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

Proceedings of the International Conference

Date: December 23

Beijing, China 2023

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

2023 年 12 月 23 日。中国北京
December 23, 2023. Beijing, PRC

Proceedings of the International Conference
“Scientific research of the SCO countries: synergy and integration” - Reports in English

(December 23, 2023. Beijing, PRC)

ISBN 978-5-905695-82-7

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 examine technical, juridical and sociological aspects of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

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

ISBN 978-5-905695-82-7

CONTENTS

DOI 10.34660/INF.2023.12.37.221

俄罗斯和中国经济的成功因素
SUCCESS FACTORS OF THE RUSSIAN AND CHINESE ECONOMIES

Podmolodina Irina Mikhailovna
Doctor of Economic Sciences, Full Professor
Voronezh State University of Engineering Technologies

Luo Weiwei
Postgraduate
Voronezh State University of Engineering Technologies

Shang Kai
Postgraduate
Voronezh State University of Engineering Technologies

摘要：　本文论证了对一个国家而言经济增长的必要性，分析了俄罗斯和中国经济的指标，并提出了一种综合评估国家发展的方法。通过线性回归分析确定了对国内生产总值增长影响最大的经济领域。论证了俄罗斯和中国在创新合作方面的有益发展，作为两国未来经济增长的因素。。

关键词：经济增长，经济增长因素，制裁，综合评估，线性回归分析。

Abstract. *The article substantiates the need for economic growth for the country, analyzes the economic indicators of the Russian and Chinese economies, presents a methodological approach to a comprehensive assessment of the development of countries, and, based on linear regression analysis, identifies the economic sectors that have the greatest impact on the countries' GDP growth. The expedient development of innovative cooperation between Russia and China is substantiated as a factor for the further economic growth of both countries.*

Keywords: *economic growth, factors of economic growth, sanctions, comprehensive assessment, linear regression analysis.*

The main goal of the country's economic policy is to ensure sustainable growth rates for the economy. Economic growth, reflecting the quantitative increase in created products, facilitates the solution of problems of limited resources, contributes to improving the well-being of the population and the implementation of large-scale socio-economic development programs. [4]

The economic growth of the Russian economy for many years was ensured by factors such as increased price competitiveness of products based on the devaluation of the ruble and favorable conditions for international trade in commodities. [1]

But as conditions on the global energy market worsened, Russia became extremely vulnerable. [2]

In the context of the introduction by Western countries of anti-Russian sanctions, which are aimed at undermining strategically important industries and the international isolation of Russia, the supply of goods and technologies important for industrial enterprises has been disrupted, supply chains have broken down, and problems have arisen in international payments. Thus, anti-Russian sanctions are a threat to economic security and a negative factor for the economic growth of the Russian Federation.

Under the current conditions, Russian entrepreneurs began to reorient their economic ties to Asia. In 2022-2023 Economic ties with China are developing rapidly. In this regard, the scientific community faces the urgent task of identifying the factors that most influence the economic growth of Russia and China and identifying areas of cooperation between these countries that will allow both countries to develop effectively.

Economic growth is the result of the complex influence of various factors (financial-economic, socio-cultural, political, natural resources, scientific and technological, etc.). This involves conducting a holistic and multidimensional assessment of the factors causing economic development. Assessing economic growth gives an idea of the dynamics of economic development in various areas and the effectiveness of government policies.

In our opinion, to identify the factors that most influence the economic growth of the country, a comprehensive assessment of indicators that reflect the main characteristics of activity in various sectors of the economy should be used.

To identify success factors for the economic growth of Russia and China, 37 indicators were used, which are divided into 4 areas: economic foundation for development, resource and transport conditions, foreign economic sector, scientific and technical potential. The selected indicators are representative, and their quantitative values are taken from World Bank statistics.

Following the requirements of the comprehensive analysis methodology, it is proposed to assess economic growth factors in a logical sequence of solving individual subtasks. [3]

At the first stage, the most important areas of the economy that influence the economic growth of the country and are subject to analysis are selected.

At the second stage, the selection of quantitative indicators characterizing the development of the economy in the areas selected at the first stage is carried out. Each of these areas is characterized by a wide variety of indicators.

At the third stage, growth indices for indicators in each sector of the economy are determined.

