road" is of great strategic importance) URL: http://news.cri.cn/gb/42071/2014/10/10/882s4720906.html*

关于社会文化发展的俄罗斯法哲学（V.M. Khvostov）
RUSSIAN PHILOSOPHY OF LAW ABOUT THE CULTURAL DEVELOPMENT OF SOCIETY (V.M. KHVOSTOV)

Frolova Elizaveta Alexandrovna
Doctor of Juridical Sciences, Full Professor
Lomonosov Moscow State University

抽象。 本文从V. Khvostova的立场出发，讨论了法律规范和道德方向的问题。 展示了俄罗斯律师法律哲学中伦理的性质，内容和物种特征。
关键词：法理学，俄罗斯法哲学，新康德主义，伦理学。

Abstract*. The article discusses the problems of the normative and ethical direction in law, presented from the position of V. Khvostova. The nature, content and species characteristics of ethics in the philosophy of law of a Russian lawyer are shown.*
Keywords*: jurisprudence, Russian philosophy of law, neo-Kantianism, ethics.*

At the turn of the XIX-XX centuries, Russian philosophers, jurists, historians deeply studied the prospects for the development of our state. A great contribution to the philosophy of law of this time was made by the famous Russian lawyer, philosopher and sociologist of law Veniamin Mikhailovich Khvostov (1868 - 1920), who was involved in ethical research. Justifying the dignity of man, a domestic lawyer studied and creatively developed the philosophy of I. Kant. Khvostov understood ethics as part of a philosophy that explores issues related to human behavior. Man, as a thinking creature, consciously sets himself tasks and strives to achieve them. Since goals have different meanings, the question arises of preferences and choices in the target activity of a person - at the same time, a person is not able to achieve all the goals set. The principles of this choice form, according to the Russian lawyer, the main subject of ethics[1].

V.M. Khvostov is a prominent representative of the normative and ethical direction in the philosophy of law. Along with P.I. Novgorodtsev, deeply exploring this issue, he emphasized the transitional period in the cultural development of contemporary society. However, while Novgorodtsev noted a crisis of legal consciousness[2], then Khvostov, focusing on the ethical component of the era, spoke of

[1]Khvostov V.M. Essay on the history of ethical teachings: Lecture course. - Moscow, 2016. P.1.

[2]See: Novgorodtsev P.I. Introduction to the philosophy of law. The crisis of modern justice. - Moscow, 1996. Assessments of the philosophy of law I. A. Ilyin, P. I. Novgorodtsev, B.A. Kistyakovsky

a moral crisis. The main theme of his philosophy of law is the features of ethics as a science in the transitional state of society. “Fermentation is going on in all areas of public life, everywhere the old has come to grips with the new, the old dogmas have been shaken, and the new ones have not yet formed and strengthened. “Our time,” he writes, “can rightfully be recognized as a transitional era, - an era when all the foundations of knowledge and faith, personal behavior and social order are subject to revision and reappraisal”[3]. As for the field of morality, as Khvostov argued, the dispute between the old and the new goes between doctrines based on external authority and theories that uphold free autonomous morality. There are no ready-made decisions in the field of moral philosophy, but the topic of behavior and its assessments in transitional times is of particular interest. Noting the well-known conservatism of the psyche of people (a steady desire to go the beaten path, to be guided in their behavior by tradition), the lawyer drew attention to the fact that a person - a “thinking creature” - is able to develop his consciousness regardless of external conditions. The existing social form sooner or later ceases to satisfy everyone, in the usual norms of social behavior, a search begins for the causes of discontent, questions are posed to evaluate these norms for their justice, rationality, and compliance with the current state of affairs in society. Moreover, it is important that once started, the process of critical analysis does not stop, even if reformers, as a rule, become victims of their struggle against tradition (Socrates) - criticism never passes without a trace: “The reformer himself can die, but this does not mean that along with him, his doctrine also perishes. True ideas sooner or later make their way into the masses, take hold of them and, in the end, triumph over a stubborn tradition”[4]. It is precisely in such epochs, Khvostov believed, that the science of ethics appears - when the habitual foundations of the life of society begin to cause bewilderment, discontent, and therefore doubt in its necessity, criticism and analysis of earlier traditional norms of behavior. In this way the cultural development of Europe followed. Ethical scientific thought arose in ancient Greece (Socrates and sophists) in the face of the need to revise social traditions. A similar process of “revaluation of all values” takes place, according to Khvostov, in Europe at the beginning of the 20th century and, especially, in Russia, where there has been no replacement to the old pre-reform order since the abolition of serfdom. The restructuring of public life, according to Khvostov, should change

see, for example: Zhukov V.N. I.A. Ilyin on the state, law and politics // Education and Law. - 2018. - No. 10. P. 256-260; P.I. Novgorodtsev: a conservative liberal and religious philosopher of law // Bulletin of the University named after O.E. Kutafina. - 2018. - No. 4, p. 65-73; Frolova E.A. B.A. Kistyakovsky as a methodologist, philosopher and sociologist of law // State and Law. - 2019. - No. 3. P. 149-158; Frolova E.A. Ideas of a social and legal state in the philosophy of law Novgorodtseva // State and Law. - No. 7. P. 57-65; Frolova E.A. P.I. Novgorodtsev as a philosopher of the theory of natural law // Bulletin of the University named after O.E. Kutafin. - 2018.- No. 4 (44). P. 57-64.

[3]Khvostov V.M. Essay on the history of ethical teachings: Lecture course. - Moscow, 2016. P.2.

[4]Khvostov V.M. Essay on the history of ethical teachings: Lecture course. - Moscow, 2016. P.6.

not only the external forms of the public, but also the whole system of moral worldview. This process is incomplete, hence the instability and uncertainty of ethical thought that distinguishes the Russian person, especially the intellectual. Outstanding Russian jurists wrote about this: P.I. Novgorodtsev, B.A. Kistyakovsky, I.A. Ilyin, noting the crisis state of legal consciousness of our society at the beginning of the 20th century. Khvostov argued that the study of morality was an important distinguishing feature of a thinking person at all times. He reasoned like Rousseau, believing that, of course, a person can be deeply moral and without an analysis of moral principles, but such morality will be less perfect.

The next stage in the scientific study of moral matter are the problems of methodology. In this area, two directions are manifested: a priori and empirical. A priori, according to Khvostov, see in moral law an undeniable fact; therefore, the task of ethics for them comes down to elucidating the logical formulas of debt maintenance. The concepts of duty and good, as well as the concepts of justice and truth, receive from them the character of timeless values freed from any psychological elements. Ethics for representatives of a priori is considered a science of due, which, like logic, exploring the norms of human thinking, studies the norms of behavior, teaches us how a person should act, if he wants to follow the requirements of duty, to go in the direction of good. The content of moral duty they represent as something originally given and unchanging. Absolute duty serves absolute good. Empiricists, the Russian lawyer considered, do not consider it necessary to single out the research method as an independent method for this science; the subject of ethics — the norms of behavior — does not distinguish it from other experimental sciences. Even paying attention to the special nature of the science of the spirit, which includes ethics, they describe another type of causality (not mechanical) that takes place in ethics - mental causation. Empiricists reduce the task of a researcher in the field of ethics to clarify the issue of what caused the emergence of norms governing human behavior. Based on these studies, they touch upon the more general question of the guiding principles that characterize various manifestations of moral consciousness. Stressing the variability of moral precepts for different eras, peoples, personalities, representatives of this direction insist on their relative and transient nature[5].

In this theoretical debate, Khvostov takes a middle position, noting the partial correctness of both of them. He is sure of the main thing - the need for a clear distinction between two areas: exact knowledge, proved by facts, on the one hand, and the field of wishes and beliefs, on the other hand, i.e. between science and metaphysics. As for ethical issues, the Russian lawyer argued, they can be approached both from the scientific side and from the side of metaphysics and religion, moreover, these points of view, in his opinion, should mutually complement each other. Khvostov argued that by posing an ethical problem, we seek not only to explain the existing moral standards, but also to answer the question of whether we should adhere to these standards in the

[5]Khvostov V.M. Essay on the history of ethical teachings: Lecture course. - Moscow, 2016. P.9-12.

future, what is the content of morality. The posing of these questions is a way beyond empirical knowledge to the field of assumptions and beliefs. It is in the field of metaphysics and religion that questions are raised about absolute values, the meaning of the universe, the purpose of man in the world process. These judgments of the Russian lawyer are not in doubt. As for his assumptions about the duality of ethical issues, perhaps this character of morality was due to his professional approach - Khvostov, first of all, a sociologist of law, striving to show the evolutionary moment in all social phenomena, which was not the primary task of philosophical reflection for representatives of the moral philosophy of law. Khvostov attributed ethics to the normative sciences. However, as was shown, he not only did not exclude, but also considered necessary a causal study of the phenomena of moral life. In general, the Russian lawyer, in substantiating his position, did not give a moral sermon, was not a doctrinaire of ethics at all, but sought to argue all his judgments, backed up with rich factual material. He repeatedly noted that for all the complexity and controversy of ethical problems, there are no final, and especially the only right decisions in the field of moral philosophy - in the humanities we can only talk about relative truths.

References

1. Zhukov V.N. I.A. Ilyin on the state, law and politics // Education and Law. - 2018. - № 10. P. 256 -260.

2. Zhukov V.N. P.I. Novgorodtsev: a conservative liberal and religious philosopher of law // Bulletin of the University named after O.E. Kutafin, - 2018. - № 4. P. 65-73.

3. Kistyakovsky B.A. Philosophy and sociology of law. - SPb., 1998.

4. Novgorodtsev P.I. Introduction to the philosophy of law. The crisis of modern justice. - Moscow, 1996.

5. Frolova E.A. B.A. Kistyakovsky as a methodologist, philosopher and sociologist of law // State and Law. - 2019. - № 3. P. 149-158.

6. Frolova E.A. Ideas of a social and legal state in the philosophy of law Novgorodtseva // State and Law. - 2018. - № 7. P. 57-65.

7. Frolova E.A. P.I. Novgorodtsev as a philosopher of the theory of natural law // Bulletin of the University named after O.E. Kutafin. - 2018. № 4 (44). P.57-64.

8. Khvostov V.M. General Theory of Law: An Elementary Essay. - Moscow, 2011.

9. Khvostov V.M. Essay on the history of ethical teachings: Lecture course. - Moscow, 2016.

10.Khvostov V.M. Ethics of Human Dignity: A Critique of Pessimism and Optimism. - Moscow, 2016.

优化高等学校非技术概况的数学成分内容

OPTIMIZATION OF THE CONTENT OF THE MATHEMATICAL COMPONENT OF THE HIGHER SCHOOL OF NON-TECHNICAL PROFILE

Poladova Valentina Viktorovna
Candidate of Pedagogical Sciences, Associate Professor
Moscow innovation University
Nikitina Tat'yana Sergeevna
Teacher of the natural science cycle
Moscow state educational complex

抽象。 本文致力于寻求优化非技术概况大学数学成分的内容。 对这方面的科学和教学文献进行了分析，提出了解决这一问题的若干规定。

关键词：高等学校，非技术概况，数学成分的内容。

Abstract. *the article is devoted to the search for optimization of the content of the mathematical component of the University of non-technical profile. The analysis of scientific and pedagogical literature in this direction is made, a number of provisions of the solution of this problem is offered.*

Keywords: *higher school, non-technical profile, the content of the mathematical component.*

The complex and contradictory changes in social reality that have taken place in our country in recent years have had a serious impact on all institutions of society, and, above all, on education, and have required a rethinking of the quality of professional training, including its mathematical component. The problem of determining the content of mathematical training of graduates of higher school of non-technical profile is still acute in the pedagogical literature.

Realizing the complexity of the task, G. D. Glazer writes: "the content and methods of mathematical education of humanitarians represent a Special and not yet fully resolved problem" [2]. According to Zholkov S. Yu.: "the Creation of a course of mathematics for a particular specialty is equivalent to directed selection in accordance with the peculiarities of this specialty and finding a balance between the volume of declared statements and the depth of their justification – a technique, in this case, mathematical" [3]. According to L. D. Kudryavtseva – the General purpose of the content of all mathematical courses should be to acquire graduates of a certain course of knowledge in this discipline, the ability to use the studied math-

ematical methods in the development of mathematical intuition, in the education of mathematical culture. Graduates should know the basics of mathematical apparatus necessary for solving theoretical and practical problems of their professional activity, develop logical thinking and be able to translate the problem from professional content into mathematical language. The common goal of all mathematical courses is to teach what is needed and what is difficult to learn [4]. Novikov A. Moscownotes that in the development of the content the authors seek to reflect in it the scientific (social) knowledge in the most modern and best systematized form – in terms of the structure of the scientific knowledge, and not in terms of possible development of his students, and most importantly, not in terms of the need for their further activities [5].

Trying to solve the urgent problem of determining the content of mathematical training of non-technical sphere, a number of modern teachers-innovators offer their scientific vision of the task. Consider them in detail:

Author / Scientific concept

- **Verbitsky A.A.** [1].

Substantiates the contextual approach to the choice of the content of higher education. Context – a system of internal and external factors and conditions of human behavior and activity that affect the perception, understanding and transformation of a particular situation, determining the meaning and significance of this situation as a whole and its components. In particular, mathematical material is presented as "text in context". Mathematical information is presented in a non-mathematical context using psychological comments, reflections, aphorisms, historical and cultural material, texts from the "author", game situations, etc. So the student has the opportunity to learn mathematical concepts in a broader worldview. The author identifies the following contexts: socio-cultural context (the whole aggregate socio-historical experience of mankind); the context of scientific knowledge (scientific knowledge – part of the socio-cultural experience accumulated by mankind and presented in a systematic way in a variety of Sciences); the context of the subject (the subject acts in a symbolic form of theoretical material and practical tasks for students); didactic context (organized and technologically designed interaction of subjects of the educational process, in which the unfolding of the content of the subject); the context of the personal significance of the content of education (a set of needs, desires, motives of the student). The content of the subject should be determined primarily from the following aspects: a differentiated approach, individualization of training, educating the potential of the subject, the professional orientation of the subject.

- **Rozanova S.A.** [6].

He believes that special attention should be paid to the development of teaching General mathematical and natural Sciences to students studying in the field of humanitarian and socio-economic orientation. For them it is necessary to introduce requirements of ability to apply mathematical methods, mathematical models in the corresponding professional activity; to enter into programs of special subjects of the

state standards sections with use of the corresponding mathematical methods.

- **Tests V.A.** [7].

Determination of the content of mathematical training should be based on the allocation of the content of the subject sources, the main rods. Such rods in mathematics are mathematical structures. They act as the basis for the strategy of selecting the content of mathematics training. Under the mathematical structure refers to a set of stable relationships that ensure the integrity of the mathematical object (mathematical system, mathematical model). These connections can be set in different ways: axiomatically, constructively, descriptively, in the form of visual images. Of all mathematical structures, the most important are logical, algorithmic, combinatorial, figurative-geometric and stochastic. In the process of learning mathematical structures are changing. There are three possible options: building structures (adding new knowledge to existing memory schemes); creating structures (creating new structures); adjusting structures (fine-tuning knowledge to the task); restructuring structures (the previously formed structure becomes a substructure of a wider structure). The content of mathematics should be based on the following principles: the principle of generalization of knowledge (the learning process should begin with the study of the initial or basic structures); the principle of interconnection of knowledge (involves the study of the object on the basis of its integrity); the principle of scientific (the content of education should be strictly scientific); the principle of regularity and consistency (knowledge, skills, skills should be formed in a certain, logically sound order); the principle of practical orientation (the relationship of learning with life).

- **Turkish V.Y.** [8].

The content of mathematics in the University of Humanities should be represented by five main parts: the foundations of mathematics; basics of algebra and analytical geometry; fundamentals of mathematical analysis; fundamentals of probability theory; elements of mathematical statistics. The course of mathematics should be built on the principle of the pyramid: applied mathematical methods can not be mastered without knowledge of mathematical statistics. Statistics are based on probability theory. Probability theory contains the results of mathematical analysis, the basics of which are the fundamental concepts of the set and function. Algebraic and geometric representations are an integral part of the General mathematical culture, so without them it is impossible to imagine a coherent mathematical course. The study of mathematics should be continued at the senior courses of the University by studying specific mathematical methods in specific areas of non-technical knowledge.

Of course, the scientific works of A.A. Verbitsky, S.A. Rozanova, V.A. Testov, V.Y. Turkish are of great importance, but do not solve the whole problem: determining the content of mathematical training of specialists in the social sphere.

The author's vision of the solution of this problem is based on the following main provisions:

– Mathematics course for graduates of non-technical sphere remains an inte-

gral part of fundamental classical mathematics;

– The content of mathematics should be determined by the latest generation of GEF-s as the basic legal documents that determine the requirements for the level of training of future specialists; the list of special disciplines that use the mathematical apparatus; professional tasks of professional activity of specialists that require the use of mathematical applied technologies;

– Mathematics should serve as the basis for postgraduate education of graduates in graduate, postgraduate and doctoral studies;

– Mathematical training of specialists in non-technical sphere should correspond to the level of development of modern science.

These provisions and developments that currently exist in science only partially cover the problem of determining the content of mathematical training of specialists in social and humanitarian spheres in the University. Therefore, the solution of the problem remains one of the promising areas of modern pedagogical science.

References

1. Verbitsky, A.A. Contexts of the content of education [Text]: monograph / A.A. Verbitsky. – Moscow: Alpha, 2003. – 80 p.

2. Glazer, G.D. Mathematics: textbook on history, methodology, didactics [Text]: textbook for students of Humanities / G.D. Glazer. – Moscow : Publishing house of Urao, 2001. – 382 p. – P. 5.

3. Zholkov, S.Y. Mathematics and computer science for the Humanities [Text]: textbook for students of humanitarian specialties and directions of higher education institutions / S.Y. Zholkov. – Moscow: Gardariki, 2002. – 531 p. – P. 518.

4. Kudryavtsev, L.D. Modern mathematics and its teaching [Text]: studies. allowance for Mat. spets. universities; with a Foreword. P.S. Alexandrova / L.D. Kudryavtsev. – 2nd ed., DOP. – M.: Science, 1985. – 170 p.

5. Novikov, A.MoscowProcess and the methods of formation of labour skills [Text] // Profpatologii. – Moscow: Higher. SHK., 1986. – 288 p.

6. Rozanova, S.A. Tenth Symposium: Qualimetry in education – methodology and practice (Moscow, 4-5 April 2002). Evaluation of the quality of fundamental mathematical and natural science education in higher educational institutions of various profiles [Text] / S.A. Rozanova, V.S. Senashenko, P.R. Senatorova. – M., 2002. – 41 p.

7. Tests, V.A. Strategy of learning mathematics [Text] / V.A. Tests. – Moscow: Technological. business school, 1999. – 303 p.

8. Turkish, V.Y. Mathematics and Informatics [Text] / V.Y. Turkish. – Moscow: Infra-M, 2002. – 560 p

教学生整合
中学有机化学研究的知识和技能

TEACHING STUDENTS THE INTEGRATION OF KNOWLEDGE AND SKILLS IN THE STUDY OF ORGANIC CHEMISTRY IN SECONDARY SCHOOL

Kolesnikova Tatyana Anatolievna
Candidate of Pedagogic Sciences, Leading Research Officer
Institute for the Development of Education (Institute "Platform")
Astrakhan, Russia
Zueva Marina Veniaminovna
Undergraduate
Astrakhan State University
chemistry teacher
"Secondary school No. 35", Astrakhan, Russia
Matveeva Elvira Faridovna
Candidate of Pedagogic Sciences, Associate Professor
Astrakhan State University
Astrakhan, Russia

注解。 本文考虑了创造和利用情境在学习有机化学过程中整合学生的知识和技能的问题。 考虑应用基于教育材料的示意图和标志性模型的学习技术的可能性，进行中小学化学课程教材的分析。

关键词：整合，主体间通信，学习技术，技能，有机化学。

Annotation*. The article considers the problem of creating and using situations to integrate students' knowledge and skills in the course of studying organic chemistry. The possibility of applying the learning technology based on schematic and iconic models of educational material is considered, the analysis of educational material at the chemistry course of primary and secondary schools is carried out.*

Keywords*: integration, intersubject communications, learning technology, skills, organic chemistry.*

There are many publications on the need to use the integration of students' knowledge as a unique phenomenon in the educational system during the study of specific disciplines. And the older the educational school, the more effectively

the integrative approach to the process of mastering a particular discipline is implemented. As previously noted, integrated lessons are aimed at studying the unity of processes occurring in both animate and inanimate nature, and the interdependence of various sciences. Chemistry and physics are united by a system of concepts about matter and its structure, about energy. Chemistry, biology and physics are united by a system of concepts about matter, forms of its movement and levels of organization [5, p. 71]. Thus, integrated lessons are the most important factor in developmental and educational training. This is a joint work of many teachers. The first stage of this work is the analysis and coordination of training programs in chemistry, biology, physics, geography, discussion and formulation of general concepts. Then, for each subject, a network diagram is compiled, where the class, subject, topic are indicated horizontally, and months, weeks, hours are shown vertically. You can also highlight generalizing lessons, practical work, forms and time of knowledge control. An important point is the selection and study of the features of the technology of teaching students the same processes, phenomena, laws, theories in chemistry, biology, physics, geography, etc. Practice shows that you can pre-determine the topic of integrated lessons.

The purpose of our research is to study the problem of creating and using situations for the integration of students 'knowledge and skills in the course of studying organic chemistry from the perspective of concomitant monitoring of awareness of students' perception and assimilation of knowledge on the course of organic chemistry.

The modern theory of the structure of organic substances is studied as a synthesis of the theory of structure of A.M. Butlerov, electronic theory and stereochemistry. There is a development of ideas about the structure of the atom and chemical bonds in the course of organic chemistry, as well as the identification of a causal relationship composition → structure → properties → the use of substances. We believe that the integration of subjects is possible if the objects of study are the same or close enough; the same methods of cognition are used; if all conditions have been created so that students independently come to the idea of integration, realize the commonality and features of living and non-living macrobodies, the universality of many physical and chemical theories and laws. As previously noted, when developing a system of student research, it is necessary to integrate various areas of theoretical knowledge and practical human activity, for example, the field of scientific knowledge of chemistry: the relationship of thermodynamics, kinetics and ecosystems [4; 6, p. 63]. Interdisciplinary communications are most successfully shown in the scheme proposed by O.S. Zaitsev [3, p. 54].

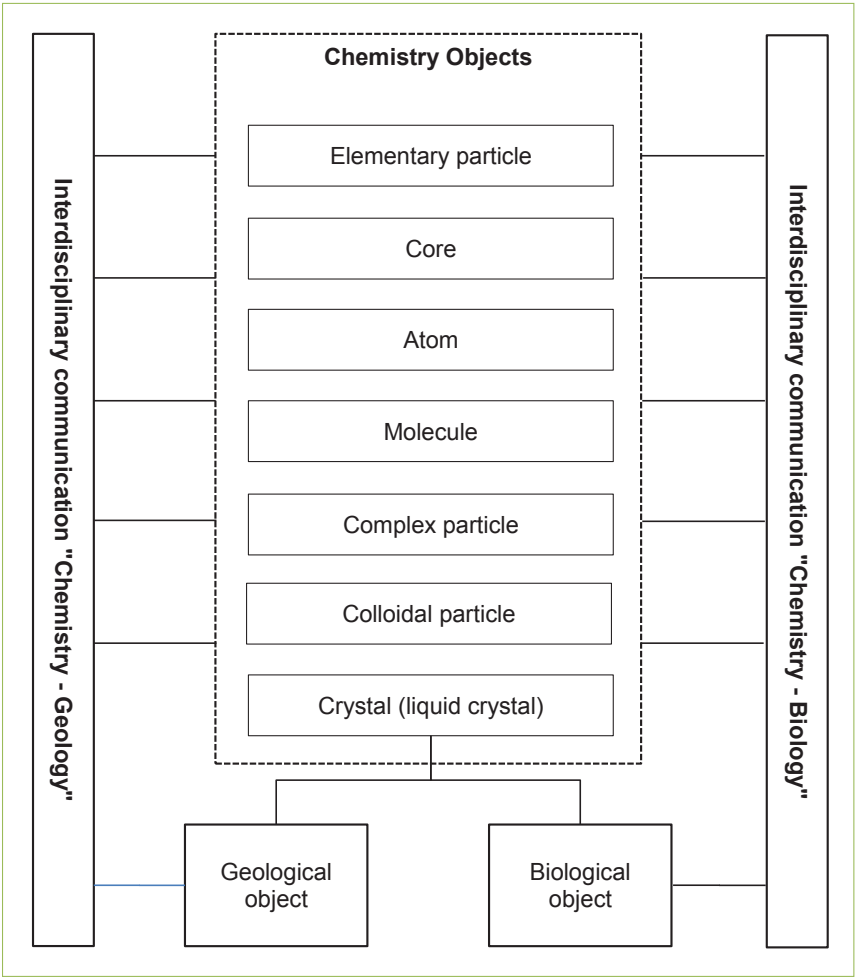


Figure 1. *Interdisciplinary communication of chemistry, biology and geology*

Studies of scientists, didactics, methodologists [1, 3, 5, 6, 7, 8] show that the simultaneous study of logically related concepts, patterns is more effective than their fragmented study. This also follows from the principle of structural unity of education. There is an integration - the union of the individual parts of the system into a single whole. Considering the integration process, we come to the solution of global problems using complex research methods.

The theoretical basis of organic chemistry is the theory of structure in its classical sense - the dependence of the properties of substances on their chemical structure, i.e. from the arrangement of atoms in the molecules of organic compounds according to valency. With an increase in the number of hours spent studying organic chemistry, it is possible to familiarize students with the electronic and spatial structure of organic compounds. The content of the course of organic chemistry focuses on the practical significance of the educational material [1, 2]. The study of the genetic relationship between classes of organic compounds is closely related to the concept of natural sources of organic compounds.

Over the years, the most effective is the integrative-problematic approach to the learning process of natural sciences. The course of organic chemistry is based on the knowledge acquired by students in biology and physics classes. Supporting knowledge on the topic “Theory of the chemical structure of organic substances”, acquired by students in the 9th grade, is developed in high school (X and XI grades). Let's compile a table in which we list the supporting knowledge on the topic “Theory of the chemical structure” formed in students in grades IX and X. Using the table, you can track the development of theoretical (chemical) knowledge among students on this topic.

Table 1. *The basic knowledge of students formed in the study of "Theory of chemical structure"*

Knowledge groups	**Basic knowledge**	
	IX class	**X class**
Theories studied in a school chemistry course on the subject	Atom structure, chemical bond. The main provisions of the theory of chemical structure Butlerova	The electrochemical theory of Berzelius; theory of radicals; substitution rule and type theory; modern ideas about the main provisions of the theory of chemical structure Butlerova
Basic concepts on this topic	Organic chemistry; valency, chemical structure; structural formulas of organic substances; isomerism and homology.	General molecular formulas of organic substances studied classes; structural, electronic formulas; homology, isomerism; mutual influence of atoms in molecules.

The obtained basic knowledge in classes VIII and IX serve as the basis for the acquisition and deepening of new knowledge, some of which in turn turns out to be new supporting educational material; from the positions of which previously studied material is being revised. In the IX class, on the basis of supporting knowledge, you can study the topic "Fundamentals of the theory of the chemical structure of organic substances." The acquired knowledge will expand and deepen in the study of specific factual material, namely when studying the topic “Hydrocarbons”. In the X class, when studying the modern theory of the chemical structure of organic substances A.M. Butlerov's previously acquired knowledge is further developed. This theoretical knowledge, in turn, becomes fundamental in the study of classes of organic compounds and the phenomenon of isomerism.

An integrative approach contributes to the formation of students' ability to compare, analyze, summarize the knowledge and skills. As noted by E.E. Minchenkov: “the ability to transfer knowledge gained in the lessons of some disciplines to the lessons of other disciplines in order to better understand the material being studied” [7, p. 385]. The methodology for conducting lessons of an integrative nature is covered in the writings of E.Ya. Arshansky, O.S. Zaitsev, M.S. Pak, E.E. Minchenkov, E.F. Matveeva et al. [1, 3, 4, 5, 7]. For example, E.Ya. Arshansky recommends that, against the backdrop of classical lessons, lessons be taught “with a very interesting and unusual book, called “Tales of a Single Substance”. This substance is benzene. Further on, in an impromptu “book”, which contains chapters (chapter 1. Mysteries of the liquid residue of the illuminating gas; chapter 2. The structure of the aromatic stronghold; chapter 3. The legend of the conquest of the Benzene Fortress; chapter 4. Getting benzene - the ancestor of aromatic substances) is gradually being studied and the assimilation of knowledge about the nature of aromatic compounds [1, p. 76 - 85]. At the end of the lesson, students are encouraged to review the “book” by answering questions.

In order to increase the motivation of learning, we use popular scientific information - situations in the lessons. In the book of Haley Birch, we will find story-stories that “direct” the student to a textbook or other source of knowledge. For example, "The Union of Biology, Chemistry... and Physics." A short story says: “Martin Karplus had to study not only chemistry to explain biology, but also combine knowledge of chemistry and physics. The Nobel Prize in Chemistry, which Karlus and his colleagues received in 2013, went to them for using both classical and quantum physics in developing powerful models that allow chemists to calculate the structures of large biological molecules [2, p. 111]. The author in each column constantly asks the reader questions: “Auto driving gave us the freedom to live and work as we like. Where would we be without oil and advances in refining gasoline? "Or:" How did we even live before the invention of plastic? What was the food brought home? What did the chips eat? What was everything made of?” etc.

In the XI class, theoretical knowledge and supporting concepts acquired by students in the process of teaching chemistry are considered and generalized at a higher level. The advanced technology of training based on schematic and iconic models of educational material [4, 8, 9] allows for less time:

1) equip students with conscious, deep and strong knowledge, which is the main foundation for further study of the topic;

2) to form students' strong skills and abilities that contribute to preparing them for active participation in the lesson;

3) to form in students positive motives for educational activities, cognitive interest in the topic;

4) to develop students' independent and creative activity.

Technology Features:

1. The training material should contain a large amount of information.

2. The studied material is arranged in blocks.

3. Blocks containing educational material are drawn up in the form of supporting abstract schemes, educational material is given in the form of supporting abstract schemes (according to V. F. Shatalov). [9, p. 69].

4. The reference abstract is a visual diagram in which the units of information to be assimilated are reflected, various connections between them are presented, and signs are reminded of examples, experiments used to concretize the abstract material [9, p.70].