At the fourth stage, generalizing integral indicators characterizing the selected sectors of the economy are calculated. We believe that generalizing integral indicators characterize the level of favorability of factors in each sector of the economy; they are determined using the formula:

$$J_{u\delta} = \sqrt[n]{\prod_{n-1}^{n} K_i},$$

where K_i - private indicators characterizing the economic sector;

n – number of private indicators;

$J_{u\delta}$ - a general indicator characterizing the degree of favorability of the economic sector.

At the fifth stage, a comprehensive indicator of the development of the represented sectors of the economy is determined.

At the sixth stage, regression analysis is carried out to determine the most significant sector of the economy for economic growth.

Indicators characterizing various spheres of the Russian economy are presented in Table 1.

Generalizing integral indicators characterizing the areas of the Russian economy selected for assessment are presented in Figure 1.

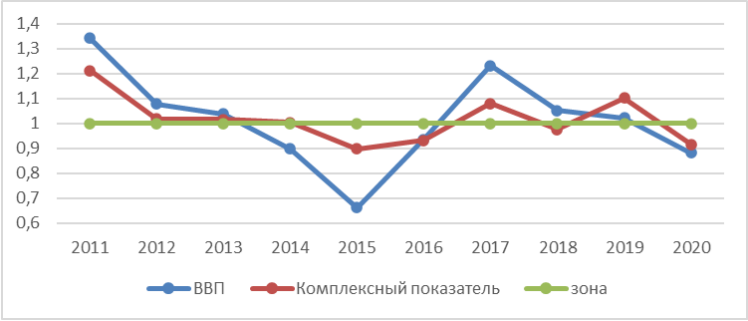


Figure 1. *Trends in the dynamics of the Russian economy for 2011-2020.*

Period 2011 - 2014 Characterized by increased global demand for raw materials, especially energy and mineral resources. This contributed to an increase in exports and was a factor in economic growth. High energy prices and increased export revenues have had a positive impact on the development of the Russian economy. During this period, GDP, general indicators in all studied areas, and a complex indicator tended to grow.

Table 1

Indicators characterizing the development of the studied areas of the Russian economy