The creation of a modern advanced methodology in the teaching of chemistry has allowed the use of teaching technology based on schematic and iconic models of educational material in teaching organic chemistry. When compiling supporting abstracts, the necessary basic knowledge is necessarily distinguished from a large amount of information. Basic knowledge is the main content of various topics of school courses in chemistry, biology, geography, etc.

We plan to use this technology in the course of teaching organic chemistry in the X grade and in preparation for the unified state exam. Including the use of fiction texts, game and problem situations, the implementation of training tasks, a joint analysis of the most complex issues of organic chemistry, the teacher should not forget to monitor the learning and success of the acquired knowledge and skills of students. The proposed learning technology allows you to improve the quality of training and the degree of awareness acquired by students of knowledge.

References

1. Arshansky E.Ya. Methods of teaching chemistry in humanitarian classes. - Moscow: Ventana-Graf, 2002. - 176 p.

2. Birch, Hayley. Chemistry. 50 ideas to know about. - Translation from English by S. Martynova. - Moscow: Phantom Press, 2016. - 208 p.

3. Zaitsev O.S. Chemistry teaching methodology: Theoretical and applied aspects: A textbook for students. - Moscow: VLADOS Publishing Center, 1999. - 384 p.

4. Matveeva E.F. Integration of professional and methodological knowledge and skills: monograph. - Astrakhan: Publishing House "Astrakhan University", 2006. - 119 p.

5. Matveeva E.F. Teaching practice in vocational training of students: monograph / E.F. Matveeva, G.N. Protasevich. - Astrakhan: Publishing House "Astrakhan University", 2010. - 168 p.

6. Matveeva E.F. The origins of the teacher's research activity: integrative approach: monograph / E.F. Matveeva, T.A. Kolesnikova. - Astrakhan: Astrakhan State University, Publishing House "Astrakhan University", 2017. - 239 p.

7. Minchenkov E.E. Practical didactics in the teaching of natural sciences: a textbook. - 2nd ed., Rev. - St. Petersburg: Publishing House "Lan", 2016. - 496 p.

8. Pak M.S. Theory and methodology of teaching chemistry: Textbook. - 2nd edition. - St. Petersburg: Publishing House "Lan", 2017. - 368 p.

9. Selevko G.K. Modern educational technology: Textbook. allowance. - Moscow: Public education. - 1998. - 256 p.

作为教育建构主义理念的自学知识设计对学生的自我设计
SELF-DESIGNING OF KNOWLEDGE TO STUDENTS AS A LEADING IDEA OF PEDAGOGICAL CONSTRUCTIVISM

Amurskaya Olga Viktorovna
Candidate of Pedagogical Sciences, Associate Professor
Federal State Autonomous Educational Institution of Higher Education "Belgorod State National research university",
Belgorod Institute for Educational Development
Strelkova Yaroslavna Alexandrovna
Candidate of Pedagogical Sciences, Associate Professor
Federal State Autonomous Educational Institution of Higher Education "Belgorod State National research university",
Belgorod Institute for Educational Development
Tarasova Svetlana Ivanovna
Candidate of Pedagogical Sciences, Associate Professor
Federal State Autonomous Educational Institution of Higher Education "Belgorod State National research university"

抽象。 文章证实了现代方法之一在人文教育学 – 教育学建构主义中的相关性。 作者详细阐述了他的主导思想 – 学生自我建构知识。 试图制定现代学习过程的特征（本质，原则，特征）； 作者介绍了作者在高等教育中建立学习过程的实践 – 在与文本合作时，通过一小组合作为学生自我建构提供了条件。

关键词：教育建构主义；学生独立建构知识；小团体合作；使用文字。

Abstract*. The article substantiates the relevance of one of the modern approaches in humanistic pedagogy - pedagogical constructivism. The authors elaborate on his leading idea - self-construction of knowledge by students. The attempt is made to formulate the characteristics (essence, principles, character) of the modern learning process; The author presents the author's practice of building the learning process in higher education - creating conditions for self-construction of knowledge by students in a small group of cooperation, when working with text.*

Keywords: *pedagogical constructivism; independent construction of knowledge by students; small group of cooperation; work with text.*

The transformation of the Russian sociocultural space, the emergence of its new characteristics, led to an update in the content of the social order of society and the state in the education system. Among the other positions reflected in the modern

social order, fundamentally stand out - the independence of the individual in making and choosing decisions; the ability to live in society, be responsible for their decisions, bear responsibility for themselves and their loved ones; willingness to act in unusual situations; identification of oneself as a member of an ethnic group, a bearer of traditional culture, a citizen of the Russian Federation, a citizen of the world.

For pedagogical science and practice, this means that in modern humanistic pedagogy, pedagogical constructivism comes out on a leading position along with personality-oriented, active, student-centered approaches. The ideas of the philosophy of constructivism were inspired by the results of studies of cognitive processes conducted by D. Bruner [1], an American psychologist and pedagogue of the twentieth century, who, in turn, pushed off the ideas of D. Dewey [2], an American philosopher and teacher, a representative of the philosophical direction of pragmatism the second half of the nineteenth and early twentieth centuries. One of the leading ideas of constructivism is of significant importance for modern Russian pedagogical reality, namely, the complete denial of the transfer of knowledge in a finished form from a teacher to students, self-construction of knowledge by students.

How much should the learning process and the activities of the teacher change? How should the teacher himself change?

It is obvious and indisputable that updating the characteristics of the teacher's activities (changing the position of the teacher and students, changing the nature of teaching, increasing the variety of educational technologies used in the activity type, the need for training of the teachers themselves) [3] should be a consequence of the teacher rethinking the principles and logic of the learning process, and also a conscious change in their professional consciousness.

And what about the learning process?

The results of a detailed study of the didactic ideas of pedagogical constructivism made it possible to single out and formulate the following characteristics of the learning process. Firstly, the modern learning process is a kind of active process of "complicity" of the teacher-consultant, organizer, coordinator of educational activities of students, in the framework of which the self-construction of knowledge by the latter is carried out. In the course of self-construction of knowledge, students do not "swallow" knowledge in a ready-made form, but learn, comprehend an individual subject / phenomenon / fact or system of objects / phenomena / facts in accordance with their own experience and independently discover and construct new knowledge on this basis. The process of self-construction of knowledge by students is possible with the active independent mental activity of the latter.

Secondly, the construction of the process of "complicity" should take into account such principles of constructivism in education as:

- the principle of activity of cognitive activity: the basis of activity is the personal experience and knowledge of the student, necessary to comprehend new knowledge;

- the principle of meaningfulness of an individual object / phenomenon / fact or system of objects / phenomena / facts;

- the principle of applying intellectual actions in the construction of new knowledge: in order for the process of cognition to take place, it is necessary to make mental efforts;

- the principle of communication: the direct influence of language, communication on the process of cognition;

- the principle of social activity of cognitive activity: the development of the student is associated with his environment;

- the principle of contextuality of cognitive activity: training takes place in the context of the life of the student, society;

-the principle of awareness of students of the goals of cognitive activity, the ways to achieve it.

Thirdly, the implementation of these principles provides a "lively" nature of learning. This nature of learning suggests that in the course of active independent mental activity, students learn, comprehend a single subject / phenomenon / fact or system of objects / phenomena / facts, independently discover, construct knowledge on the basis of real practical situations and problems. The latter are borrowed from the “live” data bank, which is replenished with the direct participation of students in the search for relevant information, observation of practical situations, the study of primary sources, the surrounding reality. In this regard, the efforts of the teacher focus on soft, but purposeful creation of conditions for problem-oriented, independent mental activity of students, during which self-construction of knowledge by students takes place.

Self-construction of knowledge by students in the modern educational process of higher education occurs in various forms (large / medium / small group of cooperation, etc.), in various ways (discussion, writing, work with text, etc.) and techniques (question, drawing, diagram, professional situation, etc.).

In the framework of a competently modeled communicative teaching situation, the teacher has the opportunity to solve a range of professional tasks: to attract the attention of students, to interest them in the topic of study; present the problem of the lesson or the selected information from the data bank; by raising leading questions, to help students turn to their own experience and gradually realize the situation of intellectual difficulty. In other words, students get the opportunity to "plunge" into the problem of the lesson, try to independently understand and analyze it, take a full part in the independent construction of knowledge.

Let us turn to the author’s practice of constructing the process of “complicity”, which is aimed at creating the conditions for self-construction of knowledge by students in a small group of cooperation, when working with text. So, at a practical lesson on pedagogy on the topic “Pedagogy - science and / or art?” Such goals are realized:

- the formation of ideas among students about pedagogy as a science, its structure and place among other human sciences;

- acquaintance with the conceptual apparatus of pedagogy as an integrated system;

- the development of skills to analyze, establish causal relationships, compare, compare the basic concepts of pedagogical science;

- creating conditions for the inclusion of students in joint activities.

At the beginning of the lesson, at the stage of updating the knowledge and experience of students, the teacher calls on students to express their own ideas about pedagogy.

For this purpose, students complete the phrase in writing: “Pedagogy is ...”, choosing an answer from the wording of the topic of the lesson, and then justifying their vision out loud. In the first column of the prepared template of the table, consisting of three columns (“I know”; “Found out (a)”; “I want to clarify”), students record the justification of the stated position (arguments, judgments, knowledge).

At the stage of expanding and deepening the initial ideas about pedagogy, students, according to the previously expressed point of view, combine 3-4 people in the corresponding small groups of cooperation “Science”, “Art”, “Science and Art”. Each group receives a quest map:

1. Check out the article “Pedagogy - science or art?” By the famous Russian teacher and psychologist Pyotr Fedorovich Kapterev (1849–1922). Analyze the points of view and approaches set forth in the text of the article, highlighting the general and differences.

2. Compare what is common and special in the interpretation of the pedagogy of KD Ushinsky and P.F. Kapterev? Which point of view seems more reasonable to you and why? State your position, what does pedagogy do? Give examples.

3. Do you agree with the author’s position on the question: “Is it possible to recognize a person as a real teacher because he is a master in teaching grammar or arithmetic, and in all other educational and educational matters he is guided by a routine, antediluvian views that are completely foreign to science?”

4. Formulate the signs of everyday pedagogical knowledge, theoretical pedagogical knowledge and pedagogical science. What are the common and special features of these phenomena?

5. How are the pedagogical culture of society and the pedagogical culture of man?

6. What do you think are the opportunities and threats of teacher education?

Performing assignments, students turn to the article and additional information, independently seek answers to questions that concern them, analyze the data of their or someone else's experience, formulate evidence.

The objective result of the work at this stage is the individual records (arguments, judgments, knowledge) recorded in the second column (“Found out (a)”), which reflect the expansion / deepening / changes / correction of the initial ideas about pedagogy for each student. The teacher once again asks students to express their point of view and justify it by completing the phrase "Pedagogy is ... .". At this point, classes are possible rearrangement of students on the basis of a changed point of view.

At the stage of modeling the structural-logical scheme, reflecting the point of view of a small group of cooperation on the problem, students write out on cards (sheets 12 cm × 5 cm in size) one concept that reflects the opinion formed on the pedagogy in the process of cooperation.

Then the students briefly analyze the concepts fixed on the cards and put them on the table. The sequence of placing the card on the table and the sequence of the student's statements are due to the relationship between the previous concept and his own. During the simulation, each student, in his own discretion, has the right to make a correction in the structural-logical scheme, having previously substantiated his vision. The scheme will take on a complete look when all cards are placed on the table, and its possible correction will be completed.

During the dynamic stage, each small group moves between the workplaces of other groups, gets acquainted with the structural and logical diagrams, and if necessary, students in the third column of the table ("I want to clarify") make corresponding notes, fix different types of questions (clarifying (closed), filling (open), figuring out the ability to quickly navigate the situation, think and explain (question-situation), detailing information (mirror), revealing additional information (relay)).

After the draw, each small group presents its formalized opinion on the problem of occupation in front of other groups and answers possible questions that may arise from students of other groups during the presentation or when familiarizing themselves with the structural-logical diagram.

At the end of the presentation of small groups, a teacher is included who, analyzing the thoughts expressed, turns to the previously cited examples, draws on the approaches and positions known in science, sums up and unobtrusively reveals his position on this issue.

Thus, students in the course of "live" training in a small group of cooperation, when working with text, not only develop the ability to analyze, establish causal relationships, compare, generalize, etc., are included in joint activities, but also ultimately consistently approach to meaningful, stemming from practical experience, independent discovery and construction of new knowledge.

References

1. Bruner D. Psychology of knowledge. Outside of direct information: per. from English K.I. Babitsky [Text] / D. Bruner. - Moscow: Progress, 1977. - 413 p.

2. Dewey D. Democracy and education: Per. from English Yu.I. Turchaninova, E.N. Gusinsky, N.N. Mikhailova [Text] / D. Dewey. - Moscow: Pedagogy-Press, 2000. - 384 p.

3. Tarasova S.I. Characterization of the teaching process in higher education: a new educational situation // Scientific statements of BelSU. Ser. Humanitarian sciences. - 2016. - No. 7 (228), issue. 29.- p. 213-216.

发展教育过程参与者的监管技能，作为在现代俄罗斯教育中实施协同方法的一个因素

DEVELOPMENT OF REGULATORY SKILLS OF PARTICIPANTS IN THE EDUCATIONAL PROCESS AS A FACTOR IN THE IMPLEMENTATION OF A SYNERGETIC APPROACH IN MODERN RUSSIAN EDUCATION

Sokhranov-Preobrazhensky Vladimir Vasilevich
Doctor of Pedagogical Sciences, Full Professor
Penza State University,
Penza, Russia

抽象。 本文讨论了学生与教师监管技能发展之间关系的概念基础及其对俄罗斯现代高等教育协同基础实施的影响。 介绍了俄罗斯高等教育机构的初步结论和研究结果。

关键词：协同学，教育，监管技能，发展，实施

Abstract. *The article discusses the conceptual foundations of the relationship between the development of regulatory skills of students and teachers and their impact on the implementation of synergetic foundations of modern higher education in Russia. Preliminary conclusions and results of the research conducted in higher educational institutions of Russia are presented.*

Keywords*: synergetics, education, regulatory skills, development, implementation*

The process of development of the higher education system in Russia in recent decades is characterized by the presence of contradictions between external factors affecting the structure and content of educational activities of participants in the educational process, for example, the emergence in 2012 of a new Law of education, and the willingness of its participants to implement the ideas of self-organization and semantic approach to solving problems of education, education and correction of socialization of students and teachers.

The Law on education 2012 States that "education - a single purposeful process of education and learning that are socially significant boon and implemented in the interests of the individual, family, society and state, as well as a set of acquired knowledge, skills, values, experience and competence of certain size and complexity in order of intellectual, moral, creative, physical and (or) professional development of a person, meet his or her educational needs and interests." [1].

Thus, the attention of the participants of the pedagogical process is drawn to the implementation in the process of interaction of the sense-forming foundations of modern didactics. This allows students in modern conditions of multi-level education to overcome communication barriers that arise in the process of mastering the complex linguistic and paralinguistic features of digital and information culture that are not developed in the process of socialization. Outside of her knowledge it is impossible to prepare students for the chosen type of professional activity; cultural correlation of familiar and acquired cultural values, adaptation to new socio-cultural conditions life in the educational space of the University; integrative entry into the process of professional and social self-organization and self-determination on the basis of the implementation of a set of regulatory skills. The willingness of students to exercise regulatory skills is formed primarily in the process of their sensemaking professionally directed educational interaction with teachers and employers, analysis of the structure and content of which focuses on the ongoing Penza state University research in the context of the implementation of the synergetic ideas of education.

Of particular interest in this direction is the disclosure of the mechanisms of meaning formation in the educational process as a priority direction of modern didactics, especially its direction, which is called semantic didactics [2, 3]. As a unifying basis of external and internal sense can be considered from the point of view of its understanding "in the context of the conceptual integrated model of meaning formation, which includes the most generalized, characteristic of all areas of research of meaning components and patterns. It is this integrated model that allows to reveal the semantic dynamics and peculiarities of meaning formation in different realities in accordance with the specifics of the semantic self-actualization field " [2, 3].

Generalising various approaches to the interpretation of meaning, I. V. Abakumova proposes to consider it in two States: situational (personal meanings, attitudes, meaning-making motives) and stable, "notsituation" (semantic constructs, semantic dispositions, and values). In the course of the study, the developed model of formation of students ' regulatory skills in the process of meaning-forming interaction with teachers and employers was implemented. Achieving this goal involves a number of tasks:

1. formation of students ' readiness to implement regulatory skills in training sessions and practice; 2. improvement of speech skills in professional and didactic communication.

The following research methods were used to implement the goals and objectives: pedagogical (modeling of situations of psychological, pedagogical and methodological support, didactic game, project method); psychological (psychological training, music and fairy tale therapy). Discusses the results obtained

through the implementation of a set of methods, to which was referred: method a reference signal (V. F. Shatalov), methods Rivina (mPas), the resolution of tasks with variable data, didactic games (N. In. Reflection, L. F. Spirin), LSS (D. A. Leontiev), SAMUEL (N. F. Kalina), "Value orientations" (M. Rokich), "orientation of the personality" (B. bass), "Learning self-assessment using the procedure of ranking" (A. A. Rean).

The results of the experiment showed that most students have a low level of formation of professionally significant regulatory skills (level of identification) (73%), medium level (level of individualization) showed 21% of students in the experimental group, a high level of development (level of personalization) is characterized by 6% of respondents. The teaching staff was respectively characterized by the following percentages: 12.4%; 44.6% and 43%.

However, a paradigm shift of cultural, personal and professional self-organization of man, the desire of the state, society, and personality to the development of a new way of doing things has led to the need for understanding this problem in the new socio-historical and actual-scientific terms understanding of the essence of manifestation of professionally significant regulatory skills in the process of teaching and professional interaction of participants of educational process as factor of increase of scientific-educational potential of society (I. V. Abakumova, D. A. Leontiev, V. A. Slastenin, A. V. Mudrik, L. F. Spirin, M. I. Rozhkov, L. V. Bayborodova, etc.).

Scientific literature analysis and own teaching experience shows the underdevelopment of models and technologies of formation of students readiness for semantic self-organization through the implementation of regulatory skills in meaningful professional learning action that is based on their lack of readiness to implement a set of regulatory skills and competencies in personal and didactic form.

In the process of research, we proceeded from the fact that each student has an initial level of manifestation of integrative characteristics of readiness for semantic manifestation of regulatory skills, acting as a willingness to carry out educational activities on the basis of the implementation of a set of social, vital or ideal meanings, developed in the period of pre-University socialization. This level was called primary didactic, allowing students to adapt to the requirements imposed on them in the pedagogical process. In addition, allocated adaptive levels of didactic action (self-selection algorithms didactic activities) and the level of creative action.

The last two levels differed in the sources of motivation of students to the manifestation of semantic professionally significant regulatory skills. In the first case it was the teacher, in the second case, the desire for self-correcting didactic action was based on the needs of the student. Defined the basic characteristics of the semantic of the students professionally significant regulatory skills. This refers to the readiness of students to manage the basic conditions-anxiety, lability and fatigue. Its fixation in the study reveals the psychological component of the process under study.

Main components of semantic professionally significant regulatory abilities: perception of information and its processing; the correlation of the objectives with the ability to achieve at a specified time; analysis of techniques, tools and methods permit students facing challenges; the current correction of the actions performed, and objective assessment of the result. The experimental work revealed a set of interdependencies and interrelations of semantic development of professionally significant regulatory skills of students with the peculiarities of their socialization. Students of control and experimental groups were ranked according to traditional socio-pedagogical characteristics: education, level of learning skills and regulatory competencies that play an important role in future professional activity, motivation of teaching, set of needs, direction of activity and structure of value orientations.

In the course of experimental work three groups of students: the first showed the alignment of socialization and the totality of demands placed on them; the second is characterized by situational correlation of socialization and professiogram of the specialist under the influence of the teacher; third – implemented protective motivation didactic activities.

In the experimental work the model of formation of the studied properties of students consisted of the following main stages: diagnosing readiness for boys and girls to the semantic manifestation of professionally significant regulatory skills, based on the natural prerequisites and their didactic experience of self-organization; identifying features of perception and reproduction of future masters of the ways of demonstrating skills and regulatory competences semantic professionally meaningful didactic monitoring in the process of educational activity. The third stage of the model can be considered modeling of the ways and means of formation of regulatory competencies; personal qualities, properties and skills that make up the basis of the investigated properties of personality. The fourth stage of formation of readiness of students of the University to exercise meaningful professional meaningful teaching self-control is the pedagogical correction of relationships between participants in the pedagogical process. The final stage of the model is to provide the evaluation-resultant function. The fourth stage of formation of readiness of students of the University to exercise meaningful professional meaningful teaching self-control is the pedagogical correction of relationships between participants in the pedagogical process. The final stage of the model is to provide the evaluation-resultant function of the process under study

A representative identification of skills, personal qualities students comprise the core characteristics of the process required the use of special psychological methods; test Amthauera; and Cattell. The tests were adapted to the regional conditions of students ' education. Special attention was paid to the identification of the quality of students ' performance of five types of tasks (awareness, analogy,

classification, generalization, numerical series) used tasks for the classification of analogy and awareness. The peculiarities of the use of tests in adolescence were taken into account. To this end, changes were made to the content of the tests. All changes were approved by the expert group of psychologists (faculty of Pedagogy, psychology and social Sciences). The resulting array of data was processed using the method of determining the reliability factor of the test (KP). It was determined by the correlation method of even and odd jobs.

The study used the classical tests of V. A. Bodrov, P. Thorndyke, V. S. Avanesov and B. V. Kulagin. The battery of tests-GATV had a special role. It is known to include 12 subtests that measure 9 abilities (General mental ability, verbal, numerical, spatial perception, form perception, clerk perception speed, motor coordination, manual dexterity, finger motor skills).

An important role during the formative experiment the programme had ASICS (L. F. Spirin), to enable students in the modeling process and special permit didactic situations. A special role was played by analysis of the level of development of intellectual skills (the ability to listen; ability to work with models, graphs; ability to work with text tasks; ability to operate knowledge; the ability to show independence of thought and action; ability to relate subject material with real tasks, which solve a mathematics teacher in the study of their subject with different categories of students; the ability to use the interests and orientation of the personality for achievement of the didactic purposes; the ability to use emotional-valuable attitude for a successful didactic of self-realization; the ability to adjust the self-assessment and to determine the actual level values of the performed didactic activities. In the process of active interaction with students during traditional classes and during the summer gathering of students.

Thus, it can be assumed that the personality-oriented and developmental nature of learning are the dominant factors in the formation of students ' readiness for semantic development are the dominant factors of formation of readiness of students to semantic manifestation of professionally significant regulatory skills and realization of synergetic in modern Russian education.

References

1. Law" on education of the Russian Federation " of December 29, 2012 № 273 / / Assembly of legislation of the Russian Federation. 2013 St. 1.

2. Abakumova I. V., Ermakov P. N., Rudakova I. A. sense-Centrism in pedagogy: a new understanding of didactic methods. - Rostov-on-don: publishing house of Rostov UN-TA, 2006. - 256 p.

3. Abakumova I. V., Ermakov P. N. Psychoenergetic problems of semantic didactics / / North Caucasian psychological Bulletin, 2005. No. 3. P. 221-229.

UDC 37.012

创新支持大学生认知兴趣的形成
INNOVATIVE SUPPORT FOR THE FORMATION OF COGNITIVE INTERESTS OF UNIVERSITY STUDENTS

Mokretsova Lyudmila Alekseevna
Doctor of Pedagogic Sciences, Rector
Shukshin Altai State Humanities Pedagogical University
Popova Olga Viktorovna
Doctor of Pedagogic Sciences, Rectorate Adviser
Shukshin Altai State Humanities Pedagogical University

抽象。 本文认为认知兴趣是大学教育活动成功和有效性的基础。 大学活动在形成认知兴趣方面的创新支持的可用性得到了证实。 作者提出了一种对学生认知兴趣形成的创新支持的等级结构，应该通过整个大学的电子信息教育环境来实现。

关键词：创新，创新活动； 创新支持，认知兴趣，认知活动，认知动机

Abstract. *The article considers cognitive interest as the basis for the success and effectiveness of educational activities in a university. The relevance of the availability of innovative support for the activities of the university in the formation of cognitive interest is substantiated. The authors propose a hierarchical structure of innovative support for the formation of cognitive interest of students, which should be implemented through the electronic information educational environment of the university as a whole.*

Keywords: *innovation, innovation activity; innovative support, cognitive interest, cognitive activity, cognitive motivation*

One of the urgent problems of education at present is the development of cognitive abilities of a person and the development of interests in cognition, self-development, and self-improvement. Such a task is particularly relevant in vocational training.

National projects in the field of science and education have indicated the mandatory link between the development of innovative activities of universities and the implementation of international quality standards for higher education. For Russian higher education, the need for international standardization of the quality of education is due to competition both between the universities of our country and at the international level [1]. The state's social order for universities is the need to train specialists capable of providing innovative breakthroughs in education, science, the social sphere and other areas of social and professional activity that are significant for Russia [2].

No one doubts that the achievement of these goals is impossible if a university student does not have cognitive motivation, cognitive interest, cognitive activity during the period of study at the university [3].

An analysis of the literature on the development of cognitive interest in general and cognitive interest in vocational education in a university in particular, conducted by us, showed that interest, including cognitive interest, is a complex and heterogeneous concept.

Cognitive interest is one of the most important motives in vocational education. Under the influence of cognitive interest, educational work even for weak students proceeds more productively [4].

Cognitive interest is often understood to mean various states of a person, united only by a positive orientation towards his activity: hobbies, inclinations, curiosity, etc. In the scientific literature that illuminates this problem, one can find various interpretations of this concept.

So, for example, I.F. Kharlamov understands cognitive interest as "an emotionally colored need that has passed the stage of motivation and gives human activities a fascinating character" [5, p. 99].

From the point of view of G.I. Shchukina, cognitive interest is a selective orientation of the personality, turned to the field of knowledge, to its subject side and the process of mastering knowledge itself.

However, in science there are interpretations of this concept that have a broader meaning. According to N.G. Morozova, cognitive interest is an active emotional-cognitive attitude of a person to the world.

Cognitive interest is the main type of interest, it carries all the functions of interest as a mental formation: its selective nature, the unity of the objective and subjective, the presence in it of an organic alloy of both intellectual and emotional-volitional processes. In this sense, it is inevitably associated with cognitive motivation and actively influences cognitive activity [6].

Based on all the above sides of cognitive interest, we understand that the process of formation of cognitive interest is one of the most significant issues of professional training of university students [6].

At the same time, for vocational education, formation is the conscious management of the student's development process or individual aspects of his personality, qualities and properties of his character and bringing them to the intended form (level, image, idea), which are dictated by professional standards, the social and professional community, the labor market.

In pedagogical practice, the formation of cognitive interest means the application of techniques and ways (methods, means) to influence the student's personality in order to create a system of certain values and relationships, knowledge and skills, a mindset and memory, the ability to comprehend and apply professionally significant competencies in practice [2].

Thus, we can conclude that for most authors, cognitive interest is an active selective orientation of the person to the world around him, and the process of its formation and development is possible only in activities and, above all, in the learning process.

The formation of cognitive interests in educational activities of students can occur in two main directions: selection of the appropriate content of educational activity and the actual organization of cognitive activity of students in basic general educational and general cultural disciplines, as well as in disciplines of general professional and special professional cycles [4].

Having set such a high bar of requirements for the formation of cognitive interest, we came to the conclusion that the traditional educational process at a university is not fully capable of generating cognitive interest [7].

The task of forming cognitive interest is to put the student in conditions of continuous learning, continuous activity, achievement of significant results at all stages of professional education, and later in their professional activity [8].

We understand that a completely new approach to the problem of the formation of cognitive interest is needed. We will call this approach innovative support for the formation of cognitive activity.

Innovative support of any type of educational activity is a combination of measures and means, creating conditions conducive to the normal course of educational processes, implementing the plans, programs, projects, maintaining the stable functioning of the educational system and its facilities. Innovative support is a process of coordinated management of educational processes, the interaction “teacher - student", "student - educational environment", "electronic information and educational environment (EIEE) - teacher", "EIEE- student" and other processes that are important in educational activities [9].

In addition, innovative pedagogical support for the formation of the cognitive interests of university students implies the presence of the following components:

- educational environment enriched by a variety of innovative activities, their continuity and the opportunity for personal self-realization;
- innovative educational technology;
- interaction of participants in the educational process on the basis of dialogic communication, reflective activity, partnerships;
- creating a field of student self-realization, motivation for self-knowledge and self-development, independent creative activity [9].

It should be noted that the continuous process of forming the cognitive interests of university students is nothing more than a combination of education and self-education, and can be considered as the most common case of obtaining knowledge in the vital areas of student activity motivated by the environment [10].

The formation of the cognitive interests of university students is not a linear, but a complex multi-level structure with a centralized conscious-volitional system for managing the innovative support of such activities, with a hierarchical subordination of the student's cognition impulses and the teacher's managing and coordinating activities [7].

A prerequisite for innovative support for the formation of the cognitive interests of university students is hierarchy [7].

The study of hierarchical levels of innovative support for the formation of cognitive interests of university students was carried out by us in the form of a pilot experiment in several state and non-state universities.

Since the objective of our study was not to evaluate these universities by the effectiveness of the formation of cognitive interest among students of these universities, we consider it possible not to name these universities in this article.

The objectives of the pilot experiment are:

1. Identification of hierarchical levels of innovative support for the formation of cognitive interests of university students.

2. Compilation of characteristics of each level of innovative support for the formation of cognitive interests of university students, taken separately.

Our pilot experiment allowed us to identify and describe the characteristics of the following levels of innovative support for the formation of cognitive interests of university students.

First level. Identification of social and pedagogical values of the development of cognitive interest as input control at each stage of transition to a new stage of training, a new discipline, a new course, a new type of educational activity, etc. We consider innovative support to be the need for comprehensive mass testing of all students studying at a university on various aspects of cognitive interest.

Second level. Creating a model of the content of educational and cognitive activities aimed at developing cognitive interest by selecting and incorporating innovative elements in the educational process. These are system-based active classes, student discussions, computer classes, business and role-playing games, video, audio, the Internet, digital and robotic elements of educational activity, etc.

Third level. Filling the bank of educational and methodological developments of special studies that contribute to the targeted formation of cognitive interest. Innovative information and communication approach to the formation of educational, managerial, educational and methodological content in the university's EIEE.