Сфере экономики	Показатели экономики страны	Единица	2010	2015	2016	2017	2018	2019	2020
	ВВП	(млн. долл. США)	1524916.70	1363482.18	1276786.34	1574199.36	1657328.76	1693114.99	1493075.89
Экономический фундамент	ВВП на душу населения	(долл. США)	4550.47	8016.45	8094.39	8817.05	9905.41	10143.86	10408.72
	Уровень инфляции	%	6.85	15.53	7.04	3.68	2.88	4.47	3.38
	Доля ВВП России в мировом ВВП	%	2.29	1.81	1.67	1.93	1.92	1.93	1.75
	Основные фонды (в процентах от ВВП)	%	21.63	20.61	21.88	21.98	20.65	20.90	21.56
	Промышленное производство (в процентах от ВВП)	%	30.00	29.79	29.17	30.67	32.55	32.15	29.72
	Налогообложение (в процентах от ВВП)	%	13.00	10.60	9.20	10.30	11.50	10.90	10.80
	Доходы населения (в процентах от ВВП)	%	26.10	24.50	24.30	24.50	27.50	27.50	27.70
	Сельское хозяйство, рыболовство (в процентах от ВВП)	%	3.34	3.87	3.84	3.55	3.39	3.53	4.00
Ресурсо-транспортные условия	Рабочая сила	(млн чел.)	75.88	75.12	75.18	74.61	74.50	73.60	73.06
	Пассажирские авиаперевозки	(млн чел.)	43.86	76.85	77.46	89.37	99.33	108.86	62.45
	Грузовые авиаперевозки	(млн т-км)	3531.58	4761.05	5863.20	6845.23	6810.61	6481.00	4314.60
	Железнодорожные грузоперевозки	(млн т-км)	2011308.00	2304758.60	2342589.50	2491875.90	2596879.70	2601928.10	2544827.90
	Железнодорожный пассажирский транспорт	(млн чел.)	139028.00	120413.00	124461.00	122920.00	129370.70	133380.87	78134.70
	Морской грузовой транспорт	Единицы измерения в 20-футовом эквиваленте	3318499.00	3662986.00	3693381.00	4107713.00	4726742.00	4966817.00	4921313.00
	Добыча нефти	Тысяча баррелей	10378.62	11086.60	11342.06	11373.68	11562.43	11679.00	10665.79
	Производство электроэнергии	Тераватт-часы	1038.03	1067.54	1090.97	1091.18	1109.20	1118.14	1085.42
	Производство зерновых	млн. метрических тонн	59.62	102.44	117.75	131.29	109.84	117.88	130.04
	Добыча газа	(млрд куб. М)	598.39	584.44	589.28	635.56	669.11	679.03	638.45
	Добыча угля	(млн тонн)	322.94	372.48	386.61	401.96	441.26	440.66	399.75
	Добыча железной руды	(тыс. тонн)	95500.00	101000.00	101000.00	95000.00	96100.00	97500.00	100200.00
	Производство стали	(тыс. тонн)	66300.00	69400.00	69600.00	72968.20	72099.00	71729.20	71621.00
	Производство алюминия	(тыс. тонн)	3947.00	3529.00	3561.00	3584.00	3627.00	3637.00	3638.00
	Добыча редкоземельных металлов	(тонн)	1495.00	2312.00	3100.00	2500.00	2600.00	2600.00	2600.00
Внешнеэкономический сектор экономики	Экспорт товаров	(млн. долл. США)	400630.00	341419.00	281710.00	352943.00	443914.00	419721.00	333530.00
	Импорт товаров	(млн. долл. США)	248634.00	193019.00	191493.00	238384.00	248856.00	253876.00	240088.00
	Прямые иностранные инвестиции	(млн. долл. США)	43167.78	6852.97	32538.90	28557.44	8784.85	31974.77	9478.81
	Портфельные инвестиции	(млн. долл. США)	1495.24	26423.21	-2361.28	-7982.8	7593.19	-12686.29	25295.80
	Общий внешний долг	(млн. долл. США)	417886.40	492191.14	535225.17	519202.54	477785.39	485793.31	460933.94
	Валютные и золотые резервы	(млн. долл. США)	479222.00	386043.00	377052.00	432731.00	468645.00	555179.00	596770.00
Научно-технический потенциал	Заявки на патенты	штука	42500	45517	41587	36883	37957	35511	34984
	Количество исследователей в области и НИОКР	(млн чел.)	3081.08	3098.11	2952.21	2821.53	2784.33	2746.67	2721.68
	Расходы на НИОКР (в процентах от ВВП)	%	1.13	1.10	1.10	1.11	0.99	1.04	1.09
	Статьи в научно-технических журналах	штука	33855	51084	60205	67396	76145	87168	89967
	Экспорт высокотехнологичной продукции	(млн. долл. США)	37539.03	54456.33	44369.33	43376.69	50251.06	54018.09	30684.76
	Общие государственные расходы на образование, всего (в процентах от ВВП)	%	3.85	3.83	3.76	4.69	4.68	3.51	3.70
	Роялти за интеллектуальную собственность	(млн. долл. США)	4841.8	5633.85	4997.36	5979.77	6288.17	6866.16	6809.07

During the period 2015 - 2016. GDP and aggregate indicators in four areas decreased. At this time, world oil prices fell sharply. The sanctions announced to Russia caused negative processes in the Russian economy, which led to a decrease in the country's budget revenues and a decrease in foreign exchange reserves, devaluation of the Russian ruble and increased inflation. All this negatively affected the lives of the population.

Period 2017 - 2019 was characterized by the restoration of the global economic situation. Rising oil prices contributed to economic growth in Russia. During

this period, more attention was paid to science, technology and innovation, including the financing of R&D and the training of scientific and technical personnel, which contributed to increasing the innovative potential of the economy. In 2020, due to the pandemic, there was a decline in many indicators in all areas of the economy, which negatively affected Russia's economic growth.

Indicators characterizing various areas of the Chinese economy are presented in Table 2.

Table 2

Indicators characterizing the development of the studied areas of the Chinese economy

Сфере экономики	Показатели экономики страны	Единица	2010	2015	2016	2017	2018	2019	2020
	ВВП	(млн. долл. США)	6087191.72	11061573.20	11233314.02	12310491.18	13894907.49	14279968.49	14687743.56
Экономический фундамент	ВВП на душу населения	(долл. США)	10674.99	9313.02	8704.89	10720.33	11287.35	11536.26	10194.44
	Уровень инфляции	%	3.18	1.44	2.00	1.59	2.07	2.90	2.42
	Доля ВВП Китая в мировом ВВП	%	9.14	14.71	14.69	15.12	16.06	16.28	17.24
	Основные фонды (в процентах от ВВП)	%	43.93	42.09	41.55	41.86	42.84	42.82	42.49
	Промышленное производство (в процентах от ВВП)	%	46.50	40.84	39.58	39.85	39.69	38.59	37.84
	Налогообложение (в процентах от ВВП)	%	10.20	9.40	9.10	9.40	9.10	8.50	8.10
	Доходы населения (в процентах от ВВП)	%	11.20	16.00	15.60	15.90	16.50	16.10	14.10
	Сельское хозяйство, рыболовство (в процентах от ВВП)	%	9.33	8.39	8.06	7.46	7.04	7.14	7.70
Ресурсо-транспортные условия	Рабочая сила	(млн чел.)	774.06	780.71	780.52	778.67	776.28	775.32	751.45
	Пассажирские авиаперевозки	(млн чел.)	266.29	436.18	487.96	551.23	611.44	659.63	417.26
	Грузовые авиаперевозки	(млн т-км)	17193.88	19805.63	21304.59	23323.61	25256.21	25394.59	19264.24
	Железнодорожные грузоперевозки	(млн т-км)	2764413.00	2375430.00	2379230.00	2696220.00	2882100.00	3018200.00	3154300.00
	Железнодорожный пассажирский транспорт	(млн чел.)	791158.00	1109312.00	1160059.00	1266681.00	1361715.00	1438606.00	328251.00
	Морской грузовой транспорт	Единицы измерения в 20-футовом эквиваленте	140552400	199839517	207160932	224117874	234618700	243560000	246040000
	Добыча нефти	Тысяча баррелей	496.34	618.17	614.70	614.07	609.99	613.43	616.63
	Производство электроэнергии	Тераватт-часы	4076.97	4308.84	3999.16	3845.86	3802.04	3848.31	3900.70
	Производство зерновых	(млн. метрических тонн)	481.56	557.42	618.17	614.70	614.07	609.99	613.43
	Добыча газа	(млрд куб. М)	96.54	135.67	137.94	149.20	161.42	176.74	194.01
	Добыча угля	(млн тонн)	3428.45	3746.54	3410.60	3523.56	3697.74	3846.33	3901.58
	Добыча железной руды	(тыс. тонн)	1077705.00	1381288.00	1280893.00	1229373.00	763374.00	844356.00	845000.00
	Производство стали	(тыс. тонн)	637229.90	803825.00	807609.40	870740.90	929038.40	995418.90	1064766.80
	Производство алюминия	(тыс. тонн)	16244.10	31518.15	32698.08	35189.10	36447.29	35043.60	37080.40
	Добыча редкоземельных металлов	(тонн)	89200.00	105000.00	105000.00	105000.00	120000.00	132000.00	140000.00
Внешнеэкономический сектор экономики	Экспорт товаров	(млн. долл. США)	1577754.00	2273468.00	2097632.00	2263346.00	2486695.00	2499457.00	2589952.00
	Импорт товаров	(млн. долл. США)	1396247.00	1679566.00	1587925.00	1843792.00	2135748.00	2078386.00	2065964.00
	Прямые иностранные инвестиции	(млн. долл. США)	243703.43	242489.33	174749.58	166083.76	235365.05	187169.82	253095.62
	Портфельные инвестиции	(млн. долл. США)	-24038.44227	66470.06188	52270.61675	-29497.7931	-106873.526	-57947.6454	-95539.0199
	Общий внешний долг	(млн. долл. США)	742737.48	1333768.99	1413904.27	1704593.81	1961562.46	2114161.99	2326751.31
	Валютные и золотые резервы	(млн. долл. США)	2913712.00	3405253.00	3097658.00	3235682.00	3168216.00	3222895.00	3357241.00
Научно-технический потенциал	Заявки на патенты	штука	391177	1101864	1338503	1381594	1542002	1400661	1497159
	Количество исследователей в области НИОКР	(млн чел.)	884.59	1150.82	1196.69	1224.78	1307.12	1471.25	1584.87
	Расходы на НИОКР	(млн. долл. США)	104090.50	227867.99	235898.82	260980.67	297349.11	319870.61	352504.18
	Статьи в научно-технических журналах	штука	308768	405811	436078	468045	531109	610458	669744.3
	Экспорт высокотехнологичной продукции	(млн. долл. США)	474347.23	652212.46	594520.85	654156.80	731318.63	715302.94	757458.88
	Общие государственные расходы на образование, всего (в процентах от ВВП)	%	3.75	3.81	3.76	3.67	3.54	3.54	3.57
	Роялти за интеллектуальную собственность	(млн. долл. США)	13039.55	22022.37	23979.58	28746.48	35782.95	34370.47	37870.65