Fourth level. Formation of methodological requirements should be carried out within the boundaries of all traditional educational disciplines of the main professional educational programs (MPEP) for the development of cognitive interest, which should be based on the educational and cognitive competence of students. Creating an electronic, digital environment for each MPEP.

Fifth level. Ensuring managerial impact on the formation of cognitive interest by organizing design, research, scientific and educational work of students in educational and extracurricular activities. This is the innovative filling of the EIEE of the university with educational, teaching, administrative materials in these areas of activity.

Sixth level. Purposeful influence on the formation of the student's cognitive interest through the control and corrective activity of the teacher. A phased study of the levels of development of cognitive interest and, if necessary, the introduction of corrective changes in the innovative support of the learning process.

Seventh level. Using the student's portfolio of educational achievements and his rating in the formation of cognitive interest. Confirmation of increasing the level of development of the student's cognitive interest in educational products: essays, creative works, tasks of increased complexity, educational and research projects, elements of research-oriented activities, etc.

The structure of the above levels, in our opinion, should be implemented both in each academic discipline of the main professional educational program (MPEP), and in the implementation of the entire MPEP.

To achieve maximum effect, this hierarchical structure of innovative support for the formation of cognitive interest should be implemented through the EIEE of the university as a whole.

In addition to identifying levels of innovative support for the cognitive interest of students, we conducted a comparative experiment in two universities (we will conditionally call them University "A" and University "B"). A comparative analysis of pedagogical phenomena or processes of innovative support for the formation of cognitive interest of students depending on various external conditions and internal conditions that are observed in universities, showed:

1. Terms of innovative support, EIEE, equipment with educational content, educational, methodological, administrative and control, control and corrective support, the portfolio of students, the rating system of the university "A" is as close as possible to the levels of the hierarchical structure of innovative support we identified for the formation of cognitive interest.

2. The university "B" has large gaps in the structure of the EIEE, there is no complete control and correction level, insufficient filling of the student portfolio, and there is no full rating system of students' creative work.

3. Comparative analysis showed that it is necessary to diagnose cognitive interest in students of the university "A" and the university "B".

To check the cognitive interest of students, a comprehensive mass computer testing of university students was used according to the methodology "Self-assessment of the cognitive position of students" and the block of questionnaires by A. E. Bogoyavlenskaya [11].

In the computer version of processing the results of studies of cognitive interest of students, the following levels of cognitive interest were laid down:

1. a low level of formation of cognitive interest, in which interest in cognitive activity is weakly expressed, is characterized by a lack of readiness for independent work, a negative attitude towards performing complex and creative tasks;

2. the average level of formation of cognitive interest is noted in the development of new knowledge only under the guidance of a teacher, occasional interest in learning, even with the help of ICT, innovative elements of learning, game and creative activity, waiting for outside help (teacher, fellow student, finished result from the Internet, etc.) with cognitive difficulties;

3. a high level of formation of cognitive interest is characterized by enthusiasm for learning, an increased interest in the use of any innovative, creative, design, scientific, educational activities, a desire for independent solutions to non-standard tasks, a mandatory independent overcoming of difficulties, a positive reaction to complex tasks.

The studies and generalized results of identifying the levels of formation of cognitive interest in two universities are presented in table 1.

Table 1

The levels of formation of cognitive interest of university students

№	Levels of formation of cognitive interest	University "A"in% of the number of respondents	University "B"in% of the number of respondents
1	High	86	24
2	Medium	12	56
3	Low	2	20

From table 1 it is seen that the innovative support of the university “A” helps to shape the students' cognitive interest, which was shown by the research results. Students of the university “A” are almost completely lacking a low level of cognitive interest formation (only 2% of students), an insignificant (about 12%) average level of cognitive interest formation, and 86% of students have a high level of cognitive interest formation.

We see a completely different picture from students of the university "B". In University “B”, 20% of students have a low level of cognitive interest, that is, they are absolutely not striving for knowledge, are not interested in creative activity, and are not able to overcome educational difficulties. More than half of students (56%) have an average level of cognitive interest. Only 24% of students have a high level of cognitive interest.

Based on the conducted study, the following conclusions can be drawn:

1. The problem of innovative support for the formation of cognitive interest of students in a university is relevant and requires constant research.

2. The development of the problem of cognitive interest is due to the tasks of modern society, concerned about preparing the young generation for active life.

3. The awakening of curiosity, the upbringing and development of cognitive interests and the need for self-education - is a complex problem and the most important task of educators, which is currently becoming especially acute.

4. The author proposes one of the options for the hierarchical distribution of levels of innovative support for the formation of cognitive interest in a university.

5. Verification of the university's compliance with the hierarchy requirements proposed in the article showed that a hierarchical approach to innovative support gives a positive result in comprehensive mass testing of students to determine the formation of cognitive interest.

6. The lack of innovative support shows low levels of formation of cognitive interest among university students.

References

1. Zhuravskaya N.T. Innovative quality assurance of the educational activities of the university. // Bulletin of TSPU. - 2009. - №8 (86). P. 67-69

2. Milova, Yu. Yu. Management of innovative activity of a higher educational institution [Text] // Economics, Management, Finances: Materials of the III Intern. sci. conf. (Perm, February 2014). - Perm: Mercury, 2014. P. 25-27.

3. Kaznacheeva S. N., Gritsenko D. I. Modern methods of development of cognitive activity of university students // Bulletin of the University of Minin. - 2015. - № 1. P. 18-25

4. Brovko O.A., Fimushkina L.V. Formation of cognitive interest of university students in the process of introducing IR technologies into the educational process. - Moscow: IECM 2018.

5. Schukina G.I. The problem of cognitive interest in pedagogy. - Moscow: Pedagogy. 1971.

6. Sokolovskaya I.N., Kivileva A. A. To the definition of the essence of the concept of "cognitive interest" in pedagogy. // Tsarskoye Selo readings. - 2017. - №1. P. 89-92

7. Bogoyavlenskaya A. E. The development of cognitive independence of students: Monograph. - Tver: Publishing House of TSPU, 2004. - 160 P.

8. Palkin E. A. Indicators of innovation // Accreditation in education. - 2008. - № 26. P. 54-55.

9. Ignatyev E. Yu. On the new didactic system in the educational information environment: // Alma mater: Bulletin of higher education. - 2009. - № 6. P. 21-26.

10. Voronchikhina T.V., Ivonin A.O. The breakdown of cognitive activity of students in the learning process in a modern university.// Bulletin of the Vyatka State University. - 2012. - №1. P.39-41

11. Bolotsky A. A. Diagnosis of the formation of cognitive independence of students // Young scientist. - 2016. - № 12. P. 821-824.

国外在执法系统中进行额外专业教育的经验及其对俄罗斯的重要性
FOREIGN EXPERIENCE OF ADDITIONAL PROFESSIONAL EDUCATION IN LAW ENFORCEMENT SYSTEMS AND ITS IMPORTANCE FOR RUSSIA

Voronov Victor Vasil'evich
Doctor of Sociological Sciences, Full Professor, Lead Research Officer
Institute of Sociology
Federal Research Sociological Center of the Russian Academy of Sciences
Moscow, Russia
Shulepin Mikhail Vladimirovich
Postgraduate
Institute of Sociology
Federal Research Sociological Center of the Russian Academy of Sciences
Moscow, Russia

抽象。 在西欧和美国，多元化的额外专业教育体系（APE）在执法系统中运作，没有俄罗斯典型的集中模式，这增加了使用现有各种形式的执法培训的可能性。长官。 本文介绍了对该领域外国经验的社会学分析，在考虑和证明其使用的可能性和局限性方面，以提高APE对俄罗斯联邦内政机构雇员的有效性。

关键词：警察，国外，额外的专业教育，高级培训，效率

Abstract. *In the countries of Western Europe and the USA, a diversified system of additional professional education (APE) is functioning in law enforcement systems without a centralized model typical of Russia, which increases the possibility of using the existing variety of forms of training for law enforcement officers. The article presents a sociological analysis of foreign experience in this field, in the aspect of consideration and justification of the possibilities and limitations of its use in order to increase the effectiveness of APE for employees of the internal affairs bodies of the Russian Federation.*

Keywords: *police officers, foreign countries, additional professional education, advanced training, efficiency*

The modern law enforcement system is a highly professional social institution, which makes extremely high demands on the qualifications and personal qualities of both officers and ordinary personnel. The system of professional training of law

enforcement personnel in modern developed countries is multilevel and includes, among other things, institutions of additional professional training and education. Currently, the system of additional professional education (APE) in law enforcement is an independent social institution that implements the following functions: *adaptive* (to changing conditions in the field of law and order), *motivational* (to personal and professional development of employees), *social and communicative* (to establish and expand professional ties with colleagues), *of professional mobility* (vertical and horizontal), *of transfer of knowledge* (vertical and horizontal),

The empirical basis of research and methods. The study is a secondary analysis of modern foreign scientific literature on the training system in law enforcement agencies of individual countries of Western Europe and North America, based on the method of comparative analysis. Despite the differences between Russia and foreign countries in terms of political structure, socio-economic processes and the development of social institutions, modern law enforcement systems in different countries face many common problems and challenges that contribute to the formation of common needs in the field of advanced training, including: and a dynamic regulatory environment, requiring constant updating and improvement of legal knowledge; adversarial and independent nature of justice, which requires high qualifications in the investigation of crimes, the collection and presentation of evidence, argumentation during the trial; the emergence and spread of new types of threats to public and state security, in particular terrorism, extremism, cybercrime; the complexity and constant updating of methods and technologies used in the commission of crimes, especially relevant in the field of cybersecurity and other high-tech industries; the emergence of new methods and technologies used in the activities of law enforcement agencies in the investigation and prevention of offenses, the protection of public order; a growing demand for increasing citizens' confidence in law enforcement, requiring the development of psychological, social and communication skills, as well as the ability to work in a socially heterogeneous environment and more.

The presence of these problems makes the law enforcement systems of various countries adapt to new conditions. This causes the natural interest of Russian specialists in studying the experience, current trends and directions of development of professional training in the law enforcement sphere of developed countries, which are characterized by a high involvement of employees in raising their own qualifications [Zakatov 2017: 313-315].

Research Overview. The basis for the professional training of law enforcement personnel in Western Europe and North America, as well as in Russia, is a multilevel system of specialized educational institutions. Depending on the position and level of responsibility, the policeman may be required to possess either only basic professional training, or higher or postgraduate education. Promotion

through the ranks usually requires an increase in the educational level, either by obtaining the appropriate formal education of the next level, or through the APE system. An effective example of such a multi-level, holistic training system in Europe is Germany. There are three levels of training in the German system [Isaeva 2018: 54-59]. The lowest level is formed by schools of the land police and schools of the paramilitary police, where training under the 1-1.5 annual program provides secondary specialized education and access to service in positions of the middle commanding staff. The second level of education is a 3-year training at special police departments in universities of public administration or high schools of the police. Admission to these educational institutions requires either a secondary specialized or higher professional education. The third, highest level of professional training is the passage of an annual training program in state or federal higher schools of the police, as well as compulsory education at the higher police school of Germany - Deutsche Hochschule der Polizei (DHPol). The latter is the highest level of professional training for police personnel and the center of competence for the Federal Police - the core of the German law enforcement system.

Of particular importance in terms of developing new competencies necessary for the police to meet changing conditions and threats are three special elements in the DHPol structure: the Institute of Police Technologies, the Police Security Research Coordination Unit, the Police and Political Education Directorate. Education at DHPol is largely regarded as continuing education. The training program for 2019 includes three main areas of professional development: *1) leadership, organizational and administrative processes; 2) operational management, transport, logistics; 3) criminal law and jurisprudence* [Jahresfortbildungsprogramm 2019]. In addition to groups of full-fledged courses and events supervised by various departments of DHPol, a number of specialized interdisciplinary trainings are offered to students. Thus, the activities of the largest German police educational organization are characterized by a high thematic diversity of the offered continuing education courses and other specialized events.

With all the importance of DHPol in Germany's additional police training system, it is only its highest level. The training itself for all categories of law enforcement officials is ubiquitous and universal, it is strongly encouraged by management and is both an opportunity and a necessity for employees. These can be centralized continuing education courses that operate in each federal state of Germany [Weiterbildung 2019]. There are also decentralized forms of continuing education at police departments, as well as e-learning opportunities. Independent participation in various courses and trainings that are relevant to the needs of a particular employee and is determined by the content of his professional activity is encouraged.

The determination of the content and formats of training largely depends on the employee himself, and state, as a rule, covers their financing. Further training opportunities exist not only at police academies or at police departments, but also outside the German law enforcement system. The international cooperation and competence of the German police is actively encouraged. The multilevel and continuous development and increase in the efficiency of human and social capital of law enforcement officials, financial support for improving their qualifications from the state determines the high level of professionalism of the German police and the effectiveness of the APE institute in Germany.

In the UK, the police training system is also multi-layered, and includes: 1) regional training centers providing initial training, and 2) a college of senior police personnel. Specialists note mainly the practical orientation of the British vocational training system: the ability to communicate, reason, think logically, listen to the interlocutor, be tactful, find an approach to people and establish contacts with them, build trust, be able to interrogate witnesses and more [Vasenin, Denisov 2014: 311- 314]. That is, in the training of employees, the emphasis is on the development of general cognitive and communication skills. The development of more specialized knowledge and skills is carried out to a large extent during special additional programs. The need for increased professionalism at different levels of the hierarchy is obvious and, according to the authors, requires a closer connection between universities and police practice.

For the countries of North America (Canada and the USA), a more complex and decentralized system of training for law enforcement officers is characteristic, which is largely associated with the features of the federal structure and a high degree of independence of local and regional parts of the law enforcement system. In Canada, where police education is practice-oriented, three different models of retraining are highlighted. The first is internal or local: training directly in police units of large cities in the form of experience transfer. The second - a centralized training program involves undergoing on-the-job training at police academies and colleges. The third - a comprehensive training program, unlike the previous ones, is much longer, up to 3 years, and includes theoretical lessons in addition to practical ones. The passage of such courses is a necessary stage of training for special services officers and senior police officers [Vasenin, Denisov 2014: 311-314].

The United States is characterized not only by a developed system of educational institutions at various levels of the law enforcement system (federal, municipal, state level), but also by active interaction with the civilian educational system. Police training is often carried out directly on the ground, resulting in a high diversity of its specific forms and models. The staffing of the police and other services is often based on the recruitment of civilian specialists and their "retraining" through additional training. This makes the role of the various forms

of APE a key element in the training of American police officers, especially at the lower and middle levels. In the training and retraining of police personnel, private educational institutions and organizations belonging to states and municipalities play an important role, they are highly independent and determine the content of programs in accordance with their needs. The result was an extremely wide network of educational institutions involved in police training. Thus, according to the data of the US Department of Justice in 2016, in 2013 there were 664 local and state academies in the country providing initial police training [Reaves 2016]. In addition to educational institutions of local and regional level, specialized federal educational institutions operate in the USA, training in which, as a rule, is required for employees of federal services, primarily the FBI. Such organizations are united in a network of Federal Law Enforcement Training Centers (FLETC) run by the US Department of Homeland Security. FLETC is the largest center for continuing education and retraining of US law enforcement officials, serving more than 90 federal agencies and offering a large number of highly specialized programs that can be implemented both at training centers and outside, including the duty station. In total, as of April 2019, the FLETC catalog included 84 programs [Search the Training Catalog / FLETC 2019]. The analysis of the catalog shows its extremely high specialization and adaptation to new needs and threats, requiring new competencies from police officers.

The American police training system is in many ways unique. In the vast majority of cases, police officers do not need special higher education, and the acquisition of the necessary knowledge and practical skills is carried out with the active participation of private and public educational institutions. At the same time, centers of highly specialized competencies have been created at the federal level, which provide training in accordance with changing conditions and needs. In this aspect, the activities of FLETC are in many ways similar to those of the DHPol high school in Germany.

Discussion and conclusions. A comparative historical analysis of modern literature on the training system in law enforcement agencies of different countries allows us to highlight several general points that characterize the main trends and problems in this area. Firstly, most experts note the growing need for additional police professionalization and the need for closer integration of police activities and higher education, scientific and practical substantiation of new methods and technologies of police work [Paterson 2011]. Moreover, such integration is fraught with certain difficulties due to differences in the social institutions of education and law enforcement. In many cases, the police are focused on predominantly practical training, which can be carried out directly within the police, while education with a high component of academic, fundamental knowledge and research is considered excessive. Nevertheless, the growing need for professionalization,

including through effective interaction with departmental and civilian universities, is considered a strategic development direction in many countries of Western Europe and North America. Secondly, additional training and education are considered integral elements of professionalization, and specialization and adaptability are key factors in the success of the respective programs. Examples of the most successful countries from the APE point of view, such as Germany and the USA, show that additional education should be diverse in both form and content, focused on the specific knowledge and competencies required by various categories of employees, and meet changing conditions of service and threats to public safety. The desired changes in the vocational training system are also associated with the need to change pedagogical approaches and, in particular, focus on the principles of andragogy (adult education), as well as the philosophy of policing, in which problem orientation and interaction with local communities play a key role [White, Escobar 2008]. Thirdly, it is possible to note thematic areas in the work of law enforcement agencies, which attract a steady and growing interest. These include courses and other activities related to the development of new types of technologies, counter-terrorism activities, public events, effective interaction with society and the ability to work in a multicultural environment. In most developed countries, the last two points are given special attention. Since the police are considered primarily as a public institution, the ability of police officers at various levels to interact with citizens, minorities and the public becomes key competencies that allow solving specific professional tasks, such as interviewing witnesses, interrogating suspects, and preventing crime in specific social contexts. The growing importance of such competencies is evident in the US and EU countries, which are currently experiencing another wave of migration crisis. Fourthly, in the system of professional training in Western countries, as well as the law enforcement system as a whole, the role of international cooperation is significantly increasing. This is especially obvious and relevant for the countries of the European Union, which strive to create a common educational space and platforms for the exchange of experience and law enforcement cooperation in order to increase their own competencies, disseminate best practices and establish effective communication channels. A key role in these efforts is played by the European Police College (CEPOL), which has EU agency status and provides international cooperation for EU police officers [CEPOL: Types of Learning 2019]. CEPOL regularly organizes specialized courses, seminars, conferences, exchange programs, manages a special educational platform on the Internet, free of charge for the police of participating countries. Requirements for the effectiveness of police units and limited budgets, as well as competition from the corporate sector, force law enforcement agencies to invest, among other things, in courses on management and development of effective leadership skills [Voronov, Petrova, Račko 2006].

Modern trends in the development of educational models in the law enforcement systems of developed foreign countries, thus, with all their diversity, are characterized by common features and problems. Since the Russian law enforcement system is faced with similar problems (the emergence of new technologies, the need for effective management, the need to work in an increasingly difficult social and cultural environment, the growing demand for building trusting relationships with society, etc.), studying the experience of industrialized countries becomes an urgent and sought-after task on using proven multi-tier APE technologies. It is advisable not to confine ourselves to the existing interaction of the Russian law enforcement system and the international police forces through INTERPOL, but to concentrate additional efforts on studying the experience of professional police education in foreign countries in order to increase the effectiveness of the APE of the Russian police.

References

1. Vasenin A.Yu., Denisov S.L. 2014. Experience in training specialists in the police of foreign countries. - A new word in science: development prospects. №. 1. P.311-314.

2. Zakatov V.V. 2017. Training of police officers abroad: features and development trends. - Baltic Humanitarian Journal. № 4. P.313-315.

3. Frolov A.N., Ermakov O.I. 2016. The use of foreign experience in the training of Internal Affairs Officers. - The postulate. № 12. P.1-4.

4. CEPOL: Types of Learning / CEPOL. 2019. URL: https://www.cepol.europa.eu/education-training/our-approach/types-learning (checked 23.05.2019).

5. Jahresfortbildungsprogramm 2019. Münster: Deutsche Hochschule der Polizei, 2019. URL: https://www.dhpol.de/JFP_2019.pdf (checked 20.05.2019).

6. Isaeva I. 2018. Police training in the system of professional training for federal police force in Germany. – Comparative Professional Pedagogy. Vol.8 (4). P.54-59.

7. Paterson C. 2011. 'Adding value?' A review of the international literature on the role of higher education in police training and education. – Police Practice and Research. Vol.12. P.286-297.

8. Search the Training Catalog / FLETC. 2019. URL: https://www.fletc.gov/training-catalog (checked 22.05.2019).

9. Reaves B.A. 2016. State and Local Law Enforcement Training Academies, 2013. / Bureau of Justice Statistics, U.S. Department of Justice. July 2016. URL: https://www.bjs.gov/content/pub/pdf/slleta13.pdf (checked 21.05.2019).

10. Voronov V., Petrova I., Račko E. 2006. Reģionālās ekonomikas konkurētspējas paaugstināšana un aktīvā adaptācija globalizācijas apstākļos. Daugavpils.120 p.

11. White M.D., Escobar G. 2008. Making good cops in the twenty-first century: Emerging issues for the effective recruitment, selection and training of police in the United States and abroad. – International Review of Law Computers & Technology. Vol.22. P.119-134.

12. Weiterbildung / Polizei Niedersachsen. 2019. URL: https://polizei-studium.de/weiterbildung (checked 21.05.2019).

教育迁移的原因和因素克麦罗沃地区青年
CAUSES AND FACTORS OF EDUCATIONAL MIGRATION KEMEROVO REGION YOUTH

Ulmyasbaeva Anastasia Olegovna
Senior Lecturer
Kuzbass State Technical University named after T.F. Gorbachev

注解。 文章探讨了促使克麦罗沃地区青年教育移民的原因。 作者的结论是，解决青年移民教育活动问题对该地区的教育机构，企业和政府是互利的。

关键词: 青年教育移民，申请人，移民流动，动机，因素，社会伙伴关系，区域发展。

Annotation*. The article examines the reasons prompting the educational migration Kemerovo region youth. The author concludes that the solution to the problem of youth migration educational activity is mutually beneficial for educational institutions, business and government in the region.*

Keywords*: Educational migration of young people, applicants, migration flows, motives, factors, social partnership, the development of the region.*

The ongoing transformation of all types of social and economic interaction in various spheres of life of the Russian society the most significant way affect the nature of the migration process. However, their spontaneity, and the severity of the disorder in the regions generate imbalances in the labor market, form the negative characteristics of social well-being, including young people, thereby actualizing the necessity and possibility of education outside their hometown or region.

Today, the education system has been an important factor of development of economy and society as a whole. Due to increased globalization educational migration is one of the major components of migration flows and has a high degree of intensity in the modern world. Consequently, in the current socio-economic conditions, more than ever, the question becomes relevant process management education of youth migration. This segment is currently ranked as the most socially and economically vulnerable in the system of Russian regional security and development.

Educational management of migration is due not only to the federal level, but also regional. Due to the specificity of production and economic entities of the Kemerovo region, educational migration in the region superimposed on the existing local capacity and awareness of this fact makes it possible to review the organization of the educational management migration process in the development of the region and the preservation of security. A study of mutual relations between the educational

migration of young people and socio-economic development of the region, mechanisms of migration flows, personal motives of educational workers, incentives for the development of regional educational systems only underscores the urgency.

Today Kuzbass migration of young people in the context of a variety of reasons is an important aspect, and its consequences are varied and cover the socio-economic, demographic, geopolitical and other aspects of society. The first inter-regional educational migration of young people leads to a change in the population and its age structure. It is seen as the direct demographic losses, which have a direct outflow of young people outside the region, and potential - declining birth rates and an aging population of the Kemerovo region. The outflow of qualified young professionals for employment or admission to master's degree, post-graduate course leading to differentiation in the population structure by education level, social status, scope, which in turn leads to a limitation of opportunities, innovation economy of the region and its lagging behind other regions of the country. Another consequence of the migration process is to reduce the demand for jobs, as well as increased competition in the field of employment.

According to the Local Agency of Federal State Statistics Service of the Kemerovo region, the population of Kuzbass aged 15-29 years decreased by 16.8% in the period from 2014 to 2018 (see. Table. 1). If current trends continue by 2025 is projected to decrease in the number of high school graduates, university at the age of 15-29 years for another 46 thousand. People. [1].

Table 1

The share of young people aged 15-29 in the general population of the Kemerovo region in 2014-2018.

Indicator	2014	2015	2016	2017	2018
15-29	535572	509590	488218	465969	445544
Total population	2734075	2724990	2717627	2708844	2694877
Percentage of population aged 15-29 (%)	19.6	18.6	18.0	17.2	16.5

Formation of the demographic potential is an important factor for sustainable development of the region. For the purposes of the management of migration of young people, which is partly educational in nature, it is important to study the migration is not after the fact, when the departure is already committed, and to take preventive measures when a person only thinks about moving. For this reason it is important to investigate the migration of young people. So, our ongoing study of the education of the migration situation in the Kemerovo region showed that the causes which impel Kuzbass school graduates leave the area are: the lack of employment opportunities in the specialty - 76%, low income - 65%, environmental conditions - 48%, cultural and leisure environment - 36% (see. Fig. 1).

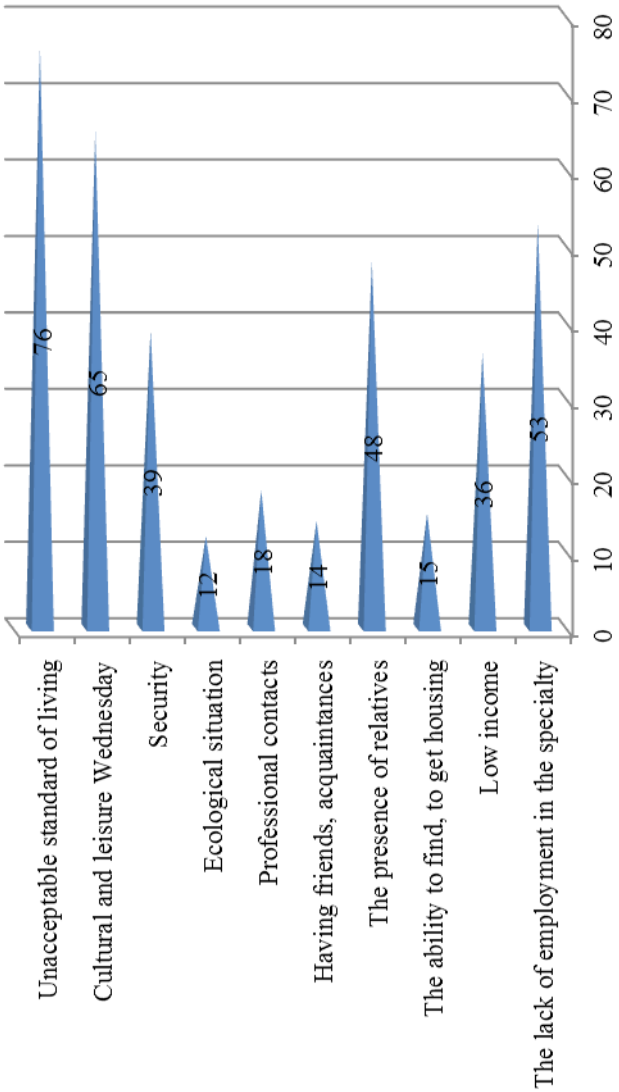


***Fig. 1** - Reasons why the Kuzbass school graduates leave the area (%)*

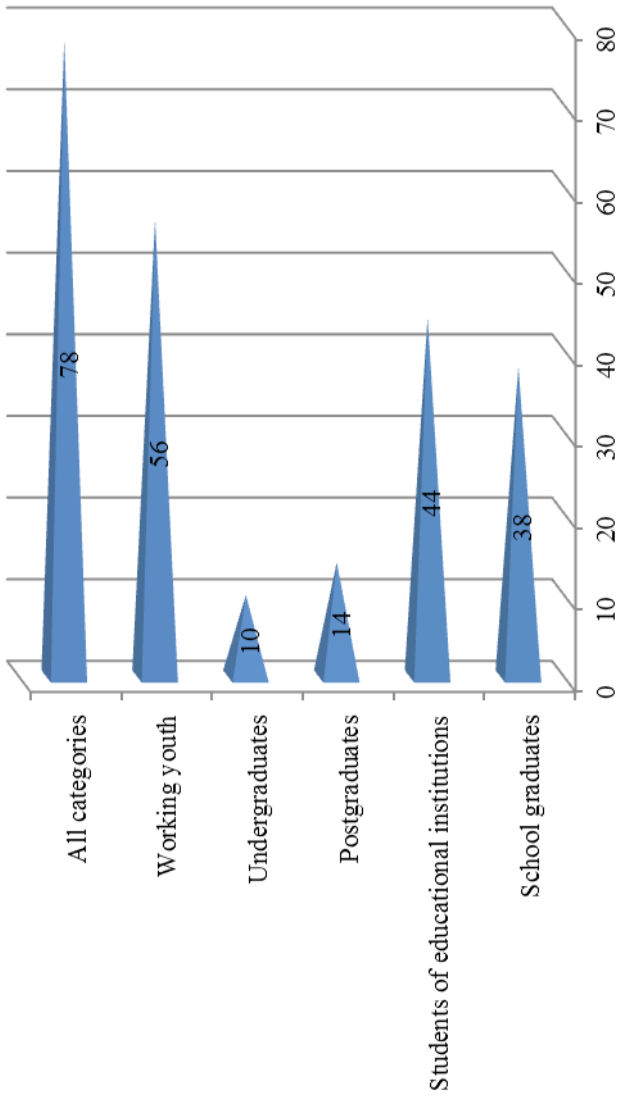


***Fig. 2** - categories of citizens in need of primary necessity of doing work to reduce educational migration (%)*

Assessing the problem of educational migration of young people, with the position of the employer, experts, the role of which were employees of regional and municipal executive authorities of the Kemerovo region, specialists of secondary and higher educational institutions of Kuzbass, provided data showing that the causes of educational migration in the region associated with the decline various sectors of the economy and the economy of the region - 49%, a prestigious high-paying jobs - 38%, wages - 36%, environmental Obst Novki - and the quality of education - 30%, lack of development of leisure and cultural environment of cities - 51%.

Experts note that the primary need to maintain efforts to reduce educational migration, increasingly required in respect of high school graduates and students of educational institutions (see. Fig. 2). This is largely caused by the fact that this category of young people aged 16-22 years is not burdened with well-established way of life, easy-going, ambitious, etc.

Noteworthy is the fact that the applicants leave to the neighboring regions of Siberia, not in the capital cities - Moscow, St. Petersburg. Therefore, in our view, should consider aspects such as the quality of higher education institutions, the range of training courses, improving the quality of teaching in schools, etc.

Thus, all of the above stated reasons, only aggravate the situation and are important motivators for moving to another region. In addition, it should be noted that the choice of the higher educational institution students focused not only on the level of training and the demand for future profession, but also on socio-economic factors in the region. Consequently, educational migration of young people is one of the available areas of penetration in the labor market is another area. In this regard, as shown by many studies in the field of migration activity, graduate school systems, and in general, youth, educational migration, which represents temporary, annually loses its vector and has the potential to go permanent.

Unfortunately, the sociological research among prospective graduates of 11 classes of educational institutions, employers and local authorities of the Kemerovo region in many ways confirmed the hypothesis of a difficult situation of modern higher education system in the region, which is automatically projected onto the labor market. Analysis of the spatial aspects of a potential school leavers mobility gives the opportunity to the preliminary conclusions about the significance of the activities of the higher education system for the regional labor market. Equally important in this respect plays a business, interested in the availability of human resources required quantity and quality, favorable investment climate, adequate economic policy of the region. Currently Kuzbass employers evaluate the theoretical knowledge and skills of graduates of educational institutions by 61%, and almost the entire 39%. Today, HR departments of companies noted a serious gap between the knowledge that enable educational institutions and activities in

the real world. In order to master the practical skills of future profession already enough traditional teaching methods, it requires innovative techniques honed on efficiency and results, such as the establishment of partnerships and contractual relationships with enterprises and organizations; target contract training students (sectoral inquiry); participation in the educational process (lectures, seminars) and the development of joint educational programs; financing institution, including the updating of material and technical base; cooperation in the field of scientific research; establishment and payment of scholarships and grants to talented students, teachers, young scientists.

Thus, in dealing with this situation, the interests of all the institutions of society: government, business and educational organizations. Therefore, the most effective and relevant instrument to address the problem of youth educational migration in the Kemerovo region, we see the development of social partnership sphere of education system with businesses and local authorities.

References

1. The Federal State Statistics Service. The number and migration of the Russian population. - Access mode :http://www.gks.ru/bgd/regl/b18_107.

Ivan Ilyin世界的“理由”
"JUSTIFICATION" OF IVAN ILYIN'S WORLD

Maltseva Anna Victorovna
Candidate of Political Sciences, Associate Professor
Belgorod State Technological University named after V.G.Shouhov
Zhdanova Irina Vadimovna
postgraduate
Belgorod State Technological University named after V.G.Shouhov

摘要。 通过识别和描述Ilyin的“世界的初始直觉”，试图定义由I.A.构建的概念设计的基本元素。 Ilyin在“宗教政治行为”中提出了“世界的正当性”。

关键词：世界接受，世界，统一，真理，宗教和政治行为。

Summary. *Through identification and the description of "an initial intuition of the world" of Ilyin the attempt to define basic elements of the conceptual design built by I.A. Ilyin for "justification of the world" in "the religiouspolitical act" is made.*

Keywords: *World acception, world, unity, truth, religious and political act.*

In the Russian philosophy of the beginning of the XX century I.A. Ilyin's creativity holds a specific place: out of "a philosophical mainstream" of all the unity of philosophy; against the liberal and socialist hobbies of most of the Russian religious philosophers; maximum involvement into relevant political and legal "situation" and perspective. Perhaps, it is possible to claim that the conviction in need of "synthesis" (practical was the general only and philosophical) the fact that in early Christianity the name "oykumena" carried (in the Russian philosophy on this "place" "conciliarity" became stronger). Ilyin, the religious philosopher, is considered the adherent of the strict, logically verified definitions, to him, at first sight, it is impossible "pensiveness" (and "mysticism") most of his contemporaries – philosophers (and he is alien to a claim for a word of God); it is more interesting to that to reveal basic elements of a conceptual design by means of which he undertakes "justification of the world".

Disgust from the world makes human life senseless, depreciates all "elements" of this world. And therefore it is so important for Ilyin to prove acceptance of the world as ortodoxy: life, creativity, any activity in the world is senseless without it. But, Ilyin has already made the acceptance of the world. In Christianity he looked for and found justification of this initial intuition.

So, for us it is important to reveal and describe "an initial intuition of the world" of Ilyin. It is represented to us so that its fundamental lines are, first, the unity of the world and, secondly, the world pierced by God's beams. Concerning unity –it is originally feeling of direct perception which he poetically describes as follows: "Look: the world around us is one huge unity where everything is mutually connected. Clouds bring us a rain, the rain fills the rivers, the rivers attract the waters to the sea, and the sea washes all the globe. The far sun lights each corner and sends us heat, light and joyful days" [1, page 182]. The same unity connects people: "All mankind lives as in uniform continuous spiritual air" [1, page 246], - as among themselves, and with the world in general: "The same happens also to us, people: all of us are interwoven into great and fine fabric of the world to make this world and, is even finer and more perfect than ourselves. Affairs terrestrial where everything is connected by live communication and where each act and also each not act imperceptibly affects all the rest are fine" [1, page 182]. And this uniform world, "the world of people and things is penetrated by grace trends, lit and consecrated with God's presence of mind" [2, page 76].

This truth, according to Ilyin, is also approved by Orthodoxy. Yes, the philosopher recognized not only existence, but also force of withdrawing from the world tradition in Christianity; however, according to him, "this tradition never expressed the last and deepest relation of Christianity to God's, to the God's world" [2, page 307], moreover, he saw influence of currents alien to Christianity Platonic [in particular – neoplatonic] and a Buddhist ascetism in it. The thinker addresses the Gospel, and the first that he establishes, so is various meanings in which the word "world" is used. So, "sometimes "world" means all universe in general as it is created by God; sometimes it means all set of the people to which there has to be preached a Gospel" [1 .310], and from here draws a conclusion: "It is impossible to allow that Christ taught us to reject God's creation or all set of the people which are hoping a christian message and having to get him …" [2, page 310].

Ilyin claims, giving numerous extracts from the Bible that "in the Gospel and in Messages "world" is rejected only so far as he disappeared from God and here resists to Him as independent, alien to Him and far; it is the world approving itself without God and against God as the independent value and reality, - the world tempting and seducing the person, awakening his lust by the "sins" [comparing Mark. 14.19.; 2 Peter 2, 20; Tim.4, 10, etc.] and conducting it to a devil. For this reason and so far as "world" "lies in the evil" [3 John.5.19] and it is subordinated to "the prince of Peace of this" [John.12.31; 14.30; 16.11]; so far as "friendship with the world is hostility against God" and "who wants to be a friend to the world, that becomes an enemy to God" [James.4.4]. The Christian cannot and should not love such world: "You do not love the world, the fact that in the world: who loves the world, in that there is no the Father's love. Because everything that in the world: the lust of flesh, lust of eyes and pride of life is not from the Father, but from this world. Both the world passes, and his lust, and executing God's will stay forever" [3 John.2.15.17]" [2 page 310].

Such "world" "cannot know God [John.1, 10; 17, 25]; he hates Christ and his pupils [John. 7.7; 8, 23; 15, 18; 17, 14]; he accepts and recognizes "only his" [John. 15.19]. But Christ "won against this world" [John. 16, 33]; "and everyone, given rise from God, wins against the world, and this is the victory which won the world, our belief" [3 John. 5.4]. What in "this world" is considered "unwise" "ailing", "not notable", can be worthy and "chosen" in the face of God [3 Corinthians 1, 27.29. Its "image" is changeable [1 Corinthians 7, 31]; and "believers should not be conformed with it" [Rom. 12, 2] because "temptations" live in it [Mtt. 18, 7], they are taken by "people of this world" [Luke. 12, 30]; they will also be judged and condemned together with it [1 Corinthians 11, 32]" [2, page 311].

But the Universe is created by God: "Both the sky, and the earth, and the sea, and "everything that in them"; and God is "The Lord of the sky and earth" [Mtt. 11, 25; Luke. 10, 21]. "He created everything that in heaven and on the earth, visible and invisible. Both He is, and everything costs to Them" [the Epistle to the Colossians. 1, 16-17; comp. Ephesians. 3, 15; comp. the Acts of Apostles. 4, 24; 14, 15; 17, 24]. So "His force and the Deity" "from creation of the world" "are seen" "through examining of creations" [Rom. 1, 20]" [1. 311], and therefore: "The objective structure of the God created world is not subject at all to an abuse and rejection" [2, page 311].

The same concerns also the person: "The mankind is not rejected by God, and therefore cannot be rejected also by us. On the contrary, God saves and educates the person. "So God loved the world that he gave His Son that any believer would not die, but had eternal life" [John. 3, 16], "that the world was saved through It" [John. 3, 17]. Christ is "A Lamb of God Who undertakes a world sin" [John. 1, 29]; "it is propitiation for sins" … "whole world" [1 John. 2, 2], and with Him God "reconciled with Himself the world" [2 Corinthians 5, 19; the Epistle to the Colossians. 1, 20]. For this reason Christ speaks about himself: "I am light to the world" [John. 8, 12; comp. John 3, 19], and about apostles: "You are light of the world" [Mtt. 5, 14] also shows that the Gospel "has to be preached" "in all people" [Mrk. 13, 10] and "on all Universe" [Mtt. 24, 14] …" [2, page 311-312].

Ilyin draws from this a conclusion about rejection of the world which does not stay in God, being a source and the tool of godless lust; but about acceptance of the world, as created by God, making the sense and purpose.

The sense and purpose of the world are defined so: "This sense is put into words: "I won against the world" [John. 16, 33] and therefore: "any power in the sky and on the earth is given to Me" [Mtt. 28, 18]; and still: "everything is betrayed to Me by My Father " [Mtt. 11, 27]. And the purpose of the world is "organization of fullness of times" and "to connect all heavenly and terrestrial under the head of Christ" [Gospel. 1, 10]" [1. 312]. Ilyin exclaims: "How not to accept the world when it is created by God, "it is loved by Him, saved, educated, expiated and

sent to the power to Christ, the Son of God?" [2, page 312]. God does not need the benefits, but he suited the sky, the earth and elements for the person, having allowed it to enjoy the sent benefits. I.A. Ilyin gives this argument, referring to Anthony the Great and Monk Evgrafiy. In this regard, the Christian has to "bring His Spirit in all "terrestrial". The sense of the embodiment of Christ also consists in it: He specifies to people an opportunity and a way of a right, Christian action, right and creative acceptance of a burden of materiality [flesh] and a burden human - sincere separation [identity]. Christ, according to the philosopher, sought to teach us to live on the earth in beams of the God Kingdom. And as He accepted mortal life, the person standing not above Christ cannot reject it. It has to include in the course of life creative making in this world, that is improvement in the spirit of itself(himself), both neighbors, and things.

Therefore acceptance of the world after Christ will be true that has to become the basis of creation of the Christian culture consisting in favoring, judgment and creative transformation of the world, its love, strong-willed and inspired execution. This is the idea of orthodox Christianity by I.A. Ilyin.

The main search of Orthodoxy, according to Ilyin is in that "to consecrate every instant terrestrial work and suffering: from Epiphany and the woman in labor prayer to the prayer for the dying, a burial service and forty days' prayers; and in a prayer before studying; and in an appeal "give a rain to the earth thirsty, Save!"; and in consecration of wheat, wine and unction; and especially in all sacraments: and a rank of sacred coronation, and in the oath to the sovereign; and in a rank of consecration of banners, blessings of military guns or the vessel military "on opposite" released …" [2, page 314]. I.A. Ilyin considered Orthodoxy initially world acceptable bringing as an example, the hermit reconciling princes, edifying or reproaching the sovereign of the bishop, the managing monastery. World acceptable is also all Russian art "from Dionysius to Nesterov, from the beautiful Kiev singsongs to "Life for the Tsar" of Glinka, from the ancient small temple in fortress of Ivan City to Christ the Saviour Cathedral in Moscow" [2, page 314-315]. The metropolitan Filaret had poetic correspondence with Pushkin, and on the oldest Russian university in Moscow is written: "The light of Christ educates everybody". The description of Novaya Zemlya "Miracles of the God's nature" was made by the novice Borisov from blessing of the orthodox aged man, and the Troitsk Monastery and Optina Pustyn played an important role in the Russian education. But, we will repeat, the main condition, an obligatory prerequisite of acceptance of the world is defined as: "The world makes sense because it is shone by perfection; and moreover – the world has life because in it the commitment to excellence lives and governs" [3, page 410]; where there is no such things, the world is subject to "improvement", or if it is not able the person [it cannot "educate" devilish will, he is not imperious and over the "outer darkness" break-

ing sometimes to the world], he nevertheless has to fight against these "powers of darkness" in the world. The Christian sees, perceives the world under a certain point of view, he cannot present it extra Christian or "secular". His direct task is Christian education and an enlightenment of the world.

And, as the general conclusion: "Christ's kingdom is "other-wordly" [John. 18, 36], but it is announced to the world and mankind; and therefore his idea is stated for this world as calling and vow. It is incorrect to think that the Kingdom of God is similar to terrestrial kingdoms. It is also incorrect to think as if it exists for this world. But "this world" exists as the greatest field [срав. Mtt. 13, 38], for sowing and increase of the God's Kingdom. The evangelical christian message consists not in that the earth and the sky are opposite and unjoinable because the earth is doomed to a sin and people are children of a sin, but that the sky has already gone to the earth in the person of the Godman that "the Kingdom of Heaven came nearer" [Mtt. 4, 17; срав. Mtt. 12, 28; Mrk. 1, 15; Onions. 4, 43; 10, 9; 10, 11; 11, 20; 21, 31, etc.] that an opportunity and reality of not sinful action and world transformation are given and certified. The gospel bears to the world not a damnation, but a vow, and to the person – not dying, but rescue and joy. It teaches not to rescue from the world, but its Christianization" [2, page 315].

So all Christian culture "is consecrated" or "comes true": "Science, art, the state and economy are kind of those spiritual hands with the help of which the mankind takes the world. And a problem of Christianity is not to cut these hands fanatically, but in penetrating their work from within the live spirit apprehended from Christ. The Christianity has the great strong-willed task which many of us do not comprehend in the world. This task can be designated as creation of Christian culture" [2, page 316].

References

1. Ilyin I.A. Collected works: In 10 vol. Vol.3. – Moscow: Russian book, 1994. – 592 pages.

2. Ilyin I.A. Collected works: In 10 vol. Vol. 1. – Moscow: Russian book, 1993. – 400 pages.

3. Ilyin I.A. Collected works: In 10 vol. Vol. 8. – Moscow: Russian book, 1998. – 576 pages.

评估医学专业申请人符合性的心理学和教学规模
PSYCHOLOGICAL AND PEDAGOGICAL SCALE FOR EVALUATION OF MEDICAL PROFESSIONAL APPLICANT CONFORMITY

Menzul Elena Vladimirovna
Candidate of Psychological Sciences, Associate Professor
Head of Department
Samara State Medical University
Tekhteleva Natalya Victorovna
Candidate of Psychological Sciences, Associate Professor
Samara State Medical University
Ryazantseva Natalya Mikhailovna
Senior Lecturer
Samara State Medical University

抽象。 该文章规定了形成一套综合诊断工具和制定指标和标准的任务，以便申请人在大学和专业活动中学习。 建立申请人专业心理选择制度的基础是相关性，科学有效性，一致性，实用性，活力性原则。 在评估卫生工作者职业特征的专业重要品质时获得的结果不仅用于确定申请人是否适合在大学学习并获得适当的职业，而且还用于规划职业培训，增加 教育活动的有效性，优化教育条件和专业自决。

关键词：职业适应性，职业自我决定，心理稳定性，情绪敏感性。

Abstract. The article sets the task of forming a complex of diagnostic tools and developing indicators and criteria for the readiness of an applicant to study at a university and professional activity. The basis for creating a system of professional psychological selection of applicants were the principles of relevance, scientific validity, consistency, practicality, dynamism. The results obtained during the assessment of professionally important qualities that are characteristic of the profession of a health worker were used to determine not only the suitability of an applicant to study at a university and obtain an appropriate profession, but also to plan vocational training, increase the effectiveness of educational activities, optimize educational conditions, and professional self-determination.

Keywords: professional suitability, professional self-determination, psychological stability, emotional sensitivity.

Motivational activity, the ability to tolerate high psycho-emotional stress, the intellectual potential of a student - a future specialist, are important components of the success of both educational and professional activities.

The need for a comprehensive methodology, which would allow to evaluate the possibilities of the applicant, is long overdue. However, the lack of uniform requirements and evaluation criteria for a specialist did not allow for such a diagnosis. A working group was formed on the basis of the laboratory of socio-psychological studies of the Samara State Medical University, the task of which was the formation of a set of diagnostic tools and the development of indicators and criteria for an applicant readiness to study at a university and professional activity. The work was carried out in several stages.

The basis of creating a system of professional psychological selection of applicants was formed on the following principles: *relevance, scientific validity, consistency, practicality, dynamism.*

To determine the professionally significant psychological characteristics of the applicant, we conducted an expert assessment of the profession. The experts were the heads of medical institutions (employers), experienced employees of medical institutions (doctors of the highest category with more than 10 years of practical experience) and leading teachers of clinical departments of Samara State Medical University.

The study involved 574 respondents.

Experts evaluated the following characteristics of the profession: focus and goals of the activity; means of labor activity; operations performed; job responsibilities; working conditions; typical errors in the work and their causes; economic, medical, pedagogical and psychological characteristics of the profession.

Criteria and indicators of success were defined: productivity; volume; efficiency; quality, reliability, faultlessness; customer satisfaction.

The results obtained in assessing the professionally important qualities that are characteristic of the profession of a health worker were used to determine not only the suitability of an applicant to study at a university and obtain an appropriate profession, but also to plan vocational training, increase the effectiveness of educational activities, optimize learning conditions, and professional self-determination.

The determination of diagnostic targets was carried out not only taking into account the results of an expert assessment of the profession, but also taking into account the criteria of customer satisfaction (employers and patients) and key characteristics that determine the specialist's competitiveness.

The following were identified as diagnostic targets:

1) professional interests, inclinations, abilities;

2) structure and content of the motivational sphere;

3) general intellectual development;

4) attention attributes;

5) formal-dynamic properties of an individual (psychomotor and communicative spheres);

6) type of emotional response;

7) emotional sensitivity;

To diagnose professional interests, inclinations and ideas about professional abilities, the I.L. Solomin "Orientation" questionnaire was used [1, 65]. This questionnaire, unlike well-known vocational guidance techniques (DDQ, PRQ professional readiness questionnaire, multi-factor determinant of professional inclinations (MDPI), Golomshtok's interests card, etc.) has several advantages: it focuses on professions that are in real demand in the modern Russian labor market, suitable for career guidance of various categories of the population, has a rigorous scientific justification and meets the criteria for quality psychometric instruments.

To determine the level of general intellectual development for professional selection, the Vanderlik test (adapted Russian version), known as the SST test (short selection test), is used [1, 76].

The test allows to determine the level of development of:

1. Verbal abilities. It allows you to predict the assimilation of the meanings of various concepts, the understanding of verbal analogies, the understanding of texts, the ability to distinguish between the direct and figurative meanings of statements, to interpret them correctly, abstracting from the meaning of a particular phrase.

2. Logical abilities. It allows to determine the level of development of logical thinking: understanding of causal relationships, the ability to identify patterns and the ability to draw the right conclusions.

3. Numerical abilities. Allows to determine the level of development of the ability to fast and accurate calculations, logical reasoning.

4. Spatial abilities. Allows to determine the ability to mentally operate objects on a plane and in space.

The listed diagnosed abilities provide the effectiveness not only of educational activity, but also make it possible to predict the success of the professional activity of a future specialist.

Applicants who receive low scores on these indicators will experience difficulties in performing complex intellectual types of activities, solving cognitive problems, making non-standard and responsible decisions, organizing their own work and the work of other people, managing, planning, controlling, constructing and designing. That is, it is possible to diagnose psychological and pedagogical unreadiness for learning.

To diagnose the properties of attention, the "Corrective Test" test is used to assess the stability, switchability, volume, and productivity of attention [6, 294].

To determine the motivation for choosing a medical profession, the methodology "Motivation for choosing a medical profession", developed by A.P. Vasilkova, which reveals the importance of choosing a medical specialty, the structure of motivation for choosing a profession was used [2, 466].

To elucidate the structural structure of the motivational-semantic sphere, the method of Joseph Nutten is used, which in qualitative forms shows a motivationally significant relation of a person to reality [4,433]. The methodology allows us to identify the motivational-semantic realization of a person, which is not limited to the area of his current active activity, but covers the scope of its potential application, which allows us to predict the success of educational activities and future student professional activities.

To diagnose the level of neuropsychic resistance, which is a reflection of both the individual's mental and somatic health level, the "Forecast" methodology (developed at the St. Petersburg Military Medical Academy) is used [6, 330]. The technique allows to determine the risk of maladaptation under stress when the emotional reflection system operates in critical conditions caused by both external and internal factors.

To diagnose the type of emotional reaction to environmental stimuli, a technique developed by V.V. Boiko [3, 601] is used. This technique makes it possible to predict a person's response to the effects of negative, ambivalent and positive incentives and to determine the type of conversion of external and internal influences into positive, neutral or negative energy states and behavioral acts.

To determine the severity of empathy, the questionnaire by A. Megrabyan and N. Epstein is used [5, 65].

To diagnose the severity and qualitative characteristics of the formal-dynamic properties of an individual, a questionnaire (QFDPI) by V. M. Rusalov is used [3, 540]. This technique allows to explore the psychomotor, intellectual and communicative spheres of the subject's activity. Within each of them, ergicity, plasticity, speed and emotionality are evaluated.

Based on the psychological diagnosis, we cannot predict success, but we can predict failure. Since when revealing even a high level of abilities, it is impossible to reliably determine whether this student will be successful. If the abilities are not enough, then it is more likely to predict that a person will experience certain difficulties both at the stage of mastering the profession and in future professional activity. Accordingly, professional selection is not so much the choice of the most successful candidates as the screening of obviously unsuccessful ones.

Thus, if we do not identify psychological contraindications, i.e. insufficient level of development of certain abilities, we believe that the applicant is professionally suitable. If contraindications are detected, then we are talking about unsuitability for the medical profession (Table 1).

Table 1.

Psychological and pedagogical scale for assessing the quality of applicants from the standpoint of the level of training and compliance with the medical profession

№	Parameter	Score	Conclusion on suitability
1.	Professional interests, inclinations, abilities	Person-person (creative class)	Recommended First
		Person-person (performing class)	Recommended
		Person-nature	Recommended conditionally
		Person-equipment Person-information Person-art	Not recommended
2.	The structure and content of the motivational sphere Effective component	Creation	Recommended First
		Obtaining	Recommended
		Avoidance	Recommended conditionally
	Emotional attitude	Positive	Recommended First
		Neutral	Recommended
		Negative	Recommended conditionally
	The temporal perspective of professional activity	Distant future	Recommended First
		Near future	Recommended
		The present	Recommended conditionally
3.	General intellectual development	More than 24	Recommended First
		16-24	Recommended
		8 - 15	Recommended conditionally
		Less than 8	Not recommended
4.	Attention Properties	15 – 19	Recommended First
		10 – 14	Recommended
		5 – 9	Recommended conditionally
		0 – 4	Not recommended
5.	Formal-dynamic properties of personality: • psychomotor sphere • communication sphere	35 – 48	Recommended
		26 – 34	Recommended conditionally
		12 – 25	Not recommended

№	Parameter	Score	Conclusion on suitability
	Emotional response	Significant predominance of euphoric activity (at least 9 points)	Recommended
		Equal number of points for euphoric, refractory and dysphoric activity	Recommended conditionally
		The prevalence of refractory and dysphoric activity	Not recommended
	Emotional sensitivity	More than 75	Recommended First
		51 – 75	Recommended
		25 – 50	Recommended conditionally
		Less than 25	Not recommended

References

1. Bendyukov M.A., Solomin I.L. Career Steps: The ABC of Career Guidance. - St. Petersburg: Speech, 2006. - P. 65-87

2. Ilyin E.P. Motivation and motives. - St. Petersburg: Peter, 2000. - P. 466.

3. Ilyin EP Emotions and feelings. - St. Petersburg: Peter, 2001. - P. 540 - 601.

4. Nuttin J. Motivation, action and future perspective. - Moscow: Meaning. - 2004. - P. 433.

5. Rogers K. Empathy//Psychology of emotions/Ed. V.K. Vilyunas, Yu. B. Gippenreiter. - Moscow: 1984.- P.65.

6. Shpar V.B., Timchenko A.V., Shvydchenko V.N. Practical psychology. Tools. - Rostov on Don: Phoenix Publishing House, 2002. - P. 294-330.

NBT测试在诊断耳鼻喉疾病并发症中的重要性
THE IMPORTANCE OF THE NBT-TEST IN THE DIAGNOSIS OF COMPLICATIONS OF DISEASES OF THE ENT-ORGANS

Teuvov Aslan Alekseevich
Department of General Surgery
Baziev Arthur Muzkharbievich
Department of General Surgery
Teuvov Islam Aslanovich
student
Teuvova Alina Aslanovna
s*tudent*
Kabardino-Balkarian State University named H.M. Berbekov
Nalchik, Russian Federation

抽象。与耳鼻喉器官疾病相关的传染病很常见。因此，这个问题需要详细研究。这项工作的主要目的是表征免疫NBT试验 – 在耳鼻喉疾病并发症的情况下中性粒细胞的吞噬和代谢活动指数。为了实现这一目标并详细研究该问题，作者使用了实验方法。该实验在40至65岁的40名患者中进行。作者发现，在该疾病的爆发期，NBT阳性粒细胞和四唑活性的百分比显着增加，达到30–40%，而对照组的数据如下 – NBT试验的活性为4.9–6.8。 %。还发现，耳石性脑膜炎患者的NBT试验为26–62%，而在所有浆液性脑膜炎患者中，NBT试验的水平较低 – 为6–11。

关键词：脑膜炎，免疫复合物，细菌感染，细胞化学指标，葡萄球菌性鼻窦炎。

Abstract. *infectious diseases associated with diseases of ENT organs are quite common. Therefore, this problem requires detailed study. The main goal of the work is to characterize the immunological NBT test – the index of phagocytic and metabolic activity of neutrophilic granulocytes in cases of complications of ENT diseases. To achieve this goal and study the problem in detail, the authors used experimental methods. The experiment was conducted on 40 patients from 32 to 65 years. The authors found that during the eruptive phase of the disease, the percentage of NBT positive granulocytes and tetrazolium activity significantly increased and amounted to 30-40%, while the control group's data were the following – the activity of the NBT test was 4.9-6.8%. It was also found that the NBT test in patients with otitic meningitis was 26-62%, while in all patients with serous meningitis, the level of the NBT test was low – 6-11.*

Key words: *meningitis, immune complexes, bacterial infections, cytochemical index, staphylococcal sinusitis.*

Introduction

The threshold of bacterial infections in various regions of the Russian Federation in recent years is characterized by a high percentage, up to 80% of the total number of patients. Especially often patients began to seek treatment already with a complicated course of bacterial infections, which is associated with frequent self-medication and irrational administration of antibiotics. Proceeding from this, as a rule, there are such complications as prolonged sinusitis, otitis media, otogenous meningitis, orbital cellulitis.

An important indicator of the natural nonspecific immunoreactivity of the body is the functional state of neutrophilic granulocytes responsible for the process of phagocytosis and intracellular digestion of the infectious agent. Due to this, the study of the functional and metabolic activity of leukocytes through the reaction with nitroblue tetrazolium, having general regularities with phagocytosis and revealing its biochemical bases, became very important [1,2].

It is known that the involvement of phagocytes depends on their ability to intracellular digestion of infectious agents. Leading intra-leukocyte microbicidal factors of phagocytes are peroxidase-dependent systems. A biochemical marker of the activity of peroxidase-dependent systems is the restoration of soluble NBT in an insoluble dark-blue formazone, which occurs in a 2-step process. Stimulation of neutrophilic leukocytes and a positive value of the NBT test occurs not only on contact with the bacterial agent, but also with endotoxins. There are also other reasons for the increase in the NBT test: immune complexes, bacillary soluble products or even blood contact with surfaces [3,4].

Based on systemic cytochemical analyzes, the main clinical and laboratory aspects of the study of the NBT test for diseases of the ENT organs such as sinusitis, otitis media, otogenous meningitis, rhinogenous orbital cellulitis were established.

Materials and methods

A total of 40 patients from 32 to 65 years with a complicated course of acute pyogenic otitis media were examined in the Otorhinolaryngological Unit of the SBHI "RKB" of the Ministry of Health of the Kabardino-Balkaria Republic. There were 28 men and 16 women. They formed the main group. 40 healthy volunteers, comparable to the main group by sex and age, were examined as a control group. The structure of complications is presented in Table 1.

Table 1. *Structure of complications of acute pyogenic otitis media*

Sex	Complications					
	Facial paresis	Acute mastoiditis	Rhinosinusogenous phlegmon	Otitic meningitis	Erysipelatous inflammation of the external ear	Total
Men	5	6	8	1	2	22
Women	3	4	4	3	4	18
Total	8	10	12	4	6	40

The spontaneous NBT test was performed by the method of I.V. Nesterova (1980). After counting 100 neutrophils, the average cytochemical index (ACI) was derived from the formula:

$$ACI = (0a + 1b + 2c + 3d + 4e) / 100, \quad (1)$$

where a, b, c, d, e – the number of cells, respectively, 0, 1, 2, 3, 4-th degree.

With the help of the presented materials and methods, the authors achieved the main goal. Which consists in the study of the immunological NBT test, which is an indicator of the phagocytic and metabolic activity of neutrophilic granulocytes in the complications of diseases of the ENT organs.

Results

Our studies to determine the value of the NBT test in bacterial (staphylococcal) infections, especially their rhinogenous complications (such as orbital cellulitis, meningitis) showed that during the eruptive phase of the disease the percentage of NBT positive granulocytes and tetrazolium activity significantly increased and amounted to 30- 40%, while the control group data were as follows – the activity of the NBT test is 4.9-6.8%.

With otitis media, erysipelatous inflammation of the external ear in the process of antibacterial therapy, with the decrement of clinical signs, there was a friendly decrease in the percentage of tetrazolium-positive cells and tetrazolium activity of granulocytes. Here we can assume the effect of antibacterial therapy on the ability of neutrophils to restore the NBT test [5,6]. In the early recovery stage, after the cessation of antibiotic therapy, the ability of neutrophil granulocytes to restore nitroblue tetrazolium increases again and the percentage of NBT positive neutrophils reaches 47-58%. That said, tetrazolium activity of neutrophils exceeds its level in comparison with healthy people in 5.6-7.5 times.