Analysis of the data in tables 1 and 2 allows us to conclude that in the period from 2010 to 2020. China's GDP has grown significantly, in 2010 China's share was about 9.1% of world GDP, and by 2020 it increased to 17.2%, which allowed China to take second place in the world in terms of GDP. Russia's economic

growth over the period under study was relatively slow. At the same time, Russia's share in world GDP decreased from 2.3% in 2010 to 1.8% by 2020.

Generalizing integral indicators characterizing the areas of the Chinese economy selected for assessment are presented in Figure 2.

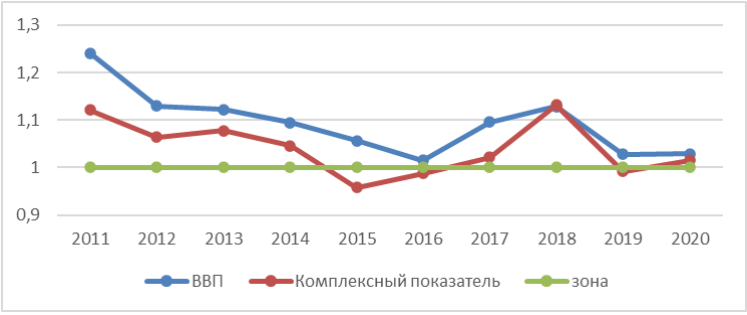


Figure 2. *Trends in the dynamics of the Chinese economy for 2011-2020.*

During the period 2011 - 2014. generalizing and complex indicators, as well as GDP, tend to grow, which indicates the relative balance of all spheres of the Chinese economy, ensuring high rates of economic growth. This is due to increased investment in infrastructure and public services, including high-speed rail, roads and bridges. Financial support was provided for the acquisition of advanced educational equipment and technologies, which contributed to the development of education and improving the quality of personnel training. Promoting financial system reform has allowed interest rates and exchange rates to be flexibly adjusted in accordance with market supply and demand. Free trade agreements concluded by China with a number of countries have made it possible to simplify trade procedures and develop foreign economic relations.

During the period 2015 - 2016. There is a deterioration in macroeconomic indicators and indicators characterizing the foreign economic sphere of the economy. During this period, the Chinese government, responding to excess capacity and financial risks, initiated structural changes aimed at eliminating production capacity and reducing leverage, closing enterprises that did not meet environmental and energy standards, and encouraging mergers and reorganizations to implement a policy of eliminating production facilities. capacity. This led to some industrial restructuring and helped improve the long-term sustainability of the economy, i.e. factors of economic growth for the future were identified.

In the period 2017 - 2020, GDP and the summary and comprehensive indicator signal the recovery and growth of the Chinese economy. The contribution of scientific and technological potential during this period is relatively high. The

use of new technologies has stimulated the rapid growth of the digital economy. The widespread adoption of technologies such as big data, cloud computing and blockchain has made the digital economy one of the engines of China's economic growth from 2017 to 2019, and Chinese investment and innovation in new energy have made significant progress. The development of clean energy technologies such as solar and wind power has not only stimulated the development of new energy, but also helped reduce environmental pollution. 2020 saw fluctuations in the economy caused by the «new corona» epidemic, which led to disruption of global supply chains and weakening demand, which in turn affected the Chinese economy.

The results of regression analysis of the influence of the studied economic sectors on economic growth in Russia are presented in Table 3.

Table 3

Assessment of relationships between economic growth indicators in Russia

No.	Spheres of economy	Regression level	R-square	Fisher criterion F	Student's criterion t(b1)	Conclusion
1	Economic foundation	Y=0.456+0.558X	0.034	0.278	0.527	unimportant
2	Resource and transportation conditions	Y=1.861X-0.878	0.250	2.660	1.631	unimportant
3	Foreign economic sector of the economy	Y=0.493+0.489X	0.723	20.868	4.568	most important
4	Scientific and technical potential	Y=2.826X-1.844	0.416	5.694	2.386	important

The conducted linear regression analysis of different spheres of economy as independent variables and GDP as dependent variable shows that for the Russian economy the most important factor of economic growth is the development of foreign economic sphere of economy, because the value of R-square of the model is 0.723, which explains the reason of 72.3% of changes in GDP. The F-test of the model showed that the model passed the F-test ($F=20.868$, $p=0.002<0.05$), which means this sector of the economy should have an impact on GDP and the final analysis of specificity shows that the value of the regression coefficient of the foreign economic sphere of the economy is 0.489 ($t= 4.568$, $p=0.002<0.01$), which means that it will have a significant positive relationship with GDP.

Further linear regression analysis allowed us to conclude the importance of the development of scientific and technological potential for the Russian economy, as the value of the regression coefficient of scientific and technological potential

is 2.826 (t=2.386, p=0.044<0.05), which means that scientific and technological potential will have a significant positive relationship with GDP in the future.

The results of regression analysis of the influence of the studied areas of the economy on economic growth in China are presented in Table 4.

Table 4

Evaluation of the relationship between the indicators of economic growth in China

No.	Areas of economic security	Regression level	R-square	Fisher criterion F	Student's criterion t(b1)	Conclusion
1	Economic foundation	Y=0.502+0.592X	0.297	3.388	1.841	unimportant
2	Resource and transportation conditions	Y=0.337+0.740X	0.344	4.202	2.050	unimportant
3	External sector of the economy	Y=0.867+0.212X	0.291	3.277	1.810	unimportant
4	Scientific and technical potential	Y=1.458X-0.483	0.672	16.366	4.045	important

The analysis of the indicators presented in Table 4 allows us to draw the following conclusions. In linear regression analysis with S&T potential as the independent variable and GDP as the dependent variable, the R-square value of the model is 0.672, which means that S&T potential explains the cause of 67.2% of changes in GDP. The F-test of the model showed that the model passes the F-test (F=16.366, p=0.004<0.05), that is, it shows that scientific and technological capability should have an effect on the relationship of GDP. S&T capacity has a regression coefficient value of 1.459 (t=4.045, p=0.004<0.01), which means that S&T capacity will have a significant and positive effect on GDP.

Thus, for the Chinese economy, the most important area in GDP growth is the development of scientific and technological potential. It is the one that will have a significant positive impact on economic growth.

The growth of the Russian economy, to a large extent, depends on foreign economic relations, but scientific and technological potential has a significant positive relationship with GDP. Therefore, the development of scientific and technical potential will be a factor of economic growth for the Russian economy.

In our opinion, further mutual cooperation between China and Russia should concern the scientific and technological sphere. It is innovative cooperation that will bring benefits to both sides. The potential of science and technology is recognized as the main engine of growth in both countries, and emerging industries such as the digital economy and new energy are laying a solid foundation for the future.

Therefore, continued focus and investment in innovation will play a key role in future economic strategies, laying a solid foundation for sustainable growth.

References

1. Podmolodina I.M. Investment policy for economic growth. – Voronezh: Voronezh State University, 2006. – 339 p.

2. Podmolodina I.M., Voronin V.P., Konovalova E.M. Innovation components of economic growth: country aspect // Bulletin of Voronezh State University of Engineering Technologies. - 2013. - №4. - P. 258-261.

3. Podmolodina I.M., Kunitsyn E.Y. Methodical approach to the assessment of the innovative environment of the country // Voprosy ekonomiki i pravo. – 2011. – №7 – P. 134-141.

4. Stankovskaya, I.K. Economic theory: a textbook / I.K. Stankovskaya, I.A. Strelets – 5th ed., revision and addendum – M.: Eksmo, 2010.