The cause of increased values of the NBT test in the early recovery stage with staphylococcal sinusitis, otitis media can be related to the circulation of immune complexes in the blood. In patients with staphylococcal sinusitis during the late recovery, the NBT test results significantly decreased and no longer showed any difference ($p > 0.05$) with the level of activity of healthy individuals.

Comparison of clinical and laboratory indicators with the studied test for staphylococcal sinusitis, otitis media, it is established that the NBT test can be a specific test. However, there were low indices of the NBT test on the background of antibacterial therapy in 3 patients with severe course of otogenic meningitis.

The data on the study of the NBT test for otogenous (pyogenic) and viral (serous) meningitises are of considerable interest. A high level of NBT restoring neutrophils is distinct in pyogenic otogenic meningitis caused by gram-negative pathogens (Pseudomonas aerugenosa). At the same time, low numbers of the NBT test were obtained with pneumococcal meningitis, viral meningitis.

The NBT test in patients with otitic meningitis was 26-62%, while in all patients with serous meningitis, the level of the NBT test was low – 6-11%. When setting the NBT test with leukocytes of cerebrospinal fluid with pyogenic meningitis and viral meningitis, the level of the NBT test was high (17-44%). These data once again confirm the differential diagnostic significance of the study of the NBT test with meningitis of different nature.

More frequent positive results of the NBT test were obtained with infections of the middle ear caused by gram-negative bacteria and blue pus bacillus, than with infections of the middle ear caused by gram-positive microorganisms and streptococci, which is especially noticeable in otogenic sepsis, rhinogenous orbital cellulitis, acute otitis media, and mastoiditis. This, apparently, is associated with toxemia in gram-negative bacteria.

Conclusion

1. Determination of the NBT test allows to detect the presence of systemic bacterial infections in the body, identify associated diseases and complications of bacterial nature and differentiate them from fevers of another etiology.

2. An increase in the activity of the NBT test indicates activity of the functional (phagocytic) activity of neutrophilic granulocytes in bacterial infectious diseases.

3. The NBT test is not always an unambiguous indicator of the presence of bacterial infections, it indicates the activation of the leukocyte membrane, which occurs under the influence of various factors.

4. Regular changes in the ability of leukocytes to restore nitroblue tetrazolium in the dynamics of the infectious process of bacterial and viral etiology, simplicity and accessibility in carrying out, high sensitivity and reproducibility of the results allow us to recommend the NBT test for wide clinical use as one of the objective methods for studying the functional state of neutrophilic granulocytes.

Acknowledgement

We express our gratitude to all the medical personnel of the Otorhinolaryngological Unit of the State Budgetary Healthcare Institution "Republican Clinical Hospital of the Ministry of Health of the Kabardino-Balkaria Republic" (Head of Department Shardanov Z.N.) and to the Eye Microsurgery Unit of the SBHI "Republican Clinical Hospital of the Ministry of Health of the Kabardino-Balkaria Republic" (Head of Department Afaunov M.A.) for the help in the research.

References

1. Haitov R.M., Ilyina N.M. Allergology and immunology: national manual. Moscow: GOITER-Media, 2009, 656 p.

2. Lawlor Jr. G., Fischer T., Adelman, D. Clinical immunology and Allergology. Moscow: Practice, 2000, 806 p.

3. Plekhova N.G., Drobot E.I., Somova L.M. Reactivity of phagocytic cells in the initiation of infectious-inflammatory processes. Advances of Modern Biology, 2011, No. 1, p. 37-49.

4. Kozlov V.A., Sennikova, S.V. Cytokine's system: Theoretical and clinical aspects. Novosibirsk: Nauka, 2004, 324 p.

5. Khaitov R.M., Pinegin B.V., Yarilin A.A. Manual of clinical immunology. Diagnosis of diseases of the immune system. A guide for physicians. Moscow: GOITER-Media, 2009, 352 p.

6. Yarilin, A.A. Fundamentals of immunology. Moscow: Medicine, 1999, 607 p.

血液透析动静脉瘘血流动力学参数的现代概念（文献综述）

MODERN CONCEPTS OF HEMODYNAMIC PARAMETERS IN ARTERIOVENOUS FISTULA FOR HEMODIALYSIS (LITERATURE REVIEW)

Koen Valeria Sergeevna
Postgraduate Student, Department of Radiation Diagnostics of North-Western State Medical University named after I.I. Mechnikov Ministry of Healthcare Russia
Zakhmatova Tatiana Vladimirovna
Doctor of Medicine, Department of Radiation Diagnostics of North-Western State Medical University named after I.I. Mechnikov Ministry of Healthcare Russia

抽象。终末期慢性肾病的社会经济意义是由于需要昂贵的治疗方法，血液透析患者的数量每年都在增加，而且大多数都处于工作年龄。用于血液透析治疗的最优选的血管通路是动静脉瘘，但其功能障碍发生在超过30%的患者中。瘘管的足够长期功能取决于其成功的成熟，及时诊断和消除永久性血管通路的可能并发症。诊断动静脉瘘功能障碍的主要方法是双重超声，可以确定直径，壁和血管腔的状态，进入流量，识别流入动脉狭窄，吻合区和流出静脉，瘘管等并发症。血栓形成，手部缺血。超声诊断血管通路并发症可以及时纠正，从而增加瘘管充分发挥功能的持续时间。

关键词：动静脉瘘，血液透析，双功超声，狭窄，血栓形成，手部缺血。

Abstract. *The socio-economic significance of chronic kidney disease in the terminal stage is due to the fact that expensive methods of treatment are required, the number of patients on hemodialysis increases annually and most of them are of working age. The most preferred vascular access for hemodialysis treatment is an arteriovenous fistula, yet its dysfunction occurs in more than 30% of patients. Adequate long-term functioning of the fistula depends on its successful maturation, timely diagnosis and elimination of possible complications of permanent vascular access. The main method for diagnosing dysfunction of an arteriovenous fistula is duplex ultrasound, which allows determining the diameters, the state of the walls and blood vessels lumen, the access flow, identifying such complications as stenosis of inflow artery, anastomotic zone and outflow vein, fistula thrombosis, hand ischemia. Ultrasound diagnosis of vascular access complications allows for their timely correction, which increases the duration of fistula adequate functioning.*

Keywords: *arteriovenous fistula, hemodialysis, duplex ultrasound, stenosis, thrombosis, hand ischemia.*

Introduction. Chronic kidney disease occupies a special place among chronic non-communicable diseases since in the terminal stage it leads to a sharp decrease in the patients' quality of life and requires expensive treatment methods [3]. The share of hemodialysis among other methods of renal replacement therapy is up to 95%. In the world, more than 2 million patients with terminal renal disease are on hemodialysis [2], and the dialysis population is increasing every year. The socio-economic significance of the disease is determined by the fact that the majority of patients are of working age - the average age in different countries varies from 49 to 65 years [1].

The most preferred vascular access for hemodialysis is the arteriovenous fistula since it is associated with a lower risk of infectious complications and lower mortality compared with the arteriovenous graft and a permanent tunneled catheter. However, arteriovenous fistula dysfunction occurs in more than 30% of patients, and the maximum duration of its functioning rarely exceeds 4 years. At the same time, the patient's stay on hemodialysis therapy can reach 20 years or more [1, 3, 13, 15]. Effective long-term treatment depends largely on the successful maturation and functioning of permanent vascular access. Given the limited vascular resource in patients, one should strive to maximize the duration of an already formed arteriovenous fistula functioning by timely diagnosis and correction of its complications. The main method for diagnosing vascular access dysfunction is duplex ultrasound [4, 11].

Changes in hemodynamic parameters in arteriovenous fistula during its maturation. Much attention is paid in the literature to changing of the hemodynamic parameters in the maturing arteriovenous fistula. Immediately after the formation of a fistula, due to a significant pressure gradient between the inflow artery and the outflow vein, there is a sharp increase in blood flow to the artery. Despite the fact that intraoperative measurement of access flow does not reflect real data due to vascular spasm and it is believed that the data may be underestimated, most arteriovenous fistulas immediately after the fistula formation show a 5–10 fold increase in access flow. For example, during the radiocephalic fistula formation, blood flow in the radial artery may increase from 20 to 200 ml/min immediately after surgery. The range of access flow values can vary greatly between different patients and is on average 50–500 ml/min. In the proximal (shoulder) arteriovenous fistula the blood flow, measured intraoperatively immediately after fistula formation, averages 700–1000 ml/min and increases by 50–100% with an increase in the vessel diameter [2]. The inflow artery lengthens and expands over time to ensure adequate blood flow. An increase in the diameter and length of the artery is accompanied by its aneurysmal degeneration in the late stages due to atrophy of the smooth muscle cells of the media.

The size of the superimposed anastomosis plays an important role in the fistula maturation and the increase in access flow. Studies have shown that when the fistula diameter is about 20% of the inflow artery diameter, there is no significant change in blood flow and ripening of the fistula. During the anastomosis formation with a size of about 75% of the artery diameter, the blood flow in the arteriovenous fistula increases significantly, and with a subsequent increase in the size of the anastomosis, a further, but moderate increase in the blood flow is observed in the outflow vein [1]. Other authors believe that when the anastomosis diameter is 1.5 times the inflow artery diameter, the blood flow increases 5.6 times, and if the diameter exceeds 3 times, the access flow increases 8 times. In this case, remodeling occurs in the anastomosis itself, which increases in size, which leads to an additional increase in the arteriovenous fistula blood flow [2, 3].

Increased access flow in the fistula affects the blood flow in the artery below the anastomosis. With a small fistula diameter, the blood flow direction in the distal part of the radial artery does not change. As the anastomosis size increases, the blood flow becomes bidirectional: anterograde to systole, retrograde to diastole. With a large amount of fistula blood flow completely changes the direction to retrograde. Significant dilation of the artery distal portion does not occur due to small access flow [2]. In the case of retrograde blood flow in the distal portion of the radial artery, blood flows through the ulnar artery through the arterial palmar arch into the fistula vein. The volume of blood entering the arteriovenous fistula from the distal part of the radial artery can reach 20–30%. When this occurs, an increase in the blood flow in the ulnar, anterior interosseous arteries and collateral branches on the forearm to compensate for the lack of blood supply to the hand.

The concept of "fistula maturation" also includes an increase in the vein diameter and the thickening of its wall (the process of the vein arterialization) [2]. A sharp increase in the fistula access flow leads to an increase in shear stress in the outflow vein. Thus, the magnitude of the shear stress ranges from -12 dyn/cm2 in the direct portion of the fistula vein to +112 dyn cm2 in the bending zones and closer to the anastomosis, which causes activation of the release of NO, prostacyclin and EDHF, increasing the concentration of cGMP in the vascular wall, which in turn, leads to relaxation of smooth muscles and the vein dilatation. At the same time, cytoskeleton reconstruction and hyperplasia of neointima and media occur, leading to a relative decrease in the diameter of the vein. NO and prostacyclin limit the hypertrophy of the vascular wall, but its thickness should be sufficient for the timely closure of the defect from the dialysis needle after puncture and prevent the hematomas development. The ratio of these mechanisms has a significant impact on the arteriovenous fistula maturation [2,

15]. Vein's large branches within 10 cm from the anastomosis, which take away a large amount of blood can prevent its maturation. Therefore, special attention should be paid to the vein branches detection during the pre-operative assessment of the vascular topography with a view to their timely ligation [6]. It has been established that the minimum diameter of the outflow vein, suitable for punctures and adequate hemodialysis, is 4–6 mm with a depth of no more than 5–6 mm [6, 13, 15].

The optimal values of access flow in the arteriovenous fistula. Among the authors, there is no consensus on the target value of the blood flow parameter in the fistula. It is believed that the minimum access flow capable of providing adequate blood flow through the dialyzer is 350–400 ml/min, and the higher the speed, the greater the likelihood of long-term successful functioning of the arteriovenous fistula and the lower the risk of fistula thrombosis [15]. Researches proved that with the fall of access flow for every 100 ml/min, the likelihood of complications increases by 10–15% depending on the level of arteriovenous fistula formation [6, 15]. However, with an increase in blood flow in the fistula, the load on the right heart chambers increases and the risk of developing chronic heart failure increases. It has been proven that access flow in a fistula should not exceed 30% of the cardiac output, averaging no more than 1500–2000 ml/min [15]. There is also evidence of the effect of high blood flow in the arteriovenous fistula on the development of complications such as hand ischemia and the outflow vein stenosis. Access flow values in the fistula that are recommended in the literature range significantly in different authors: from 350 to 2000 ml/min [6, 9, 13]. According to the American and European clinical recommendations, the optimal blood flow rate is not less than 600 ml/min [15].

The literature provides data on other parameters that are able to predict the maturation effectiveness and the duration of the arteriovenous fistula functioning. So, fistulas, superimposed on the radial artery with the blood flow of more than 20 ml/min, in the future often function more adequately. Arteriovenous fistulas with an intraoperative blood flow of about 230 ml/min have a greater likelihood of maturation as compared with fistulas with a small intraoperative access flow (average 98 ml/min) [2, 12]. Most often, the blood flow values in the fistula and the size of the outflow vein a month after the formation of the fistula are used as predictors of effective arteriovenous fistula maturation. With a vein diameter of more than 4 mm and the access flow of 500 ml/min and higher, the fistula adequately functions in 95% of cases, with 1 criterion in 74–76% and only 33% of cases if none of the criteria exists. It has been proven that veins with a diameter of less than 2.5 mm prior to fistula overlay have poor maturation ability as well as arteries with a diameter of less than 2 mm, so some authors do not recommend the formation of a fistula between vessels of this size [3, 6, 13].

Stenotic lesions of blood vessels that form the arteriovenous fistula. Fistulas with hemodynamic parameters that have not reached target values cannot be used for effective hemodialysis. With the help of duplex ultrasound, it is possible to identify the arteriovenous fistula complications, which prevent its successful maturation [13]. One of the most frequent complications of vascular access is stenosis. Atherosclerotic changes and diabetes mellitus can be causes of inflow artery stenosis. Outflow vein stenosis is associated with high access flow, multiple punctures in the local zone, turbulent blood flow and vibration, which permanently injure the vein wall [3, 6]. Histological studies demonstrate the accumulation of myofibroblasts, fibroblasts, and fibrocytes in the subendothelial intimal layer, which is an indication of increased metabolic activity of cells, which develops as a result of the above damaging factors [6]. The stenotic area can be detected in duplex ultrasound in the B-mode as a section for reducing the vessel lumen by at least 50% [13]. However, taking into account the possible unevenness of the outflow vein diameter during long-term functioning of the fistula, its tortuosity with the formation of acute angles, as well as to assess the hemodynamic significance of stenosis, other criteria should be used. The indicators of blood flow in the place of the alleged stenosis and 2 cm below are determined, the ratio of the peak systolic velocity in the place of stenosis and in the proximal area is calculated. If this ratio exceeds 2:1, then stenosis of more than 50% of the inflow artery or the draining vein is diagnosed. For stenosis of the anastomotic zone, this indicator is 3:1 or more, and an increase in the peak systolic velocity in the anastomotic zone of more than 400–500 cm/sec is also taken into account [13, 14]. Some authors recommend comparing the blood flow rate in the stenotic zone and in the distal section, while they believe that with more than 50% stenosis, the ratio is more than 2 for stenosis of an artery and vein, 3 or more for anastomotic stenosis at a peak systolic velocity of more than 400 cm/sec in the stenotic area for all localizations [5].

Hemodynamically significant stenoses lead to a decrease in access flow in the distal zones. It has been established that the presence of stenosis of more than 50% is indicated by a decrease in blood flow of less than 500 ml/min, as well as a decrease in access flow by 25% compared with the data from the previous study [5, 7, 8, 13, 14, 15]. As an auxiliary criterion for significant stenosis of the outflow vein researchers suggest the diameter of the vein free lumen in the stenosis area of less than 2.7 mm with a sensitivity of 90% and specificity of 80%.

In the absence of inflow artery stenosis or the fistula vein at low blood flow in the arteriovenous fistula, the search should be continued in order to identify the subclavian and internal jugular vein stenosis [13, 15]. According to the literature, the frequency of central stenosis is from 5 to 20%. Their most frequent cause is previous vein catheterization [1, 15]. Timely diagnosis of ipsilateral stenosis of the subclavian and internal jugular veins, as well as the distal portions of the cephalica or basilica veins during the preoperative stage, is of particular importance to reduce the risk of vascular access dysfunction [1].

Arteriovenous fistula thrombosis. A decrease in the fistula access flow as a result of stenosis leads to the blood clots formation [3, 7, 8]. According to different authors, arteriovenous fistula thrombosis occurs in 70–95% of cases, and fistula stenosis is found in 85% of thrombosed accesses. Other causes of thrombosis are a violation of the rheological properties of blood associated with an increase in uremic toxins in patients with chronic kidney disease, as well as low systemic blood pressure and permanent vessel injury due to repeated punctures in the local area [14]. It has been established that to reduce blood clots formation, a fistula with an outflow vein length sufficient for punctures — at least 30–35 cm is required [4]. Studies have shown that the risk of thrombosis is significantly reduced with minimum access flow in the fistula of about 580 ml/min [10]. In addition to visualizing thrombotic masses in the vessel lumen, ultrasound criteria for arteriovenous fistula thrombosis include the absence of vein compressibility and impaired blood flow phasicity during breathing [5].

Another risk factor for arteriovenous fistula thrombosis is the aneurysmal dilation of the fistula vein. Its formation is facilitated by numerous punctures, localization in the area of fusion with the inflow veins, in the valve apparatus area, as well as in the rigid zones formed as a result of previous surgical interventions or catheterizations [1, 6]. The turbulent nature of the blood flow in the aneurysm leads to the settling of platelets on the endothelium in places with low blood flow rates with subsequent agglutination and activation of the fibrin coagulation process [6].

Hand ischemia. Another complication of the arteriovenous fistula functioning is hand ischemia. The frequency of the complication is from 5 to 20%, and the incidence of hand ischemia without obvious clinical manifestations is from 67 to 95% [2, 5]. The question of what factors lead to its development is controversial. Among the most frequently indicated reasons for the hand ischemia formation are: high access flow in the fistula (more than 750–1900 ml/min), retrograde blood flow in the distal part of the inflow artery, stenotic lesion of the inflow vessel, and peripheral artery disease [1, 2, 3, 4, 5]. However, studies have shown that not all patients with large volumetric discharges by fistula or inflow artery stenosis have hand ischemia. The isolated presence of retrograde blood flow in the artery distal to the fistula, which occurs in 80–90% of patients, does not lead to the hand ischemia [1, 2, 3]. The discharge of blood from the artery directly into the vein, bypassing the microvasculature of the hand, high blood flow in the fistula, the narrowing of the inflow artery normally leads to an increase in heart rate, cardiac output, access flow in the ulnar artery and to the development of collateral branches in the forearm to compensate for blood flow deficit in hand [3]. It has been proven that patients suffering from diabetes are more likely to develop hand ischemia as a result

of disruption of the blood flow autoregulation mechanisms against the background of microangiopathy [2, 3, 4, 9]. Thus, the hand ischemia is a multifactorial pathology, the forearm arteries condition that are not involved in the arteriovenous fistula formation, the hand microvasculature and the violation of the compensatory mechanisms of blood flow regulation play a decisive role in its development [5].

Conclusion. The topicality of the problem of hemodialysis replacement therapy is stipulated both with the increase in the number of patients on hemodialysis and the high incidence of vascular access complications. The duration and quality of life of patients depend on many factors, the most important of which is the efficiency of arteriovenous fistula functioning for hemodialysis. Various approaches to ultrasound assessment of its maturation, normal functioning and diagnosis of complications have been given. It has been established that during the formation of an anastomosis with a size of about 75% of the artery diameter, the blood flow in the arteriovenous fistula increases and conditions for its normal maturation are created, and when the anastomosis diameter is about 20% of the inflow artery diameter, fistula does not mature. It is believed that the minimum outflow vein diameter, suitable for puncture and adequate hemodialysis, is 4–6 mm with a depth of no more than 5–6 mm. In the literature, there is no consensus about the optimal value of the access flow in the arteriovenous fistula, and the figures vary significantly among different authors (from 350 to 2000 ml/min). The criteria for significant stenosis of vessels forming arteriovenous fistula are: the diameter of the vein free lumen in the stenotic zone less than 2.7 mm, the decrease of access flow distal to the stenosis to less than 500 ml/min, the ratio of the maximum linear velocity in the place of stenosis and in the proximal part more than 2:1 (for stenosis of the anastomotic zone 3:1 and more). The main factors for the occurrence of arteriovenous fistula thrombosis are considered to be a disorder of the rheological properties of blood, a decrease in systemic arterial pressure, a permanent trauma of the vessel due to repeated punctures in the local area, dilation of the outflow vein and a decrease in access flow. The frequency of hand ischemia is from 5 to 20%. Among the reasons for the formation of hand ischemia, high blood flow in the fistula, stenosis of the inflow artery, damage to the forearm arteries not involved in the formation of arteriovenous fistula, and the hand microvasculature, as well as disorder of the compensatory mechanisms of blood flow autoregulation are of major importance. Thus, regular duplex ultrasound performing allows detecting the arteriovenous fistula complications and makes it possible to carry out their timely correction.

References

1. Grinev K.M., Karpov S.A., Alferov S.V. Non-thrombotic complications of permanent vascular access for hemodialysis and methods of its surgical treatment. Vestnik SPbGU. Medicina. 2017. V. 12. No. 4. P. 340–353 (In Russian).

2. Gurkov A.S. Blood flow in forearm and hand vessels in patients with arteriovenous fistula for hemodialysis. Dis. ... kand. med. nauk. Saint-Petersburg, 2014. 189 p. (In Russian).

3. Manafov Je.N. Permanent vascular access for hemodialysis: surgical tactics. Dis. ... kand. med. nauk. Moscow, 2015. 109 p. (In Russian).

4. Popov A.N. Optimal variants of long-term functioning arteriovenous fistulas in hemodialysis patients. Dis. ... kand. med. nauk. Ekaterinburg, 2015. 129 p. (In Russian).

5. Hatchinson S.J., Holms K.K. Ultrasound diagnostics in angiology and vascular surgery. Moscow: GJeOTAR-Media, 2018. 400 p. (In Russian).

6. Shol'c H. Vascular access for hemodialysis. Per. s angl. pod red. A.S. Gurkova. Moscow: Prakticheskaja medicina, 2019. 280 p. (In Russian).

7. Agarwal A.K., Shah R., Haddad N.J. Access Blood Flow Testing. Seminars in dialysis. 2014. V. 27. No. 6. P. 595–598.

8. Aragoncillo I., Abad S., Caldés S. et al. Adding access blood flow surveillance reduces thrombosis and improves arteriovenous fistula patency: a randomized controlled trial. JVA. 2017. V. 18. No. 4. P. 352–358.

9. Huber T. S., Larive B., Imrey P. B. et al. Access-related hand ischemia and the Hemodialysis Fistula Maturation Study. J. Vasc. Surg. 2016. V. 64. No. 4. P. 1050–1054.

10. Ishii T., Suzuki Y., Nakayama T. et al. Duplex ultrasound for the prediction of vascular events associated with arteriovenous fistulas in hemodialysis patients. JVA. 2016. V. 17. No. 6. P. 499–505.

11. Itoga N. K, Ullery B. W., Tran K. et al. Use of a proactive duplex ultrasound protocol for hemodialysis access. J. Vasc. Surg. 2016. V. 64. No. 4. P. 1042–1049.

12. Ladenheim E. D., Lulic D., Lum C. et al. First-week postoperative flow measurements are highly predictive of primary patency of radiocephalic arteriovenous fistulas. JVA. 2016. V. 17. No. 4. P. 307–312.

13. Pietrryga J. A., Little M. D., Robbin M. L. Sonography of Arteriovenous Fistulas and Grafts. Seminars in dialysis. 2017. V. 30. No. 4. P. 309–318.

14. Quencer K. B., Kidd K., Kinney T. Preprocedure Evaluation of a Dysfunctional Dialysis Access. Elsevier. 2017. V. 20. No. 1. P. 20–30.

15. Vascular Access Work Group. KDOQI Clinical Practice Guideline for Hemodialysis Adequacy: 2015 Update. AJDK. 2015. V. 66. No. 5. P. 554–930.

慢性不可预测的中度应激模型大鼠血浆皮质醇水平
PLASMA CORTISOL LEVEL IN RATS WITH CHRONIC UNPREDICTABLE MODERATE STRESS MODEL

Yepifantseva Yelena Valerievna
Doctorate PhD of Karaganda Medical University
Karaganda, Kazakhstan
Semenikhina Polina Sergeevna
Assistant teacher of the Department of neurology, neurosurgery, psychiatry and rehabilitation of Karaganda Medical University: Karaganda, Kazakhstan
Romanova Mariya Andreevna
Junior Researcher, Laboratory of Pharmacology, Joint Stock Company "International Research and Production Holding "Phytochemistry"", Karaganda, Kazakhstan.

抽象。 背景：慢性不可预测的中度压力被认为是导致抑郁和焦虑症的因素之一。 应激诱导的疾病的发展中的重要作用属于糖皮质激素，但糖皮质激素在慢性应激中的特异反应性问题仍在讨论中。 评估使用皮质醇作为慢性压力标志物的可能性以及在慢性压力影响下预测行为障碍的发展仍然是一个迫切的问题。

Abstract. *Background: Chronic unpredictable moderate stress is considered one of the factors leading to depression and anxiety disorders. A significant role in the development of stress-induced disorders belongs to glucocorticoids, but the question of the specific reactivity of glucocorticoids in chronic stress remains under discussion. The assessment of the possibility of using cortisol as a marker of chronic stress and predictor of the development of behavioral disorders under the influence of chronic stress is still an urgent problem.*

The aim of this research is to study the level of cortisol in blood plasma of rats during the formation of a chronic unpredictable moderate stress model.

Methods: The study involved 20 male outbred rats, which were divided into two groups by randomized selection. Rats were exposed to various stress factors for 21 days, in order to create a model of chronic unpredictable moderate stress. Four times during the experiment blood from the tail vein was sampled to determine cortisol levels and animals were examined in behavioral tests. The days indicated as the control points correspond to 0, 7, 14 and 21 days of the experiment.

Results: Comparison of rat cortisol levels didn't show significant difference between the experimental and control groups. Comparison of cortisol levels in each group for different control points using the nonparametric Wilcoxon T-test at α=0,01 showed a significant difference in the experimental group between the first and the third control points with a significant increase in the cortisol level in the latter (p=0,007).

The results of animal studies in behavioral tests showed signs of depression and anxiety spectrum disorders in the experimental group.

Conclusion: The results of the study of cortisol levels in blood plasma in rats while showing the increase in absolute numbers in control group, didn't demonstrate significant statistical difference between the experimental and control groups and cannot be used as a marker of model validity. Rats of the experimental group showed signs of anxiety and depression disorders, regardless of the level of cortisol.

Introduction

Chronic stress is considered one of the factors in the development of adaptive disorders, a significant part of which includes behavioral and emotional disorders of anxiety and depression spectrum [1]. In conditions of increasing urbanization and accelerated life rhythm of modern man, the frequency of stress disorders is steadily growing. Experimental models are required to study the etiology and development pathogenesis and to design new methods for treatment of stress-induced disorders. The experimental animal model should have similar properties and should reproduce the symptoms of the simulated condition, have similar etiology and pathogenesis, and predict an improvement in the condition and relief of symptoms under the influence of a specific treatment [2]. The mechanism of stress-induced disorders development is explained by the increasing level of glucocorticoid hormones as a result of activation of the "hypothalamus-hypophysis-adrenal gland" system under the influence of stress factors [3]. There are reports indicating an initiating effect of glucocorticoids on depressed and anxious behavior in experimental animals, and with the development of characteristic behavioral disorders an increase in glucocorticoids is predicted under the conditions of chronic stress [4, 5, 6]. The study of biochemical mechanisms of the glucocorticoids damaging effects continues with the advent of new data on the effect of chronic stress on the neurochemical processes in the brain in depression and anxiety disorders. The question of the damaging effect of glucocorticoids on neurochemical processes in the brain and the structural state of the hippocampus remains open. The fact that under conditions of chronic stress there is a persistent increase in the level of corticosteroid hormones leading to destructive processes in the central nervous system is still considered controversial. It is necessary to study the corticosteroid hormones levels increase in conditions of chronic stress in comparison with a single moderate stress, which does not have an inducing effect on the development of behavioral disorders of the depression and anxiety spectrum.

Table 1. *Chronic unpredictable moderate stress*

Type of exposure [1]	Experiment Cycle Day						Control, tests
	1	2	3	4	5	6	7
«Narrow cell»	12.00-08.00.00						Behavioral tests Blood sampling
Food deprivation		8.00-08.00					
Immobilization in a case			10.00-14.00				
Shading during daylight hours				6.00-21.00			
Water deprivation					8.00-18.00		
Artificial lighting in the dark					19.00-10.00		
Full immobilization						10.00-12.00	

Methods

The reference model of stress disorder leading to development of depressed and anxious behavior in animals is a model of chronic moderate stress, which is based on the principles developed by Paul Willner [3]. All procedures of chronic unpredictable moderate stress involve the use of a few moderate stressors with their occasional and unpredictable use for several weeks.

Selection and Description of Participants

The study was conducted in accordance with the requirements of the European Convention for the Protection of Vertebrate Animals Used in Experiments and Other Scientific Purposes (Strasbourg, 1986). The study was approved by the decision of the Committee on Bioethics of the Medical University of Karaganda on June 17, 2019, protocol No. 65.

20 male outbred rats weighing 450-500 g. were used in the study. They were kept (five rats per cage) under standard laboratory conditions (25 ± 2 °C, humidity 60-70%), maintaining a 12-hour natural day-night cycle with free access to standard food and water. The quarantine and keeping conditions of the animals before the start of the experiment met the established requirements.