DOI 10.34660/INF.2023.42.58.222

美国和中国：脱钩后会发生什么？ 俄罗斯及其在此过程中的成功
USA AND CHINA: WHAT WILL HAPPEN AFTER DECOUPLING? RUSSIA AND ITS SUCCESS IN THIS PROCESS

Kharlanov Alexey Sergeevitch
Candidate of Technical Sciences, Doctor of Economic Sciences, Full Professor, Chief Researcher
Y. A. Gagarin State Scientific Research-and-Testing Cosmonaut Training Center

Dubinin Vladimir Ivanovich
Candidate of Technical Sciences, Associate Professor, Deputy Director
Y. A. Gagarin State Scientific Research-and-Testing Cosmonaut Training Center

Kryuchkov Boris Ivanovich
Candidate of Technical Sciences, Full Professor, Head of Research Laboratory
Y. A. Gagarin State Scientific Research-and-Testing Cosmonaut Training Center

Evans Julia Nailievna
Master's degree student
Diplomatic Academy of the Russian Foreign Ministry

抽象的。 作者分析了人工智能和大数据的现代趋势、正在进行的信息通信技术转型、世界经济数字化领域正在进行的初创企业和绿地、全球化国家工业的演变，这些在后疫情时代的复苏中需要新的方法和商业模式 对于后工业化的“知识经济”和“消费经济”，它们决定了主权国家寻求降低全球治理结构和试图维护霸权思想的跨国行为体对其影响程度的替代路径的向量 在“美国世界”的进一步瓦解中，大都市与其服务的外围地区之间的殖民发展。 第三世界。”

关键词：ADF、人工智能、大数据、ICT 行业、替代现实、额外现实、市场、巨型宇宙、生态系统、创新、俄罗斯、美国、中国、解耦、LML（大语言模型）、聊天、机器人、神经算法、网络解决方案 、机器学习 (ML)、工业 4.0、生成智能。

Abstract. *the authors analyze modern trends in AI and Big Data, the ongoing ICT transformation, ongoing startups and greenfields in the field of digitalization of the world economy, the evolution of globalized national industries, which in*

the post-Covid recovery require new approaches, business models for the post-industrial "knowledge economy" and " consumer economy," which determine the vectors of alternative paths for sovereign states seeking to reduce the level of influence on them of global governance structures and transnational actors who are trying to preserve the ideas of hegemony and colonial development between the metropolises and their serving peripheral areas in the further disintegration of the "American world." third world."

Keywords: *ADF, AI, Big Data, ICT industry, alternative reality, additional reality, marketplace, megaverse, ecosystem, innovation, Russia, USA, China, decoupling, LML (large language models), chats, bots, neural algorithms, network solutions, machine learning (ML), Industry 4.0., generative intelligence.*

The world is sliding increasingly into an era of geopolitical instability and economic volatility, where, apart from talk about a "new global world order", starting with the 1991 speech of the same name by the Club of Rome, including the incyclicals of the Popes and various neophytes and children of Sodom from Baphomet to the reptilian color, no one wants to admit that the institutions of global governance and the latest scientific and technological revolution are of little use, and the ambitions of the ruling elites, even through their complete dissolution in transnational value chains, are worth nothing in the post-Covid recessionary recovery of the world economy [1].

Therefore, talk about "peaceful priorities" and about building new frameworks of international treaties for the control of nuclear weapons or hypersonics, as a fatal and so far insurmountable military threat to the dominance of the Anglo-Saxons, remains good intentions, especially when everyone is declaratively trying to whitewash their accelerated plans for military development (Joe Biden signed the US military budget for 2024 in the amount of a record 886.3 billion US dollars) [2]. It has already included 800 million for Ukraine, but the main expenses are on the creation of new technologies and industrial capacities for the American military-industrial complex, assistance to Israel and the completion of the Patriot complexes (there are no more than 65 of them left inside the United States so far), which are hastily exported from Japan to assistance to the Jewish state and expose the missile defense system of the Asia-Pacific region, especially on the eve of the elections on the island. Taiwan and on the eve of the loss of the Kuomintang party there). At the same time, China, which is rapidly developing reforms within the PLA (the People's Liberation Army of China a year earlier than the stated plans, by 2027, after the 20th Congress of the CPC) also strives for dominance in the regions of Asia and to squeeze out the countries of the small Asian NATO (Japan, South Korea, Singapore and Australia in East Asia) from waters under its control and zones of responsible military construction (on natural and man-made

islands) and to block potential assistance to island China if the capitalist party (Kuomintang) still wins the winter elections and we will talk about the clash of interests of the United States and China over the future of the rebellious island [3].