---

*Types of exposure:

"Narrow cell" - limiting the space of the cell by half due to the installation of an additional partition in the cell;

Food deprivation - food deprivation for 24 hours;

Immobilization in a case - animals are placed in individual cases, which do not deprive them of the ability to move, but greatly limit the space for movement;

Shading during daylight hours - artificial dimming during daylight hours, lasting 15 hours;

Water deprivation - deprivation of water for 10 hours;

Artificial lighting in the dark - creating artificial lighting in the nighttime hours, lasting 15 hours;

Full immobilization - placing animals in individual canisters, depriving them of the ability to move for 2 hours

The animals were divided into groups using randomized selection. Two groups of 10 rats each were formed. The experimental group of animals was exposed to the impact according to the model of "Chronic unpredictable moderate stress." The control group of animals remained in standard conditions.

Experimental procedure for chronic unpredictable moderate stress (CUMS) model

For 21 days the animals of the experimental group were experiencing the trials according to the scheme of "Chronic unpredictable moderate stress" lasting 21 days (3 cycles of 7 days each).

Animals in the two groups underwent a simultaneous study in behavioral tests and a blood sampling procedure four times over the entire period of the experiment: on the day preceding the start of the experiment and on the last day of each seven-day cycle of the experiment, designated as control points.

Behavioral assessments

Behavioral assessment was carried out according to standard protocols in the “open field” test [7], “the elevated cross-maze” test [8, 9], “tail suspension” test [10, 11] and “sucrose preference” test [12].

Technical Information

Blood sampling in animals in a volume of 1 ml was carried out in the morning from the tail vein. Animals were under mild ether anesthesia. After centrifugation of blood, plasma cortisol level was determined. Determination of cortisol level was carried out by enzyme-linked immunosorbent assay (ELISA) using a set of reagents for the quantitative immunoenzymatic determination of cortisol in human blood serum “ELISA Cortizol steroid” / RK-IMN-5 No. 015123 dated January 29, 2016 / LLC “Alkor Bio Company”, Russia /. Stages of sampling blood from rats were marked with serial numbers from 1 to 4 in order. The days chosen to be control points correspond to 0, 7, 14 and 21 days of the experiment.

Statistics

The results were statistically processed using the SPSS.Statistics.v22.Multilingual-EQUiNOX (SPSS Inc) software.

Results

Statistically significant differences ($p \leq 0,05$) were calculated using descriptive statistics and the nonparametric Mann-Whitney U-test ($\alpha = 0,05$).

Table 2. *Comparison of cortisol levels in two groups*

Blood sampling point	Median (Q25; Q75) in the experimental group (nmol / L)	Median (Q25; Q75) in the control group (nmol / L)	U	p
1	50,00 (18,34;72,5)	13,66 (12,214;15,50)	22,00	0,060
2	44,11 (15,26;72,7)	73,16 (53,78;81,1)	29,00	0,310
3	103,1 (61,22;126,9)	93,26 (61,22;94,2)	32,50	0,307
4	125,1 (62,06;135,1)	126,9 (71,81;128,5)	36,00	1,000

According to the results of statistical analysis, there were no significant differences in the level of cortisol at the same blood sampling control points between two groups.

A pairwise comparison of cortisol levels between the control points in each of the two groups was carried out using the nonparametric Wilcoxon T-test at α=0,01, calculated taking into account the correction for the number of compared groups: $\alpha = 1\text{-}0{,}95^{1/n}$, where n is the number of pairwise comparisons.

Table 3. *Pairwise comparison of cortisol levels in control points in rat plasma.*

	Experimental group		Control group	
Pairwise comparison	**T**	**p**	**T**	**p**
1 & 2	20,00	0,767	1,000	0,017
1 & 3	1,000	**0,007**	0,000	0,012
1 & 4	4,000	0,050	0,000	0,012
2 & 3	10,00	0,139	17,00	0,515
2 & 4	3,000	0,036	2,000	0,015
3 & 4	13,00	0,484	5,000	0,038

According to the results of pairwise comparisons, a significant difference was revealed between the indicators in the first and third control points in the experimental group of animals (p=0,007). However, cortisol levels when compared at other control points did not show significant differences between the experimental and control groups.

According to the results of behavioral tests, animals of the experimental group showed comparable indicators of behavioral reactions and the absence of significant differences in the 1st and 2nd control points. However, the results obtained from the third control point indicate a significant difference (p<0,05) from the control group in the "open field" test, "elevated cross-maze" test and "tail suspension" test; there were no significant differences in the “sucrose preference” test. In animals of the experimental group, signs of anxious behavior manifested through an increased number of defecations and urinations, more frequent grooming, and an increased duration of stay in closed sleeves of their cages. A decreased orientational research activity and increased total time of immobilization plus the period of latent immobilization can be also considered manifestations of depressed behavior.

Discussion

The model of chronic unpredictable moderate stress provides an opportunity to study the behavioral and biochemical phenomena of stress-induced disorders, which include adaptation disorders with depression and anxiety manifestations. We assume that in chronic stress a steady increase of glucocorticoid hormones levels, specifically cortisol, in the blood plasma, has a damaging effect on the structures of the central nervous system, in particular the hippocampus, which are responsible for the development of depression and anxiety disorders. According to the results of the study, only a single statistically significant episode of an increase in cortisol level in animals of the experimental group was noted, while according to observations in two groups, a steady increase in the absolute average plasma cortisol level is noted in both groups, which by the end of the experiment have comparable numerical values. The study revealed that in behavioral tests animals of the experimental group showed more severe behavioral disorders than in the control group, which does not correlate with the data of the biochemical study. Thus, it can be assumed that the development of behavioral disorders does not directly correlate with the level of cortisol in the blood and may happen due to changes in the biochemical processes of the brain, that are mediated by indicators not controlled in the study. The study obtained data indicating an increase in the level of cortisol in the blood plasma in the control group, the explanation for which may be a reaction to the behavioral tests and blood sampling, which are a sufficient stress factors to increase the level of cortisol in the blood as an acute stress response to the manipulations of researchers and an unusual environment. These data confirm the assumption, that recording glucocorticoid hormone levels under stress cannot serve as a reliable marker for differentiating acute and chronic stress-induced increasement of plasma corticosteroid hormones and cannot be used to assess the validity of experimental models. The revealed statistically significant difference in cortisol levels in the experimental group between the first and third control points can be considered as a phenomenon of corticosteroid stress response. However, this difference is not preserved when comparing the first and fourth control points and cannot be interpreted as a persistent increase in cortisol levels causing the development of behavioral disorders. Such a short-term increase in cortisol level during a certain period of exposure to chronic stress can possibly serve as a mechanism, inducing changes in oxidative metabolism. Thus, according to the results of the research, we consider it reasonable to further study the level of cortisol in a prolonged model of chronic unpredictable moderate stress with a simultaneous study of oxidative stress indicators in the blood and brain tissues of experimental animals.

References

1. International Classification of Diseases (10th revision). Classification of mental and behavioral disorders (clinical descriptions and instructions for diagnosis). WHO, Russia, SPb.: Overlayd, 1994. – 304p. [in Russian]

2. Willner P. Chronic mild stress (CMS) revisited: consistency and behavioural-neurobiological concordance in the effects of CMS. Neuropsychobiology. 2005. 52(2). P. 90–110. https://doi.org/10.1159/000087097

3. Willner P. The chronic mild stress (CMS) model of depression: History, evaluation and usage. Neurobiol Stress. 2016 Aug 24;6:78-93. https://doi.org/10.1016/j.ynstr.2016.08.002

4. Goshen I., Kreisel T., Ben-Menachem-Zidon O., Licht T., Weidenfeld J., Ben-Hur T., Yirmiya R. Brain interleukin-1 mediates chronic stress-induced depression in mice via adrenocortical activation and hippocampal neurogenesis suppression. Mol. Psychiatry. 2008;13:717–728. https://doi.org/10.1038/sj.mp.4002055

5. Chen J., Wang Z.Z., Zuo W., Zhang S., Chu S.F., Chen N.H. Effects of chronic mild stress on behavioral and neurobiological parameters - role of glucocorticoid. Horm. Behav. 2016;78:150–159. https://doi.org/10.1016/j.yhbeh.2015.11.006

6. Dominguez G., Henkous N., Prevot T., David V., Guillou J.L., Belzung C., Mons N., Béracochéa D. Sustained corticosterone rise in the prefrontal cortex is a key factor for chronic stress-induced working memory deficits in mice. Neurobiol Stress. 2019 Apr 4;10:100161. https://doi.org/10.1016/j.ynstr.2019.100161.

7. Kuniishi H., Ichisaka S., Yamamoto M., Ikubo N., Matsuda S., Futora E., Harada R., Ishihara K., Hata Y.. Early deprivation increases high-leaning behavior, a novel anxiety-like behavior, in the open field test in rats. Neurosci Res. 2017 Oct;123:27-35. Epub 2017 Apr 24. https://doi.org/10.1016/j.neures.2017.04.012

8. Byistrova M.N., Demidova M.A., Galchinskaya I.L., Zholobov I.S. Investigation of the effect of various dosage forms of sedative collection on the behavior of mice in the test "Elevated Cruciform Maze" // Modern problems of science and education. – 2012. – № 2. – P. 25–28 [in Russian]

9. Bahtiyarova Sh.K., Kapyisheva U.N., Ablayhanova N.T., Baimbetova A.K., Zhaksyimov B.I., Korganbaeva A.A., Yidyiryis A., Bolathan M.B., Dautova M.B. Behavior of animals in various tests // International Journal of Applied and Basic Research. – 2017. – № 8-1. – P. 92-96 [in Russian]

10. Zhu W., Gao Y., Chang C.F., Wan J.R., Zhu S.S., Wang J. Mouse models of intracerebral hemorrhage in ventricle, cortex, and hippocampus by injections of autologous blood or collagenase. PLoS One. 2014 May 15;9(5): e97423. https://doi.org/10.1371/journal.pone.0097423. PMID: 24831292 PMCID: PMC4022524

11. Cryan J.F., Mombereau C., Vassout A. The tail suspension test as a model for assessing antidepressant activity: review of pharmacological and genetic studies in mice. Neurosci. Biobehav. Rev. 2005; 29: 571-625. https://doi.org/10.1016/j.neubiorev.2005.03.009

12. Fernandez J.W., Grizzell J.A., Philpot R.M., Wecker L. Postpartum depression in rats: differences in swim test immobility, sucrose preference and nurturing behaviors. Behav Brain Res. 2014 Oct 1;272:75-82. doi: https://doi.org/10.1016/j.bbr.2014.06.041. Epub 2014 Jun 29.

工作年龄的年轻人 – 北极地区居民的脑能量交换过程的半球间不对称性
INTERHEMISPHERIC ASYMMETRY OF BRAIN ENERGY EXCHANGE PROCESSES AMONG YOUNG PEOPLE OF WORKING AGE – RESIDENTS OF THE ARCTIC REGION

Kottsova Olga Nikolaevna
Postgraduate
Northern (Arctic) Federal University
Arkhangelsk, Russia
Gribanov Anatoly Vladimirovich
Honored Scientist of the Russian Federation
Doctor of Medical Sciences, Full Professor
Chief Researcher of Research Laboratory of Body Functional Reserves at the Institute of Biomedical Research, Northern (Arctic) Federal University
Northern State Medical University (Arkhangelsk), Russia

抽象。本文介绍了在北极地区出生和生活的不同类型半球优势的年轻人（121人）的调查结果。该研究使用5通道硬件 – 软件复合体“Neuro-KM”进行。获得的结果的特征在于恒定电位的显着值。在具有右半球优势的个体的因子分析中，第一个因素由大脑额叶部分的能量过程分布表示，第二个因子表示大脑中央部分能量过程的分布，第三个因素表示能量过程在大脑前部的分布。枕骨区域的因素;在左半球占主导地位的人 – 分别在中央，枕骨和额叶。所呈现的能量过程分布的神经生理学特征是具有右半球优势和“左半球”个体完全适应的个体中枢神经系统的长期适应性重排的表现。

关键词：北极地区，劳动年龄的年轻人，半球间不对称，恒定潜力水平。

Abstract. *The article presents the results of surveys of young people (121 people) of both sexes with different types of hemispheric dominance, born and living in the Arctic region. The study was conducted using the 5-channel hardware-software complex "Neuro-KM". The results obtained are characterized by pronounced values of the constant potential. In factor analysis in individuals with right-hemispheric dominance, the first factor is represented by the distribution of energy processes in the frontal parts of the brain, the second factor indicates the distribution of energy processes in the central parts of the brain, and the third factor in the occipital regions; in persons with left hemisphere dominance - in the central,*

occipital and frontal, respectively. The presented neurophysiological features of the distribution of energy processes are a manifestation of long-term adaptive rearrangements of the central nervous system in individuals with a predominance of the right hemisphere and complete adaptation in "left hemisphere" individuals.

Keywords: *Arctic region, young people of working age, interhemispheric asymmetry, level of constant potential.*

Functional asymmetry of the brain plays a leading role in the adaptive behavior of a person. Adaptation to various climatic and geographical conditions is characterized by general changes in the functional asymmetry of the brain with the possibility of inversion of interhemispheric relationships [4].

It is believed that in the process of adaptation to new environmental conditions and in a state of stress, the right hemisphere is more activated. The functioning of the right hemisphere is associated with the assessment of environmental uncertainty and the forecast of unlikely events [5], the revision of the usual central regulation programs. In this case, all the information entering the brain is revised again, and on its basis a new reaction sequence is created, which is subsequently carried out under the control of the left hemisphere [11].

Most of the inhabitants of the Arctic territory of the Russian Federation are characterized by interhemispheric asymmetry of cerebral energy processes with right-hemisphere dominance [2,6,9], which characterizes the functional state of the body [8].

However, there is still no data on the distribution of cerebral energy processes during adaptation in young people of working age with different types of hemispheric dominance, born and living in the Arctic region.

Based on this, the aim of this work was to determine the characteristics of the distribution of energy processes in the hemispheres and brain regions in young people of working age with different types of hemispheric dominance, born and permanently living in the Arctic region.

The study involved 121 young people (average age 30 years), of which 65 people with right-hemisphere dominance, 56 people with left-hemisphere dominance of cerebral energy processes. By motor characteristics, all subjects were "right-handed." All of them were born and live in the Arctic region.

The study was carried out using a 5-channel hardware-software complex for topographic mapping of electrical activity of the brain "Neuro-KM" according to the level of constant potential of the brain. LCP was recorded in monopolar leads according to the international 10–20 system. During the study, the skin resistance values were constantly monitored at the sites where the LCP was removed, which did not exceed 30 kOhm.

The LCP distribution was analyzed by mapping the monopolar values of constant potential (CP) and calculating their gradients. Interhemispheric asymmetry of the brain was assessed by the inter-temporal difference Td-Ts. The obtained LCP values were compared with the average standard values built into the complex software.

Statistical processing of the obtained data was carried out using the SPSS-20 for Windows software package. A check was made for the normality of the distribution and the presence of rough observations. Most of the variables had an abnormal distribution, in connection with this non-parametric methods were used for independent samples (M-Whitney test). The results of nonparametric data processing methods were presented as a median (Me). For all the results presented, the differences were considered significant at a level $p < 0.05$. Features of the structure and relationships of indicators of environmental adaptation of cerebral energy metabolism in young people were established using factor analysis with Varimax rotation.

Prior to inclusion in the study, written informed consent was received from all participants. The registration of the level of constant potentials was carried out in the morning, 1.5–2 hours after eating with the maximum physical and mental rest of the subjects.

Results and Discussion. Analysis of the LCP distribution values revealed the features of energy consumption in the cerebral cortex in young people of working age in the Arctic region. The results of the study in young residents of the Arctic region revealed an increase in energy consumption in absolute values in the frontal, central, and occipital parts of the brain in people with right- and left-hemisphere dominance, a statistically significant difference in the indicators of interhemispheric asymmetry in "right- and left-hemisphere" individuals was revealed (Table.).

Table

Distribution of brain LCP in young people of 30 years with different type of hemisphere dominance living in the Arctic region (Me, Q1, Q3), mV

Indicator	Right hemisphere (n=65)	Left hemisphere (n=56)
	Me	Me
Fz	9,8(3,07;28,85)	9,72(3,54;17,42)
Cz	17,24(6,71;22,91)	16,37(5,46;25,73)
Oz	10,5(5,02;18,35)	13,24(4,85;18,82)
Td	10,74(4,09;21,19)	5,73(-0,69;11,91) *
Ts	4,74(-2,17;13,09)	10,48(3,85;22,44) *
Interelectrode potential difference		
Td-Ts	5,04(2,3;8,9)	-4,24(-7,42;-1,65) *
Fz-Cz	-5,68(-14,16;7,74)	-2,7(-16,16;1,88)

Indicator	Right hemisphere (n=65)	Left hemisphere (n=56)
	Me	Me
Fz-Oz	-2,86(-8,63;10,05)	-1,42(-8,2;3,63)
Fz-Td	-3,06(-9,78;6,35)	3,8(-4,19;13,0) *
Fz-Ts	2,92(-2,78;13,53)	-0,69(-12,26;6,1) *
Cz-Oz	4,45(-2,9;10,29)	3,13(-3,12;12,73)
Cz-Td	3,77(-4,13;11,43)	9,22(0,95;18,14) *
Cz-Ts	10,84(3,13;18,18)	2,79(-6,48;17,28) *
Oz-Td	-1,24(-6,5;4,9)	5,78(-1,21;12,55) *
Oz-Ts	6,12(-0,03;10,5)	0,5(-7,54;7,65) *
Average and deviations from average		
Xav	10,18(6,01;17,37)	10,99(5,63;17,22)
Fz-Xcp	-1,2(-6,37;5,46)	-0,98(-5,4;3,6)
Cz-Xcp	4,98(-0,14;9,55)	3,43(-1,71;11,89)
Oz-Xcp	-0,27(-3,65;3,68)	-0,31(-3,63;5,14)
Td-Xcp	1,38(-2,32;4,71)	-4,88(-9,56;-0,97) *
Ts-Xcp	-5,54(-9,44;-1,73)	1,08(-5,64;3,69) *

Note. Reliability of differences in indicators between groups: *-p<0,05

An increase in brain energy consumption was noted in young residents of the Arctic region in the frontal, central, and occipital parts of the brain and throughout the cerebral cortex as a whole, regardless of the type of hemispheric dominance as compared to the middle band (Fig. 1).

Given the data embedded in the software, the Td-Ts indicator characterizing interhemispheric asymmetry in 30-year-olds is -1.90 mV. Given the negative values of this indicator, normally the right-handed people should be dominated by activity of the left hemisphere. In our study, the following indicators were obtained: the whole group of "right-handed" young people according to the level of constant potentials of the brain was divided into groups with right-hemisphere domination of cerebral energy processes (65 people) and left-hemisphere domination (56 people).

In young people with right-hemispheric dominance of brain energy processes, the interelectrode difference Td-Ts is 5.04 mV. In persons with left hemisphere dominance it is equal to -4.24 mV.

Thus, there is a more pronounced specialization of the hemispheres in people living in the Arctic region, compared with the data of the middle band.

Factor analysis using varimax rotation also revealed differences in cerebral energy metabolism in people of working age with different types of hemispheric dominance living in the Arctic region of the Russian Federation (Fig. 2).

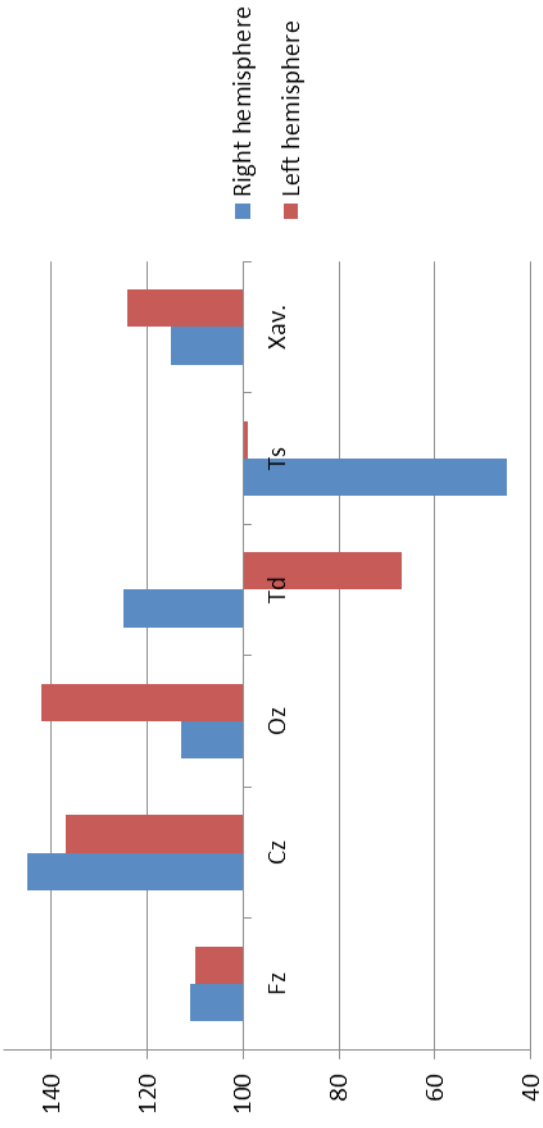


Fig. 1. *Distribution profile of the brain LCP in young people with different types of hemispheric dominance living in the Arctic region of the Russian Federation,% (data from middle-band residents are taken for 100%)*

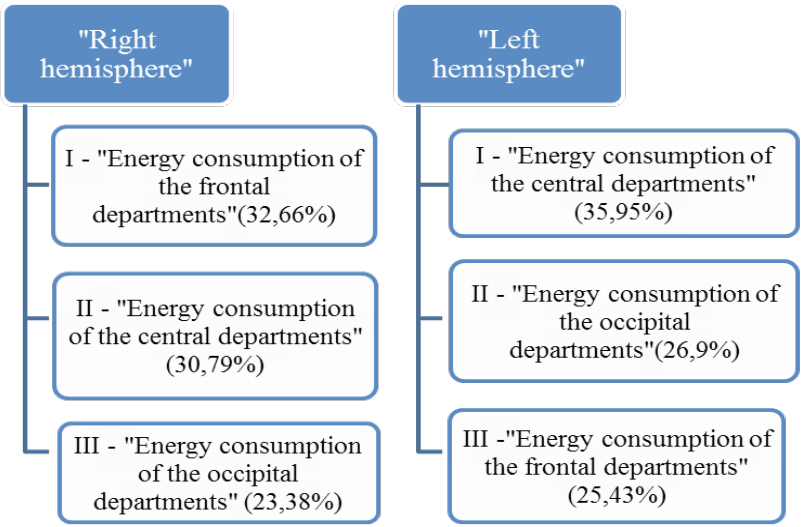


Fig. 2. *The factor structure of cerebral energy processes in a state of relative rest in young people with different types of hemispheric dominance living in the Arctic zone of the Russian Federation*

Factor structures based on the results of the study indicate differences in energy processes in the cerebral cortex in young people with different types of hemispheric dominance.

Adaptive reactions always go with increased activation effects on the frontal cortex of the cerebral hemispheres, which ensures the optimal functional state of the body. However, the maintenance of this state is impossible without sufficient energy supply of neurons. Thus, increased energy metabolism of the brain with activation of the frontal cortex is the basis of the response program for long-term adaptation of the organism in the Arctic region [1]. Such reactions in our study were noted in "right-hemisphere" individuals.

The factor structure of “left hemisphere” individuals is characterized by a predominance of energy processes in the central parts of the cerebral cortex, which indicates a close interaction of the cortical and subcortical levels and leads to less intense functioning of the central nervous system. The second factor in people with a predominance of the left hemisphere is energy consumption in the occipital regions of the brain, where the cortical center of the visual analyzer is located, which provides analysis of incoming information from outside and the formation of behavior stereotypes based on this [3,10].

Normally, the distribution of cerebral energy processes of the brain has a "domed shape", that is, in the central leads maximum LCP values are observed, and to the periphery they decrease [7].

In our study, all the subjects have the distribution of LCP in the form of a pronounced dome, which indicates the effectiveness of cerebral energy processes in subjects of both groups.

Conclusion. The adaptation process involves the formation of a new vision of familiar phenomena and the creation of other ways of responding to changes in the environment. Thus, depending on the type of task, the right or left hemisphere dominates. Analysis of interhemispheric asymmetry of energy consumption using the neuroenergy mapping method allows us to assess the degree of dominance

Environmental adaptation of neurophysiological mechanisms is associated with an increase in cerebral metabolism. Moreover, in individuals with a predominance of the left hemisphere it is expressed in close interaction of the cortex and subcortical structures of the brain and is characterized by completeness of adaptation processes, in individuals with involvement of the right hemisphere, centralization of regulatory processes is manifested - long-term adaptation.

The study was supported by the 2019 "Young Scientists of Pomerania Scientific Projects Competition" as part of research project No. 18-2019-02a.

References

1. Boyko E.R. Physiological and biochemical foundations of human life in the North. Yekaterinburg: Ural Branch of the Russian Academy of Sciences, 2005. 190 p.

2. Gribanov A.V., Anikina N.Yu., Kottsova O.N. Distribution of cerebral energy processes in young people permanently living in the Arctic region // Journal of biomedical research. - 2019. - Vol. 7. - № 1. p. 118-123.

3. Ilyukhina V.A. Psychophysiology of functional conditions and cognitive activity of a healthy and sick person. SPb: N-L, 2010.368 p

4. Leutin V.P., Nikolaev E.I., Fomina E.V. Functional asymmetry of the brain and incomplete adaptation // Guide to functional interhemispheric asymmetry / ed. V.F. Fokina, I.N. Bogolepova, B. Gutnik, V.I. Kobrin, V.V. Shulgovsky. - Moscow: Scientific World, 2009. p. 429–457.

5. Systemic mechanisms of adaptation and compensation / S.G. Krivoshchekov, V.P. Leutin, V.E. Divert et al. // Bull. SB RAMS. - 2004. - № 2. - p. 148–153.

6. Stepanyan L.S., Stepanyan A.Yu., Grigoryan V.G. Interhemispheric asymmetry in the systemic activity of the brain in the correction of adolescent aggressiveness // Asymmetry. 2009. № 2. p. 41–50.

7. Fokin V.F., Ponomareva N.V. Energy physiology of the brain. - Moscow: Antidor, 2003. 288 p.

8. Fokin V.F. Dynamic functional asymmetry as a reflection of a functional state // Asymmetry. 2007.Vol. 1, № 1. p. 4–9.

9. Khasnulin V.I., Khasnulina A.V., Bezprozvannaya E.A. Asymmetries of the functional activity of the cerebral hemispheres and ensuring effective adaptation to geoecological factors at high latitudes // World of Science, Culture, Education. - 2011. - № 2. p. 308–311.

10. Khasnulin V.I., Khasnulin P.V. Modern views on the mechanisms of formation of northern stress in humans at high latitudes // Human Ecology. - 2012. - №. 1. p. 3–11.

11. Fan, S. [Going global by adapting local: a review of recent human adaptation] / S. Fan, M.E. Hansen, Y. Lo, SA. Tishkoff // Science. – 2016. – Vol. 354. – p. 54–9.

以Barnaul市为例，一年中不同季节的光周期和环境温度对单胎妊娠率的影响
THE INFLUENCE OF PHOTOPERIOD AND AMBIENT TEMPERATURE IN DIFFERENT SEASONS OF THE YEAR ON THE RATES OF DELIVERY IN SINGLE PREGNANCY ON THE EXAMPLE OF THE CITY OF BARNAUL

Maltseva Anastasia Evgenevna
Senior lecturer in Biology, histology, embryology and Cytology of the Federal State Budget Educational institution of Higher Education Altai state medical University of Ministry of Healthcare of the Russian Federation

抽象。在决定人类活动和健康的自然因素中，一个重要的地方是外部条件的季节性波动。出生时刻是指人类个体发育的关键时期。新生儿的身体对外部影响最敏感。这项研究的目的是检验这样的假设，即天气因素的某些值，如光（光周期）和温度会影响一年中不同季节的劳动频率。进行了一项基于医学统计数据的回顾性研究。根据季节，分析了与光周期和温度作用有关的出生时间数据的月度数据，在1998年和2014年期间，分析材料的选择是由于这些年来环境因素指数最多的事实。熟悉并典型的巴尔瑙尔气候;太阳活动的年平均值是可比的，并且对应于11年太阳活动周期的上升分支的中间。

关键词：Barnaul，光周期，新生儿，季节性。

Abstract. *Among the natural factors that determine human activity and health, an important place is occupied by seasonal fluctuations in external conditions. The moment of birth refers to the critical periods of human ontogenesis. The body of newborns is most sensitive to external influences. The purpose of this study is to test the hypothesis that certain values of weather factors, such as light (photoperiod) and temperature influence the frequency of labor in different seasons of the year. A retrospective study based on medical statistical data was conducted. Analyzed monthly data on births chatote in connection with the action of photoperiod and temperature depending on the season, during the 1998 and 2014, the Selection of materials for analysis was motivated by the fact that in these years, the indices of environmental factors were the most familiar and typical for the climate of Barnaul; annual averages of solar activity were comparable and corresponded to the middle of the ascending branch of the 11-year solar cycle.*

Keywords: *Barnaul, photoperiod, newborns, seasonality.*

Introduction

As is known, there are basic circadian rhythms, which are the universal temporary basis of all dynamic processes occurring in the human body. Phase and frequency synchronization of such oscillations occurs under the influence of external cycles. It was established experimentally that of all varieties of external synchronizers for human biorhythms have a real value the following Heliophysical factors: photoperiodism; fluctuations in the magnetic field of the Earth; the temperature change of the environment [1].

In this regard, the purpose of this study is to test the hypothesis that some values of meteorological factors, such as light (photoperiod) and temperature have an impact on the frequency of labor in different seasons of the year.

Materials and methods

In the first stage, the available material for the study was documentation in medical records 1154 women, births which took place from 1 January to 31 December in hospital maternity hospital № 2 of the city of Barnaul in 1998, the Age of patients: 15 – 43 years. Data on the number of births per day, gestation period, number of fetuses were taken into account (cases of two-child birth and caesarean section were excluded from the analysis).

To verify the type and extent of the identified dependencies and the resulting mathematical models were carried out re-analysis on the available material data 2014, for the following reasons [7]:

1) in contrast to a number of years separating 1995 and 2015, it was in the years 1998 and 2014 that environmental factors were most similar and typical for the climate of Barnaul; so in 1998 and 2014 the average annual temperature was, respectively, 2.4 and 2.6 degrees, the average minimum -21 and -18 degrees, the average maximum-22 and 21 degrees. During these years annual monthly values of ambient temperatures were not extreme, as has happened, for example, in 2001, 2012, when the winter temperature reached is 48.2 and 43.7 degrees respectively in 2002, when the summer temperature reached 38.3 degrees.

2) the average annual solar activity (wolf number) in 1998 and 2014 were comparable and were, respectively, 64.16 ±5.52 and 79.28±3.27. that corresponded to the middle of the ascending branch of the 11-year solar cycle [8].

The boundaries of climatic seasons were set by air temperature (table 1):

Table 1.
Time limits and temperature conditions of climatic seasons in Barnaul in 1998 and 2014

Climate season	Boundaries (start and end dates) of the season	Average temperature for the season,°C
1998		
Winter	10.11–21.02.	–15.5±0.8
Spring	22.02–19.05.	–0.2±0.8
Summer	20.05–28.08	19.9±0.4
Autumn	29.08–9.11	5.9±0.6
2014		
Winter	25.11–27.02.	–14.8±0.7
Spring	28.02–8.04.	–1,0±1.1
Summer	9.04–25.08	18.1±0.5
Autumn	29.08–24.11	3.4±0.6

In the course of the work, geographical and climatic conditions were assessed at the first stage. Geographic coordinates of Barnaul: 53°20'56' North latitude, 83°46'35' East longitude.

Climate – some average regime of weather conditions, characteristic for each of the given places of the Earth because of its geographical position, i.e. years of weather regime prevailing in this area of inland territory, to which the Altai region, is experiencing the greatest climate change: for 100 years, the temperature on the planet has increased by 0.8 °C for Russia and in the Altai territory is 1.8 degrees. These changes are accompanied by an increase in interannual temperature variability ("weather capriciousness"). In addition, warming is uneven seasons [9, p.].

Against the background of increasing instability of meteorological processes, in the period from 1990 to 2018, the average annual temperature in Barnaul ranged from 0.7 to 6.6 degrees, the minimum for the year – from -7 to -25 degrees, the maximum for the year – from 17 to 25 degrees [4].

The influence of seasonality on the frequency and outcomes of childbirth has been the subject of many studies conducted in different regions of the globe. The city of Barnaul is located in the zone of temperate latitudes with a continental climate, which determines the specificity of the annual dynamics of weather conditions.

The second stage of the analysis considered the annual dynamics of the number of births according to the daily and monthly averages.

Literature data indicate a certain annual rhythm of conception frequency [3, 5], as well as daily and seasonal frequency of premature birth [6].

Based on the data obtained, it can be concluded that in 1998 and 2014 there is a General tendency to reduce the number of births in the range from January to December. The discrepancy in the dynamics of the average monthly indicators can be explained by the difference in weather conditions in calendar and" meteorological " months, the intervention of various exogenous and endogenous factors in the month of conception, which can affect the development of the fetus [3, p. 76].

From the data obtained, it follows that the maximum number of births falls on January-March, and the minimum – on November-December, which, respectively, means that the maximum of conception is observed in may-July, and the minimum – in March-April. These results are generally consistent with those of other authors. So, in the process of investigating the seasonal nature of the conceptions and births, Kalentieva S. V., installed peak conception in February and may, and their decline in April and December. It is indicated that the seasonal structure of conception is the most characteristic of primeval [6].

The increase in the number of conception in the warm period of the year is explained by many authors by the influence of ambient temperature [2, c. 400].

In temperate latitudes, the continental climate is characterized by a large annual amplitude of air temperature (hot summers and cold winters). The duration of the calendar and climatic seasons varies significantly (short summer, long winter). In this regard, the next task was to determine the contribution of different meteorological factors in their combined effect on the frequency of childbirth in different climatic seasons. The limits of climatic seasons, as it was shown earlier, were set by air temperature. Verification of the joint influence of the climatic season and meteorological factors on the frequency of labor was carried out by multiple regression (construction of a common linear model).

The average daily values of the number of births in different climatic seasons obtained during the implementation of the multiple regression method are presented in tab. 2.

Table 2.

Average daily number of births in different climatic seasons

Year	Winter	Spring	Summer	Autumn	P
1998	4,87±0,27	4,59±0,19	3,98±0,26	2,60±0,22	0,003
2014	6,52±0,29	5,5±0, 23	6,01±0,17	5,31±0, 24	0,003

Verification of the combined influence of the climatic season and meteorological factors on the frequency of labor by multiple regression showed its significant effects in the model combining the season with temperature.

The results also indicate that wind speed may be a significant meteorological factor determining the difference in the number of births in different climatic seasons (in 2014).

Photoperiodism plays the role of one of the leading "sensor-time", which synchronizes the action of which is manifested at the biological objects of different complexity, from cells to multicellular organisms. The effectiveness of the light signal is largely determined by the time of its impact on the body and depends on what phase of the cycle "rest – activity" was presented light signal. As a rule, the greatest effect is achieved when exposed to light signals at the beginning and end of the active period.

The influence of light on the daily rhythms of physiological, biochemical, immune and other processes of the body is carried out not only indirectly through the regulation of motor and eating behavior, but also directly through retino-hypothalamic connections. Of particular importance in the transmission of effects on biorhythms is the epiphysis (pineal gland). It is shown that the epiphysis (pineal gland) has its own biological clock, "progress" which is constantly updated in accordance with the geophysical rhythms, among which the leading role plays photoperiodism. There is also evidence that the synchronizing effect of the photoperiod on human biorhythms depends on the intensity of lighting. At low light level photoperiodic synchronization of daily fluctuations of physiological and metabolic processes is realized indirectly through influence on rhythms of rest - activity. At high intensity, light directly affects the neuroendocrine processes of man, in particular suppresses the production of melatonin of the epiphysis (pineal gland).

One of the leading factors of seasonality in influencing the frequency of conception and childbirth is the photoperiod. As F. Bronson and P. Heideman [10, c. 541] point out, the length of the day is important for vertebrates and is used by them as a signal of upcoming events in the environment and as a regulator of reproduction. Melatonin secretion depends on the ratio of the duration of light and dark periods of the day. The concentration of the hormone in the blood is reduced in a long day, which, as a result, reduces its depressing effect on the release of gonadotropins and sex steroids, which leads to the activation of reproductive function in the summer, an increase in the frequency of conception, and then childbirth after 9 months, i.e. in the spring.

The main reason for the inverse correlation between the seasonal peak melatonin concentration and seasonal low ovarian activity in a population of high (polar) latitudes may be the direct influence of changes in melatonin concentration, explaining the reasons for seasonal changes in fertility.

A number of scientists studied the seasonal dynamics of melatonin levels in humans. Blood samples for tests were collected every hour at night for 5 hours, from 22: 00 to 02: 00 hours, and the next day at noon. All subjects had a circadian rhythm of melatonin secretion in summer and winter. Melatonin levels were significantly higher at night in winter than in summer. Mental disorders (by General Health Questionnaire (GHQ-28)) were significantly and negatively correlated with melatonin production in summer and winter.

The seasonality of the frequency of conception is associated with changes in the quality of the fetal egg or receptivity of the endometrium.

The severity of the seasonal dynamics of human biological functions is associated with the contrast of meteorological indicators in different climatic seasons of the year, which is typical for the temperate zone and especially for its continental areas.

Many authors hypothesized that, along with endogenous causes, exogenous factors, in particular, meteorological conditions of the environment, affect the condition of newborns [8]. One of the critical periods of embryogenesis is the month of conception [7].

These hypotheses were tested by us in the course of our own research, resulting in the following conclusions:

1. In the conditions of Barnaul maximum births occur in January-March, and the minimum-in November-December, which, respectively, means that the maximum of conception is celebrated in may-July, and the minimum – in March-April.

2. The temperature of the environment is a key meteorological parameter that determines changes in the frequency of childbirth in different climatic seasons of the year.

3. In the winter climatic period, the number of births is most affected by weather factors, which include air temperature, atmospheric pressure, baric trend, humidity compared to other climatic periods.

References

1. Dmitruk, A. I. Biorhythmological aspects of the problem of adaptation in sports: educational and methodical manual / A. I. Dmitruk; St. Petersburg state University of physical culture. P. F. Lesgaft. - SPb., 2007. - 58 p.

2. Isaev, A. A. Ecological climatology / A. A. Isaev/ / scientific world. -2003-423 p

3. Koroteeva, T. V., Seasonal dynamics of hormonal metabolism in healthy women of different ethnic groups. Physiology of adaptation / T. V. Koroteeva, Radysh I. V., Ermakova N. V., Khodorovich A. M.: Proceedings of the 2nd all-Russian scientific and practical conference, Volgograd: Volgograd scientific publishing house.-2010.- P. 76-77.

4. Maltseva A. E. Seasonal dynamics of human reproductive function in connection with the peculiarities of the manifestation of environmental factors in the city of Barnaul.- Topical issues of experimental and clinical medicine-2019: collection of abstracts of scientific and practical conference with international participation. - SPb. 2019. - 328 p.

5. Radish, I. V. Circannual change in the assessment of quality of life in women of different ethnic groups/I. V. Radysh, T. V. Koroteeva, V. I. Torshin, Yu. p. Starshinov //Physiology of adaptation: Materials of the 2nd all-Russian scientific-practical conference, 22-24 June 2010 - Volgograd: Volgograd scientific publishing house. 2010. - S. 10-11.

6. Rogova N. And. Daily the absence of functional processes in the system "mother-placenta-fetus" in the prenatal period and during childbirth in the different seasons of the year depending on stereoisomery utero-placental complex: abstract dis. candidate of medical Sciences: 03.03.01 / Rogova Nadezhda Anatolyevna; [place of defense: state budgetary educational institution of higher professional education Volgograd state medical University of the Ministry of health of the Russian Federation].- Volgograd, 2013.

7. Fedorova O. I. Influence of meteorological factors per day of birth on the number of births in the city of Barnaul/O. I. Fedorova, Y. V. Lastochkina, A. E. Maltseva.- Ukrainian ecological journal, 2018, 8 (2), Pp. 342-347.

8. Fedorova O. I., Maltseva A. E. Seasonal dynamics of the functional state of newborns depending on abiotic environmental factors in the conditions of the city of Barnaul. - Human ecology.- Publishing house of the Northern state medical University of the Ministry of health of the Russian Federation, 2019- № 5. S. 49-55

9. Kharlamova, N. F. long-Term climate changes in the inland territory of Russia (Altai region)/ N. F. Kharlamova. - News of Altai state University. - 2010-Pp. 133-140.

10. Bronson F. H. seasonal regulation of reproduction in mammals / physiology of reproduction. 2nd ed. / F. H. Bronson, the Keys to D. P., E. Knobil, J. Neill, EDS. New York: Raven press, 1994.– P. 541-583.

植物生物量臭氧化。
从臭氧化松木和白杨木中分离出的木质素的紫外光谱

PLANT BIOMASS OZONATION. UV SPECTRA OF LIGNIN ISOLATED FROM OZONIZED PINE AND ASPEN WOOD

Mamleeva Nadezhda Alekseevna
Senior researcher, Ph.D.chem.sciences
Lomonosov Moscow State University
Lunin Valery Vasilyevich
Prof. Dr. Science, academician RAS
Lomonosov Moscow State University

注解。 通过紫外光谱研究松树和白杨木臭氧化中的木质素转化。 对从初始和臭氧化木材中分离的二恶烷 – 木质素的UV二阶导数光谱（第二光谱）进行了分析。 结果表明，木材臭氧化中木质素转化的主要途径是芳环的破坏。 此外，还进行芳烃的改性。 发生芳香醛，酮和碳酸的形成。

在相同的臭氧消耗水平下，与落叶木中的木质素相比，软木木质素的破坏效果较差。 在松树臭氧化产品中，与白杨木相比，芳香醛和酮占主导地位。 该结果应该是由于落叶和软木质素组成之间的差异。

关键词：木材臭氧化，木质木质素破坏，二恶烷 – 木质素，紫外二阶导数光谱

Annotation. *Lignin conversion in pine and aspen wood ozonation was investigated by UV- spectroscopy. It was carried out the analysis of the UV second derivative spectra (2nd spectra) of dioxan-lignin isolated from initial and ozonized wood. It is shown that the dominant pathway of lignin conversion in wood ozonation is a destruction of aromatic rings. Besides, modification of aromatics takes place. Formation of aromatic aldehydes, ketones and carbon acids occurs.*

At the same ozone consumption level, the softwood lignin destruction is less effective as compared to lignin in the deciduous wood. In the products of pine ozonation, aromatic aldehydes and ketones dominate in comparison to aspen wood. This result is supposed to be due to the difference between deciduous and soft lignin composition.

Keywords: *wood ozonation, wood lignin destruction, dioxan- lignin, UV second derivative spectra*

The lignocellulosic biomass offers many possibilities for the chemical industry due to its chemical composition, abundant availability and relatively low costs. New opportunities in the production of varied chemicals and materials are related to the carbohydrate, protein and the phenol building blocks contained in biomass. Modern technologies demand a sustainable processing of biomass into a number of target products including the energy, food, feed, chemicals, and material applications. [1].

Oxygen, hydrogen peroxide, and ozone are among the most environment friendly oxidants that effectively destruct aromatic compounds of lignocellulosic biomass. These compounds are used in pulp plants as bleaching agents [2,3]. Among various oxidants, ozone is an attractive alternative for a number of reasons. It does not leave strongly acidic, basic or toxic residues in the treated material, and it can be decomposed back to oxygen by a simple catalyst bed or by increasing the temperature. Finally, most ozonation reactions take place at near-ambient temperatures and pressures.

Direct ozone action upon the poplar, aspen, pine, spruce, sugar-cane, wheat and rye straw, corn stalk and others was investigated. Ozone impact on lignocellulosic biomass resulted in a lignin degradation. To intensify the process of enzymatic hydrolysis to sugars and ethanol, the ozonation was used as a pretreatment of biomass [4-7]. Vegetable raw was also ozonized with the aim of consequent cellulose obtaining [8,9].

Ozonation of poplar, aspen and spruce reveals in the formation of a number of carbon acids (oxalic, tartaric, glyoxyic, malonic, malic, succinic, glycolic, formic, muconic, acetic, and et al.) [8,10]. It was noted that ozone rapidly oxidized the initially generated oxyaromatics and transformed them into a short chain of aliphatic carboxylic acids [8,10,11]. The composition of ozonization products was influenced by the ozone consumption [8,10].

It was concluded in [5,6,8,9] that lignin is the most affected polymer, followed by hemicelluloses and finally by cellulose. Cellulose degradation may become noticeable depending on system parameters. Some authors consider the cellulose destruction is negligible [5,6].

It was shown that the water presence intensified the ozone consumption by biomass. There are a lot of researches on the influence of water content on efficiency of processing plant biomass with ozone. [4,7,9,10,12]. Earlier, it was shown that, the optimum water content that corresponds to the most effective impact varies markedly, depending on the nature of biomass. Optimum MC was found to be at 58-60% [9] (aspen) and 60-63% (pine). [10].

This work continued the study of wood treatment with ozone. The paper is aimed to the main pathways of the lignin transformation in the course of wood ozonization. Aspen (*Populus Tremula*) and pine (*Pinus Sylvestris*) wood ozonization was investigated. Lignin conversion in ozonization of the wood was studied by the UV- spectroscopy method.

Experimental

Ozonization of aspen (*Populus Tremula*) and pine (*Pinus Sylvestris*) sawdust samples (particle size of 0.31-0.61 mm) of moisture content (MC) of 60±5% was investigated. The MC value is defined as water mass divided by the mass of oven-dry wood (m_{odw}), $m_{odw} = (m_0 - m_{H2O})$, where m_0 and m_{H2O} are the mass of the sample and water.

$$MC\ (\%) = (m_{H2O}/m_{odw}))\times 100.$$

To obtain wood samples containing water, the air dry sawdust was penetrated by water following the procedure [12]. The procedure of wood ozonization and specific ozone consumption (OC, mmol/g) calculation are described in [9,10].

The residual lignin content in initial and ozonized samples was determined as the acid-unsolved lignin content by applying the procedure described in [12].

To obtain dioxan-lignin (DL), the wood sample was boiled for 1 h in dioxan with the presence of catalytic HCl amounts. The residue was dried in air. To register the UV spectrum, the product was dissolved in water.

UV-spectra of aqueous DL solutions were recorded with Cary 3E (Varian) using signal accumulation conditions. The second derivative spectrum (2nd spectra) computation followed averaging–out and smoothing of the signal under standard procedures [12].

Results and discussion

The UV spectra of dioxane lignin (DL) aqueous solutions are presented in Figure 1. It is seen that it is not possible to get information about lignin conversion from the UV-spectra of Figure 1. We used the second derivative UV- spectra (the 2nd spectra) of DL to find out the principle ways of the wood lignin transformations under ozone impact.

For the first time, the derivatives of absorption spectra on the wavelength were used for interpretation of spectra in [13]. The second wave-number derivative of Gaussian equation results in the negative maximum corresponding to the spectral maximum position. Attempts of analysis and identification of lignin and ligninsulfonates spectral bands with derivative spectra were performed in [13-16]. Derivative absorption spectra on wavelength used for spectra interpretation in [13].

Analysis of the DL 2nd spectra was carried out using the data on the 2nd spectra of lignin structure models published in [14,16]. The 2nd spectra of DL corresponding to various values of ozone consumption are presented in Figure 1. Spectrum 1 in Figure 1 corresponds to the lignin of the initial sample. The main absorption bands correspond to the π-π* transitions of guaiacol (3-methoxy-4-hydroxylphenol) with the bands at 253, 272, and 280 nm, syringol (3,5- dimethoxy-4-hydroxylphenol) with the bands at 265, 273, and 280 nm, guaiacylethane (250, 276,and 284 nm), guaiacylethanol (272, 275, and 283 nm). Besides, slight bands of C=O containing aromatic structures are observed. It follows that the lignin from initial

wood is characterized by guaiacyl- (G) and syringyl (S)-type structures and G-type structures with alkyl-aryl bonds. Guaiacyl- and veratryl-type carbonyl- and carboxyl compounds are also present in small amounts. Bands in the region of 285-288 nm and 310-320 nm prove the presence of aromatic chromophores containing α-C=C bonds [14].

As seen in the spectrum 2 in Figure 1, the aromatic S- and G-structures content decreases with ozonation just as C=C bonds do as well. The spectrum contains intense bands characteristic of acetoguaiacon (the bands at 259, 267, 270, and 302 nm) and acetoveratron (267, 296, and 301nm) and other carbonyl- containing compounds. As compared to the initial sample, the contents of vanillic (the bands of 265, 284, and 296 nm) and carboxyvanillic (277, 293, 315, and 324 nm) acids also increase.

Relative content of carbonyl- and carboxyl-containing compounds increases as the ozone consumption increases. The 2nd spectrum of the sample of OC = 2.2 mmol/g shows that the amount of aromatic acids and ketones in the sample is small (spectrum 3, Fig.1). The data in Figure 1 also indicates that a part of the aspen lignin is not exposed to ozone.

At the initial stage of the substrate ozonation, the content of aromatic carboxyl-and carbonyl- compounds increases. Their source could be a reaction of O_3 with alkene substituents of the corresponding aromatic compounds [17,18]. These compounds could also be formed in oxidation of aliphatic substituents with ozone.

The 2nd spectrum of DL of the initial and ozonized pine are present in Figure 2. The major chromophore types of pine and aspen DL are presented in Table 1.

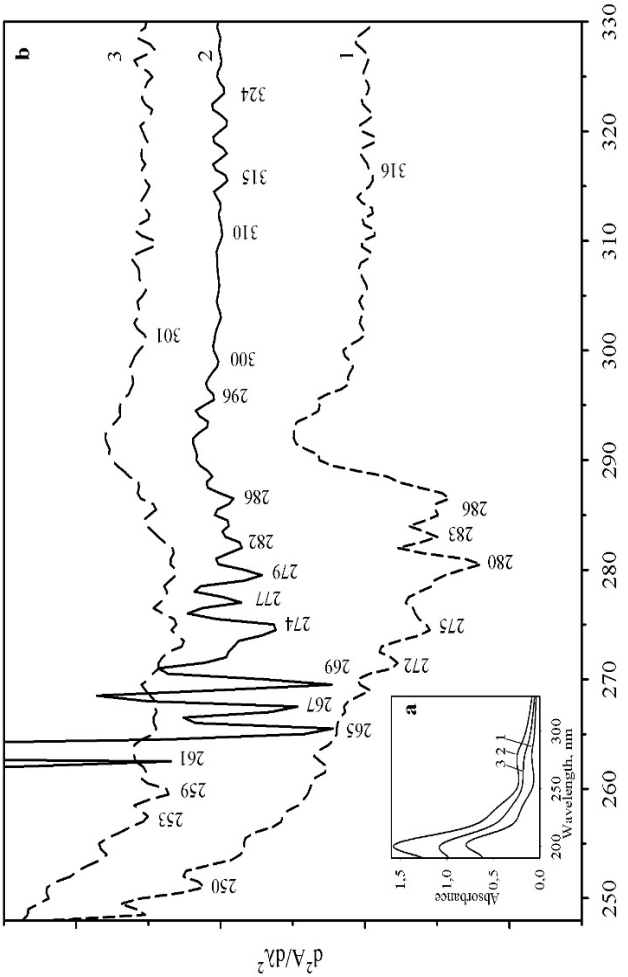
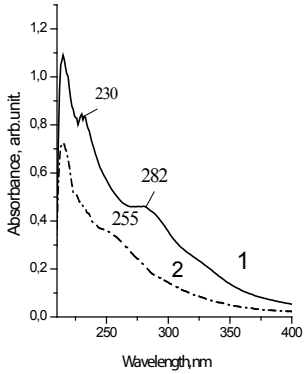
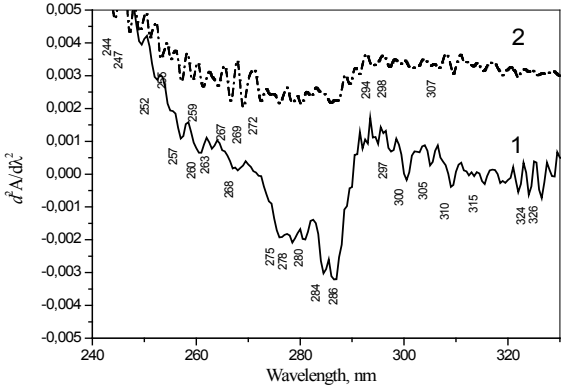


Figure 1. *UV spectra (a) and the second derivative spectra (b) of DL extracted from aspen wood samples: OC, mmol/g: 0 (1), 1.2 (2), 2.2 (3).*
Spectrum 3 was obtained by multiplying the experimental spectrum in 5 times



A



B

Figure 2. *UV spectra (A) and 2nd spectra (B) of DL extracted from pine samples: OC mmol/g: 0 (1), 2.2 (2)*

Apart from G-structures with aliphatic substituents, the G-structures with conjugated C=C bonds (eugenol, *iso*-eugenol, coniferyl alcohol) are noticeable in DL spectrum of the initial sample. Phenol, syringol and carboxyl-compounds amounts are small (Table 1, Fig.2).

Table 1. *Aromatic structures with the main absorption bands in 2nd spectra of dioxan-lignin obtained from initial and ozonated wood*

Wood	Initial sample	Ozonated sample OC = 2.2±0,2 mmol/g
Aspen	guaiacol (244, 254, 272, 280), syringol (264, 273, 280) guaiacylethane, (250, 276, 284), guaiacylpropane (270, 276, 284), guaiacylethanol (272, 275, 283); (vanillyl alcohol (254, 275, 283), 4-acetoguaiacon, (259, 267, 270, 302), acetoveratrone (267, 296, 301), eugenol (254, 268, 276, 284), dimethoxycinnamic acid (275, 286, 308, 324)*). **25.3% LG**	4-acetoguaiacon, vanillin (250, 270, 298, 308), benzaldehyde (250, 268, 276, 285), benzoic acid (260, 267, 276), phenol (254, 261, 268, 276), 2,3 dimethylphenol (242, 267, 278); (guaiacol, syringyl, guaiacylethane, guaiacylpropane, verarol (245, 267, 278)). **9.3% LG**
Pine	guaiacol, guaiacylethane, eugenol, *iso*-eugenol (244, 252, 263, 291, 297, 309), eugenol, coniferyl alcohol (256, 267, 284, 300, 310), 3,4- dimethoxycinnamic acid; (syringol, phenol, 5- carboxyva-nillic acid (276, 314, 326), 2,4- dihydroxybenzoic acid (250, 254, 290, 297)). **28.0% LG.**	2,5 dihydroxibenzaldehyde (255,259, 274, 298), veratric aldehyde (246, 268, 297, 307), *o*- veratric aldehyde (244, 262, 309, 322, 339), propiosyringone (246, 280, 301), acetoveratrone, *p*- methoxiphenon (258, 273, 278), 4-acetoguaiacon, 5-carboxyvanillic acid, 2,4- dihydroxybenzoic acid, pyrocatechol (243, 267, 282); (eugenol, *iso*-eugenol, coniferyl alcohol, guaiacylethane). **17.4% LG**

**Minor chromophores are shown in brackets.*

The pine wood lignin is less destroyed by ozone. The structures corresponding to the initial lignin (eugenol, *iso*-eugenol, coniferyl alcohol, guaiacylethane) are also seen in the spectrum 2 of ozonated sample. The comparison of the spectrum 2 in Figure 2 and the spectrum 3 in Figure 1 shows that the intensities of pine aromatic bands are higher than that of aspen wood. The lignin residual content is also higher -17.4% as compared to 9.3% for aspen wood at the same ozone consumption (OC = 2.2 mmol/g).

DL isolated from ozonized aspen and pine is characterized by common features, namely, high content of carbonyl- and carboxyl compounds. The structure of these compounds differs due to the difference between deciduous and soft lignin composition. (Table 1). Apart from G-type aromatics destruction into aliphatic compounds, a formation of aromatic ketones and aldehydes occurs. It could be a result of O_3 reaction with lignin double bonds according to the Criegee mechanism [17,18]. This suggestion explains a remarkable variety of aromatic carbonyl-compounds found in the ozonized pine sample.

Formation of aromatic aldehydes and acids in ozone reactions with unsaturated aromatic compounds were observed in [18]. It is likely that this result is due to a presence of conifer structures in softwood lignin. Formation of carbonyl-containing aromatic compounds coincides to IR data obtained for ozonized pine wood [8]. It was found [19,20] that oxidation of veratrole as well as coniferyl alcohol results in generation oxyaromatic structures.

The UV- spectroscopy method (in the second derivatives) allows us to find out the main pathways of lignin conversion in wood ozonation. The data on the 2nd spectra show that S-, G- structures and double bonds are oxidized first of all. The products are characterized by the presence of the mostly resistant to ozone phenyl-, benzyl-, veratryl- structures. Some of aromatic structures of lignocellulosic complex are not exposed to the reagent. It was shown that lignin in pine wood is most resistant to ozone.

The analysis with UV second derivatives carried above is not the ultimate one. It could be improved with the data on the origin of specific bands composing the lignin spectrum as well as by development and correction of the 2nd spectra of models. The UV second derivative way could be used to clarify principle ways of lignin conversion during various processes.

References

1. Gosselink, R.J.A. Lignin as a renewable aromatic resource for chemical industry. Examples of acceptable reference systems Doctor Thesis. Wageningen Univ. The Nethelands. 2011.

2. Demin, V.A, Shereshovets,V.V., Monakov,Yu.B. (1999). Russ. Chem. Rev., 68, 1029-1050.

3. Roncero, M.B., Colom, J.F.,Vidal,T. (2003). Carbohydr. Polym. 51, 243-254.

4. Li C., Wang L., Chen Z., Li Y., Wang R., Luo X., Cai G., Li Y., Yu Q., Lu J., Bioresour. Technol. 2015. 183, 240.

5 Travaini, R., Otero, M. D. M., Coca, M., Da-Silva, R., Bolado,S. (2013). Bioresource Technology, 133, 332–339.

6. García-Cubero,T., González-Benito, G., Indacoechea, I., Coca, M., Bolado, S. (2009). Biores. Technol. 100, 1608–1613.

7. Ben'ko. E.M, Chukhchin, D.G , Lunin , V.V. Russ. J. Phys. Chem. A, 2017, 91, 2092.

8. Mamleeva, N.A., Kharlanov, A.N. , Chukhchin, D.G. , Bazarnova , N.G., Lunin, V.V. (Khimiya Rastitel'nogo Syr'ya, 2019, 85–94. (in Russ.). DOI: 10.14258/jcprm.2019015143.

9. Mamleeva, N. A.,Autlov, S. A., Bazarnova, N.G., Lunin, V.V. Russ. J. Bioorg. Chem., 2016, 42, 694.

10. Mamleeva, N.A., Babayeva, N.A., Kharlanov, A.N. , Lunin, V.V. (2019). Russ. J. Phys. Chem. A, 93, 37.

11. Quesada, J., Rubio, M., Gomez, D. (1998). J. Agric Food Chem. 46, 692-697.

12. Mamleeva, N.A., Autlov, S.A., Bazarnova, N.G., Lunin V.V. (2009). Pure Appl. Chem, 81, 2081-2091.

13. Giese,A.T.& French, C.S. (1955). Appl. Spectroscopy. V.9, 78-96.

14. Popova, N.R., Bogolitsyn, K.G. In K. G. Bogolitsyn and V. V. Lunin editors. Physical Chemistry of Lignin. Arkhang. State Tekh. Univ. Arkhangelsk. Russia. 2009. pp.221-256.

15. Bogolitsyn, K.G. & Lindberg, I. (1986). Khimiya Drevesiny, №4, 56-60.

16. Bogolitsyn, K.G. (1987). Zhurn. prykl.spectr. 46, 1024-1027.

19. Khudoshin, A.G., Mitrofanova, A.N., Lunin V.V. (2008). Russ.Chem. Bull. (Russ.Fed.), 57, 283-288.

17. Bailey, P.S. Ozonation in Organic Chemistry. Vol. 2. Nonolefinic compounds. Acad. Press, New York.1982.

18. Razumovsky, S.D. & Zaikov, G.E. Ozone and its reactions with organic compounds. Amsterdam. The Nethelands. Elsevier. 1984.

20. Ferron, B., Croué,J.P., Dore M.// Ozone: Science&Engineering. 1995. 17. P.687. doi.org/10.1080/01919512.1995/10555779

预防海上冲突的立法差距
LEGISLATIVE GAPS IN THE PREVENTION OF COLLISIONS AT SEA

Astrein Vadim Viktorovich
д.т.н., к.д.п., Professor of Navigation department, Master mariner, Admiral Ushakov State Maritime University, Novorossiysk
Astreina Ludmila Borisovna
к.г.н., Assoc. Prof. of Navigation department Admiral Ushakov State Maritime University, Novorossiysk
Shtyrkhunova Natalya Aleksandrovna
к.ф.н., Assoc. Prof. of Navigation department Admiral Ushakov State Maritime University, Novorossiysk

抽象。 本文介绍了对海上碰撞预防立法中的差距的分析，该立法实施了各种船舶管理战略。 本文考虑了克服和消除立法差距的方法。
关键词：立法差距；集中，分层，分散的船舶管理；防止海上碰撞。

Abstract. *The paper introduces an analysis of the gaps in the legislation on the prevention of collisions at sea which implements various strategies for ship management. The ways of overcoming and eliminating the legislative gaps are considered in the paper.*

Keywords: *legislative gaps; centralized, hierarchical, decentralized ship management; prevention of collisions at sea.*

Historically the option of a strategy suitable for preventing collisions at sea and ensuring safe navigation of vessels depends on the time period which is required in order to take the appropriate decision. Some tasks are to be dealt with based on *the principle of centralized strategy,* while the others - *on hierarchical principle*.

With the centralized management the typical form of management to prevent collisions of ships (PCS) is that effected by a single centre and as a rule in some constrained conditions, for example: by the shore based Vessel Traffic Service (VTS) in accordance with the COLREGs -72; while navigating in ice conditions – by an icebreaker in accordance with the local rules of navigation; when navigating in convoy – by a flagship or any other ship designated by the commanding authority. In all cases mentioned above the center heading the management of a group of ships assumes responsibility for the planning and managing of all vessels in order

to transfer them from a dangerous state to a required safe state. The features of such a management structure are as follows: accurate allocation of actions, hierarchical management (vertical subordination), availability of formal management rules and regulations.

For preventing collision on the high seas the decision about actions of ships is taken, as a rule, by a ship having privileges as compared with other ships and is based on the principles of the hierarchy in ships passing laid down in the COLREGs-72. As opposed to the single centralized management strategy to prevent collisions of ships, with the centralized strategy the complexity of the task is significantly reduced resulting in the increased decision-making efficiency.

In addition to the above considered collision prevention situations there may be cases involving *n-homogeneous ships (n≥ 2)* where there is no a privileged vessel and for this reason a hierarchy doesn't exist. All ships are equal and homogeneous. Such situation is not described in COLREGs-72 and there are no clear recommendations or algorithms for action in the existing Comments on the COLREGs-72. The navigating officer makes decision with due regard to the «good seamanship» and his own experience. The decision- making method in such a situation is based on *the decentralized management strategy.* This strategy means that each vessel involved in the situation independently decides on its actions and tries to develop and coordinate its actions taking into account the maximum possible contribution to the achievement of a common group goal.

The PCS system is built on the appliance of rules. To make decisions on the prevention of collisions of ships (PCS) a system of regulatory legal acts is required. The system of regulatory legal acts on PCS is a set of regulatory legal acts adopted and implemented for the PCS, connected by relations of subordination and coordination. The system of regulatory legal acts on the PCS is built up based on their differences in types and forms.

The safety of the international shipping is regulated by the following legal acts: Convention on the High Seas, 1958; United Nations Convention on the Law of the Sea 1982; Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs-72); International Convention for the Safety of Life at Sea, 1974, as modified by the Protocol of 1978 relating thereto; International Code of Signals, 1965; International Convention on Load lines, 1966; national rules and laws of coastal states.

The normative legal acts can be divided into *basic* and *derivative.*

The main international legal act for preventing collisions of ships is the **Convention** on the International Regulations for Preventing Collisions at Sea (COLREGs-72) which was signed on October 20, 1972 in London at the International conference on the revision of the Collision Regulations of 1960, convened by the Intergovernmental Maritime Consultative Organization (IMO). The COLGERs-72 in the form of a convention has independent significance. First of all the Convention is an international treaty comprising a set of generally accepted standards, norms and criteria.

At the conference the Convention on COLREGs-72 was prepared and first adopted, the annex to which are the Rules themselves. The Convention established the international regulatory framework for the COLREGs and determined the procedures for their entry into force and making further necessary corrections, additions and amendments to them. COLREGs-72 represents a system of international obligatory and recommendatory rules aimed at preventing collisions at sea and is one of the important aspects of ensuring the safety of navigation.

The legal regulation of the consequences resulting from a collision of ships including the procedure and grounds for compensation for damage caused by the collision is established in Chapter XVII of the Merchant Shipping Code of the Russian Federation based on the International Convention for the Unification of Certain Rules of Law with respect to Collisions between Vessels (the Brussels Collision Convention, 1910) adopted in Brussels on September 23, 1910.

The **derivative** legal acts include: standards, regulations, instructions, recommendations, charters and others.

The relations arising from the MSC are regulated by **federal laws** (FL) issued in the Russian Federation.

In accordance with the FL-261 **«On sea ports of the Russian Federation and amendments to the certain legislative acts of the Russian Federation»** dated November 8, 2007 (hereinafter referred to as the Law on seaports) and FL-155 **«On internal waters, territorial sea and contiguous zone of the Russian Federation»** dated July 31, 1998, the **«General Rules of navigation and mooring of vessels in the sea ports of the Russian Federation and on the approaches thereto»** (General Rules) have been approved.

The **«General Rules»** include the following rules and regulations: rules of the road and vessel traffic control within the water areas of seaports and on approaches to them including vessels' navigation in areas covered by Vessel Traffic Services; procedures for arrival at and departure from seaports; vessels' stay in seaport water areas and on approaches to them; ensuring the safety and security of hydraulic structures of seaports; ecological requirements including waste to be disposed from ships in seaports; quarantine requirements in seaports; vessel's manoeuvring to pass a vessel engaged in dredging operations; ice navigation.

The «General Rules» in the terms of vessels' collision avoidance shall conform as closely as possible to the COLREGs-72.

The COLREGs-72 Rule 1 *Application*, paragraph (b) establishes the right to develop and issue the local sailing rules which are usually called By-Laws or Obligatory Harbour Regulations.

«By-Laws» comprise the description of a seaport; procedures for arrival at and departure from the seaport including the safety of navigation requirements; navigation of vessels in the seaport water area and on the approaches to it; Vessel Traf-

fic Control Service area and navigation regulations in the area covered by VTS; vessels' stay in the seaport water area at anchorages and alongside berths; other information as prescribed by the acts of law of the Russian Federation pertaining to the merchant shipping.

Laws governing the activities of enterprises involved in ensuring the safety of navigation are adopted in the form of charters.

Thus the Federal state unitary enterprise «Rosmorport» (FSUE «Rosmorport») is entitled to perform 56 kinds of activities in accordance with its Charter. In particular, par. 12 of the FSUE «Rosmorport» Charter provides a list of services rendered by FSUE «Rosmorport» related to the safety of navigation. The list comprises all kinds of services rendered to ships on the approaches to seaports and within the seaport water areas related to their safe navigation, maneuvering and stay in the seaport waters, pilotage and etc.

Regulatory legal acts specifying the issues of application of the regulatory legal acts are adopted (issued) in the form of **instructions**. An instruction is a document comprising directions or guidelines on the procedure and method of executing or implementing something.

As an example it may be «Typical instruction for pilot vessels to safely embark on /disembark a pilot from ships» (Typical instruction) having been developed in order to establish the uniform safety navigation requirements for pilot vessels and safety instructions for pilot's embarkation on/disembarkation from ships.

The document describing the best practice for taking the necessary actions is called a **recommendation**. Thus «Recommendations on the organization of Navigation Service» (Recommendations) generalize the experience of captains and navigating officers in terms of organizing the proper navigation service in various areas and sailing conditions in order to ensure an effective and safe operation of a ship.

The Recommendations are a guide for arranging the work of navigators on the bridge which are intended to facilitate the process of development of the proper conscious skills required to fulfill their navigational duties including their duties as watch officers.

However the Recommendations do not exclude or limit the application of any other measure or action that in the opinion of the captain or a navigating officer may be effective in the specific sailing circumstances and conditions.

Since the amount of goods transported by sea is steadily growing navigators have to regularly deal with untypical and disputable situations when there is no legal regulation of certain legal relations. Not so frequently in case of a centralized strategy but almost always with decentralized management the legislative gaps arise in certain situations related to preventing collisions of ships.

The above given brief analysis of legislative acts, analysis of numerous collisions between vessels, the cumbersome legislative framework and its applicability raise questions about the applicability of the existing legislative acts related to the PCS.

Legislative gaps with regard to the prevention of collisions of ships are generally considered as regulatory weaknesses and investigated by identifying the causes and conditions for a gap to take place and determining the ways to eliminate, overcome and prevent them. It should be clearly understood that the availability of gaps in PCS legislation is inherent in any dynamically developing system based upon rules. The prevention collisions system is changing in its quality and new technologies are implemented, new conditions and restrictions emerge while the «so called universal rules» (COLREGs-72) written in terms of linguistic indeterminacy remain the same. As a rule technical progress is in ahead of developing and issuing the appropriate legal acts regulating their enforcement. Thence there are legal gaps due to various reasons. The gaps in PCS legislation emerge as a result of subjective reasons such as omissions, shortcomings made in the process of the lawmaking. Failure to comply with legal procedures will inevitably lead to unclear enactments and regulations and in consequence to emerging gaps in legislation. Thus a legislative gap on PCS is a complete or partial lack of legislative norm required for regulating the certain legal relations between ships in the prevention of collisions at sea.

Legislative gaps, as a rule, become obvious in the process of applying the regulations. When following the regulations a navigator is faced with the lack of legislative norm for a specific legal situation which cannot be regulated based on the existing legislation. In order to minimize them the international and governmental lawmaking authorities are to develop and implement the effective mechanisms for overcoming and eliminating the gaps in legislation.

The principal means of eliminating any legislative gap is setting a norm, i.e. lawmaking. In this respect the following effective ways to overcome or eliminate gaps in the PCS legislation may be proposed:

1) Application of analogy techniques;

2) Identification of the true meaning of the norm by interpreting the legal provisions of the COLREGs-72;

3) Timely introduction of amendments or corrections to COLREGs-72.

The variety of relationships between different ships, homogeneous or heterogeneous, with different management strategies for preventing collisions of ships make it possible to conclude that the PCS legislation without any gaps cannot be achieved. However the problem can be solved or at least its negative effect can be minimized if the international and national state lawmaking authorities response in due time to changes in relationships covered by the rules or emergence of new relationships and disappearance of the old ones. It is the timeliness that is an essential factor that could help to solve the problem.

References

1. International Regulations for Preventing Collisions at Sea, 1972 (COLREGs-72). Consolidated Edition, 2003 (Russ. ed.: Mezhdunarodnye pravila preduprezhdeniya stolknoveniy sudov v more 1972 (MPPSS-72). Moscow, RKonsul't Publ., 2004. 80 p.)

2. Cahill R. A. Collision and their causes. London, 1983 (Russ. ed.: Keyhill R. A. Stolknovenie sudov i ikh prichiny. Moscow, Transport Publ., 1987. 240 p.)

3. Cockroft A.N., Lameijer J.N.F A Guide to the Collision avoidance Rules: International Regulations for Preventing Collisions at Sea. (Russ. ed.: Коккroft A. N., Lameyer D.N. Tolkovanie MPPSS-72, Moscow, Transport Publ., 1981. 279 p.)

4. Yudovich A. B. Predotvrashchenie navigatsionnykh avariy morskikh sudov [Prevention of navigational accidents at sea]. Moscow, Transport Publ., 1988. 224 p. ISBN 5-277-00172-7.

5. Yaskevich A. P., Zurabov Y.G. Kommentarii k MPPSS-72 [Comments to COLREGs-72]. Moscow, Transport Publ., 1990. 479 p.

6. Skvortsov G.N. Legislative gaps and ways of their overcoming and eliminating by the Constitutional Court of the Russian Federation Journal Ogarev-online, 2016, no. 8 (73), p.7. Available at: e-library.

7. Sorokin Y. V. Legal nature and essence of the concept «juridical collision». Probely v Rossiyskom zakonodatel'stve [Law], 2013, no.3, pp. 51-55. (in Russian)

互联网广告k-means聚类
INTERNET ADVERTISEMENT *K*-MEANS CLUSTERING

Kovalenko Mihail Valer'evich
student
National Research University MPEI, Moscow, Russia
Zein Ali Nazhievich
PhD, Assistant Professor
National Research University MPEI, Moscow, Russia
Borisova Svetlana Vyacheslavovna
Senior Lecturer
National Research University MPEI, Moscow, Russia.

抽象。 我们分析了用于聚类互联网广告的不同k-means算法。 原始数据来自社交网络VKontakte。 任何聚类过程的有效性取决于所选择的算法，因此有必要进行研究并确定最佳算法。 应该注意的是，聚类算法的基本实现并不是最优的，因此在基于研究的选定算法中，您需要实现一个可以改进基本版本的修改版本。

关键词：网络广告聚类，k-means算法，k-means ++算法，LSA算法，数据准备，数据存储，数据过滤，大数据，数据分析，数据挖掘，Vkontakte。

Abstract*. We analyze different k-means algorithms for clustering internet advertisements. Raw data is grabbed from the social network VKontakte. The effectiveness of any clustering process depends on the chosen algorithm, for this it is necessary to conduct research and determine the best one. It should be noted that the basic implementations of clustering algorithms are not optimal, so in the selected algorithm based on research, you need to implement a modified version that will improve the base version.*

Keywords*: internet advertisement clustering, k-means algorithm, k-means ++ algorithm, LSA algorithm, data preparation, data storage, data filtration, big data, data analysis, data mining, Vkontakte.*

Achievements in computer engineering and data science has made possible to make breakthrough in data analysis. By time, volumes of data have become bigger and scientists started to introduce the term “big data”. A data scientist can afford to analyze raw, unstructured and heterogeneous data using “data mining” concepts. Grigory Piatetsky-Shapiro, one of the world’s leading experts in data mining has given this definition of the term “data mining”: “Data mining” is the process of

detecting previously unknown and practically useful knowledge in raw data that are necessary foe decision-making in human activity fields. Data mining, when applied, can bring benefits and valued decisions. Data mining concepts bring knowledge and can be used by users uninformed in mathematics. Data mining is applied, for example, in sociology, politic science and marketing. Huge arrays of raw data are analyzed, simplified and then given as "valued knowledge" for data customers.

Marketing specialists can build closer relationships with customers by understanding their behavior and their consummation needs, so it will better retain them and avoid unnecessary action and additional spending on promotions and advertisements. In other words, data mining can reach out customers with interesting offers according to their behavior, Interests and needs. Data clustering as a subclass of data mining can be implemented in marketing solutions. Clustering advertisement data can bring clear ideas about what goods or services available on marketplace, the target audience and how many consumers are interested in this good or that service. Well known algorithms are widely used for clustering advertising data, however these algorithms can be improved by increasing their speed.

The purpose of the study:

The main goal of this research is to improve (increase) the speed of clustering algorithms *k*-means. The main idea is to develop modified *k*-means clustering algorithms, implementing them in cluster tasks and analyzing the best result of completion time.

The object of the study:

Variety of *k*-means clustering algorithm modification and their implementation in test. Clustering advertisement (ads) in the internet will be used to analyze the result of implementing modified clustering algorithms on clustering speed.

Advertisement grabbing and storage:

According to the media research company "mediascope", vkontakte (vk.com) has the largest internet audience in Russian Federation with more than 196 million groups with advertising posts. Using VK API it is possible to parse pages and extract ads. Extracted data will be then stored in MongoDB database, later processed with data filtration.

Data filtration:

In order to start working with data, we should prepare grabbed text for further analysis. These are the filtration steps:

1. Selecting headlines – using HTML tags it is very easy to detect headlines with the tag <head>.
2. Excluding punctuation symbols.
3. Stemming text – converting text to root words.
4. Normalizing text.
5. Word indexing.

Data mapping:

After finishing with data filtration, it is necessary to obtain the frequency matrix, according to which we are going to perform partitioning using LSA algorithm, that will give the position of advertising posts according to their semantic relationship.

	T1	T2	T3	T4	T5	T6	T7	T8	T9
wikileaks	1	0	0	1	0	1	0	1	0
арестова	0	0	0	1	0	0	0	1	0
великобритан	0	0	0	1	0	0	0	1	0
вручен	0	0	1	0	1	0	0	0	1
нобелевск	0	0	1	0	1	0	0	0	1
основател	1	0	0	1	0	1	0	1	0
полиц	1	0	0	0	0	0	0	1	0
прем	0	0	1	0	1	0	0	0	1
прот	0	1	0	0	0	0	1	0	0
стран	0	0	1	0	0	0	1	0	0
суд	0	1	0	0	0	1	0	0	0
сша	0	1	0	0	0	0	1	0	0
церемон	0	0	1	0	1	0	0	0	0

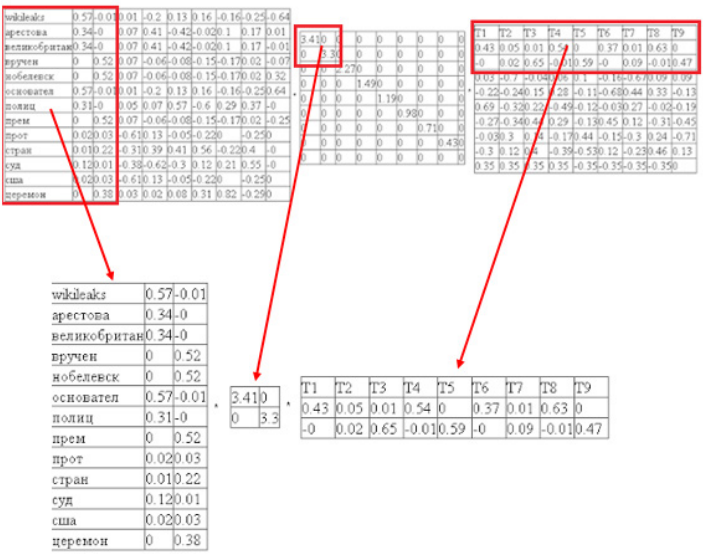
Picture 1 - *Template of frequency matrix of words in documents*

Singular Value Decomposition (SVD) of the frequency matrix gives as a result three components

$$\mathbf{M} = \mathbf{U}\sum\mathbf{V}^*$$

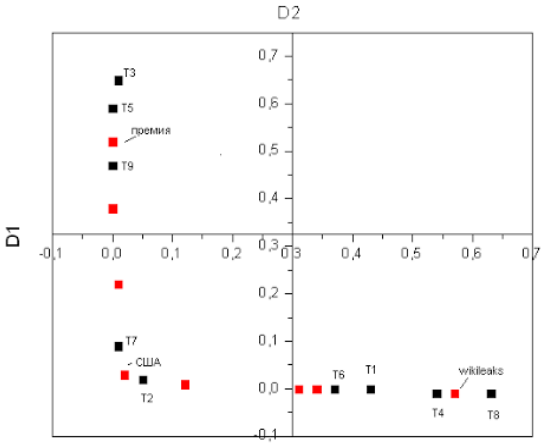
where

- **U** is an $m \times m$ unitary matrix over K (if $K =$, unitary matrices are orthogonal matrices),
- **Σ** is a diagonal $m \times n$ matrix with non-negative real numbers on the diagonal,
- **V** is an $n \times n$ unitary matrix over K, and **V*** is the conjugate transpose of **V**.



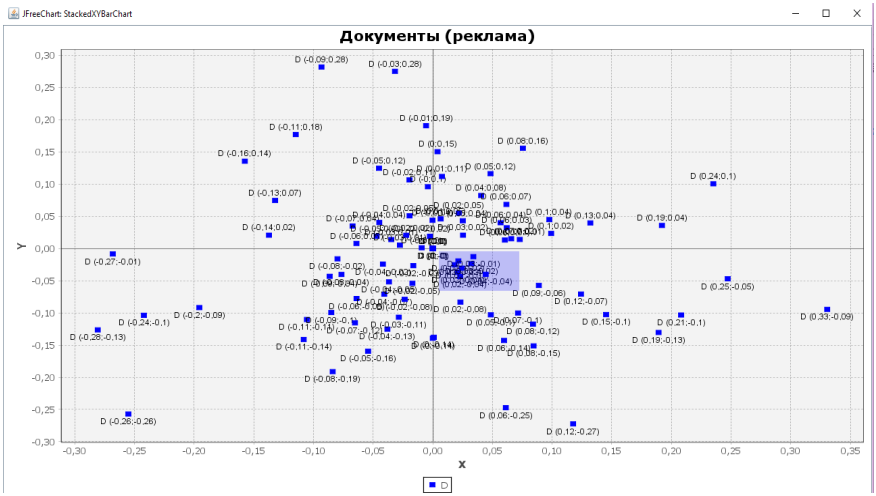
Picture 2 - *Decomposition of the frequency matrix of words in documents using a test example of news headlines*

Analyzing the result of singular decomposition (pic.2), it is clear that the first two columns of the matrix U and two rows of the matrix V have the highest value for clustering (selected in red).



Picture 3 - *Mapping, red squares are representing singular words, black squares are representing documents*

Displaying documents and words on the map (pic.3) we can see that the words (red squares) on the map are located closer to the documents (black squares) in which they are mentioned. For example, the word “премия” is located in texts T3, T5 and T9. That is why the position of word “премия” will be closer to the position of relevant documents (texts) in which it is detected.



Picture 4 – *Mapping of advertisement documents*

As can be seen on pic.4 there are places (zones) for document accumulation, indicating that there are relevant in content and that they are semantically related.

Clustering

Clustering is about sorting elements of a certain set into groups, depending on their similarity. Elements of the set can be anything, for example, data or feature vectors. The groups themselves are commonly called clusters [3]. Clustering divides many objects into groups, which are determined only by its result. Classification refers each object to one of the predefined groups.

Definitions

An object is an elementary data group with which clustering algorithms operate.

Each object is identified by a characteristic vector.

$$x = (x1, ..., xd)$$

Components xi are individual characteristics of an object.

The number of characteristics d is determined by the dimension of the characteristic space. A cluster is a subset of “close to each other” objects. The distance *d (xi, xj)* between the objects *xi* and *xj* is the result of applying the selected metric in the space of characteristics.

General clustering scheme

Data clustering includes the following steps [4]:

1. Highlighting characteristics.
2. Definition of the metric.
3. The division of objects into groups.
4. Presentation of results.

***k*-means Algorithm**

k-means is one of the most popular clustering algorithms. Its main advantages are ease of implementation and low computational complexity. Working on a discrete data set, the algorithm minimizes the distance between the *k* centers of the clusters and the points of the source data in the corresponding space. [1]

***k*-means clustering**

The success of *k*-means method is due to two factors: its simplicity and computational feasibility (it can be presented mathematically by function *O (nkdi)*, where *n* is the number of input elements (objects), *k* is the number of clusters, *d* is the measurement of input data and *i* is the number of iterations needed for convergence.

Knowing the number of clusters in a priori (in our case it will be 15), we want to know the weight center of each cluster (the point at which the distance to all other points in the cluster is the minimum possible). In other words: *k* random centers are assigned first. Then for each element of the input data set, the nearest random point is calculated and added to the "cluster set" of the nearest center. Then, for each set of clusters, it is necessary to calculate the midpoint and use this midpoint as a replacement for the random center. This process is performed iteratively until the midpoints remain unchanged between one iteration and the other.

Extending the *k*-means algorithm (*k*-means ++)

k-means ++ is an improved version of the *k*-means clustering algorithm. The main plus of the improvement is that this method is able to find better initial values of cluster centroids. The basic *k*-means does not regulate how this stage of the algorithm is performed, and therefore is unstable. The algorithm was proposed in 2007 by David Arthur and Sergey Wassilvitsky [6].

The results of the study of modifications of *k*-means algorithms

Input data set is 995200 (advertising posts). The number of clusters will be varied: 2, 4, 8, 16, ..., 1024. The following algorithms should be considered as experiments:

1) *k*-means (*km*);
2) *k*-means ++ (*km*++);
3) *k*-means parallel (*kmp*);
4) *k*-means ++ parallel (*kmp*++).

We will check how the algorithms behave with a fixed data set and a changed value for the number of clusters. The experiments will be carried out on a computer with the following configuration.

Equipment: Processor: Intel (R) Core (TM) i3-3110M CPU @ 2.40GHz; Memory: 4.00 GB (3.89 GB available); System Type: 64-bit operating system, x64 processor; OS: Windows 10 Pro Microsoft Corporation, 2017.

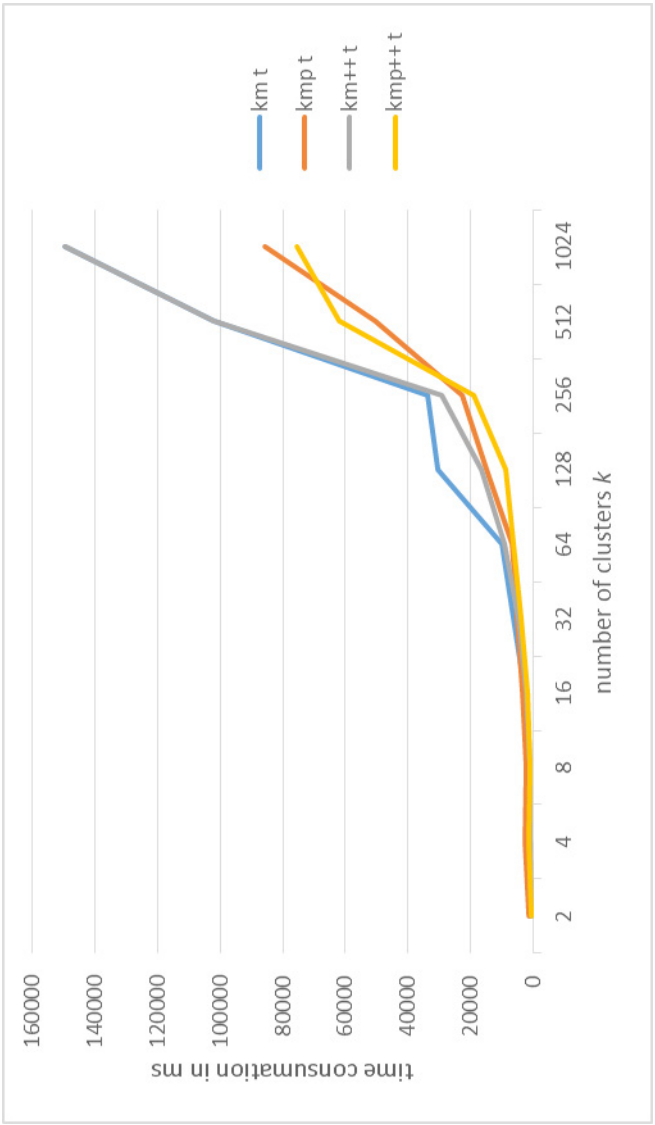
Table 1 - *Time measurements for modifications of k-means algorithms by the number of iterations*

№	Number of clusters(k)	Data volume	k-means AVG time (5 experiments)	k-means number of iterations	k-means parallel AVG time (5 experiments)	k-means parallel number of iterations	k-means ++ AVG time (5 experiments)	k-means ++ number of iterations	k-means parallel ++ AVG time (5 experiments)	k-means parallel ++ number of iterations
1	2	995200	816	12	1163	15	426	7	613	9
2	4	995200	1161	14	2641	38	734	9	1521	24
3	8	995200	1413	18	2321	30	976	10	1026	16
4	16	995200	2372	20	3232	31	2138	17	1789	23
5	32	995200	6132	29	4999	31	4771	22	3695	29
6	64	995200	9884	24	6576	25	9151	22	6172	27
7	128	995200	30242	19	14936	31	16289	20	8712	21
8	256	995200	33582	38	22612	26	29217	19	19116	24
9	512	995200	102267	32	50356	28	102267	22	61946	27
10	1024	995200	149542	24	85565	22	149542	21	75565	21

It can be seen from (Pic. 5) that the basic implementation of the *k*-means algorithm and the extended version of *k*-means ++ have approximately equal run times in terms of runtime. But a parallel implementation shows a much better result, thereby working faster.

When comparing algorithms by the number of iterations performed, the extended *k*-means ++ implementation will show the best result, since it has the smallest values in number of iterations over the entire interval, unlike other implementations.

Converting tabular data into Graph.



***Picture 5** - Algorithm runtime comparison graph*

Conclusion

In this article, we have solved the practical task of clustering advertisement on the Internet using 4 different modifications of *k*-means method. The implementation of basic algorithm *k*-means was ineffective in terms of execution time and number of iterations. For large amounts of data it is best to use a parallel modification of the *k*-means algorithm. The *k*-means parallel ++ algorithm showed the best result in terms of execution time; by the number of iterations, km ++ showed the best result. As a final decision we can confirm that *k*-means parallel ++ algorithm is better for advertisement clustering according to execution time when the number of clusters bypasses 16.

Bibliography

1. Кластерный анализ. [Электронный ресурс.] – Режим доступа: https://ru.wikipedia.org/wiki/Кластерный_анализ - (дата обращения: 27.05.2019).

2. Обзор алгоритмов кластеризации данных. [Электронный ресурс.] – Режим доступа: https://habr.com/ru/post/101338/ - (дата обращения: 27.05.2019).

3. A.K. Jain, M.N. Murty, P.J. Flynn – "Data Clustering: A Review" (http://www.csee.umbc.edu/nicholas/clustering/p264-jain.pdf)

4. J. Kogan, C. Nicholas, M. Teboulle – "Clustering Large and High Dimensoinal data" (http://www.csee.umbc.edu/nicholas/clustering/tutoroal.pdf)

5. J. MacQueen, "Some Methods for Classification and Analysis of Multivariate Observations" in Proc. 5th Berkeley Symp. On Math. Stat. and Prob., Vol. 1, pp. 281-297, 1967

6. k-means++. [Электронный ресурс.] – Режим доступа: https://ru.wikipedia.org/wiki/K-means%2B%2B - (дата обращения: 19.06.2019).

7. Стеммер Портера для русского языка. [Электронный ресурс.] – Режим доступа: http://www.algorithmist.ru/2010/12/porter-stemmer-russian.html - (дата обращения: 27.06.2019).

NOTES

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

（2019年8月31日。中国北京）

编辑A.A.Siliverstova
校正A.I.尼古拉耶夫

2019年8月31日。中国北京。
USL。沸点：98.7。 订单253.流通450份。

在编辑和出版中心印制
无限出版社