Therefore, the decoupling of the technological divorce between the USA and China in the global ICT industry, which has been going on for about 5 years, is hitting both empires by paralyzing commercial and technological activity, strengthening the factors of currency wars and protectionist measures prohibited in the WTO, but skillfully implemented by China in the fight for "brain drain" and for the accelerating "capital flight" from the countries of the "golden billion" to the nanoclusters of the Middle Kingdom [4]. Moreover, until the world becomes primitive, that is, devoid of technology and ambitions of total global dominance or zonal military-currency-technological-innovative development, no decoupling can formally end - any new product in both hemispheres is stolen and copied technically through a set of appropriate substitutes similar quality, but different levels of configurations and applied NBICS solutions (nature-like technologies) [5], which will increasingly be polarized according to the "friend or foe" principle and build new contours of team play with different levels of competence involvement. And political loyalty, as well as economic expediency in such situations, will predetermine a new architecture of relations, fragmenting globalized leading industries and returning them to the level of sovereignizing states in their post-pandemic recovery [6].

Therefore, ideas about new principles and rules of the global world order will increasingly resemble the redistribution of markets for raw materials and technologies, which will provide future safe and not very logistics chains to those states that managed to snatch their share of income in global GDP and managed to stop their technological assimilation by Western big tech and eastern unicorns. Here it is necessary to always monitor the statements of the "magnificent seven" Apple, Microsoft, Alphabet, Nvidia, Amazon, Meta and Tesla, which I will always look at the flagship Sam Altman from the Open AI company [7], who announced on his world tour with celebrities about the possibilities of revising the results involvement of AI and the role of decoupling, which only manages, de facto, to "hit the tails" of already taken technocratic decisions, but is unable to stop either the "explosive growth" in the digital reindustrialization of the new infrastructure of man-made vulnerabilities, or to polarize any state as the undisputed leader of ICT dominance [8] in all areas of the commercial and consumer segment of AI products ("Internet of things", 3D printing, virtual and augmented reality, metaverses, digital platforms of payment systems, marketplaces, "smart" and "energy-saving" houses and cities of "closed loops" of cooperative development, "man-machine" ecosystems, cloud services, data storage and transmission in Big Data, crypto communications, quantum computing, 5G and 6G+ communications, hydrogen

energy and hybrid development of the automobile industry and solar panels for renewable energy sources energy sources) [9] in Industry 4.0 of the upcoming robotic-humanoid system). At the same time, search engines such as Google are not lagging behind in the race with Amazon to snatch victory and become leaders against the backdrop of the Anthropic startup, investing in it by 2 billion US dollars and setting the tone for the whole variety of cloud solutions for virtual network clients of modern big tech, as the main tech giants generated Silicon Valley is in the process of creating chips and computers for the needs of the financial, gaming (avatars and their own android drawn personalities with a different set of properties) and in the military space industry [10].

Therefore, the United States is meeting the Japanese halfway, having previously seized control of Hollywood, allowing them to create, for NATO breakthroughs, including a metallurgical union, part of the growing American-Asian strategic partnership "for their own" based on the merger of US Steel and Nippon Steel Corporation, which is carrying out this deal for 14.9 billion US dollars, while hoping that the Japanese management of the metallurgical monster being created will overcome Korean, Indian and especially Chinese pressure on the metallurgical markets and increase global steel production from 66 to 86 million tons per year, bypassing the Indian ArcelorMittal (69 million tons per year) and become the only pursuer of the leader, the Chinese Baowu Steel Group (132 million tons per year) [11]. This means that in decoupling, the struggle for metals will intensify, as the main infrastructure component of new gadgets, tablets, mobile and virtual devices for personal use (including neural networks and chipping the brains of their clients, which is now allowed in some English-speaking countries in search of the optimal combination of human brains and machine copying his skills) [12].

Russia, too, analyzes the risks of growing military tension not only in the northeastern military district of Ukraine, but also understands that increased spending on new types of weapons and telecommunications in the post-industrial development of the "knowledge economy" will be inevitable and allows 7 out of 20 companies [13] as leaders trading on the Moscow Exchange for 2022-2023 in terms of total trading volume, adjust traditional commodity sectors in support of ICT and metallurgical development. In particular, it looks like this, after the raw materials and banking traditional four (Sberbank (Moscow, 3.14 trillion rubles), Gazprom (St. Petersburg, 1.22 trillion rubles), Lukoil (Moscow, 1 .13 trillion rubles), VTB (St. Petersburg, 0.685 trillion rubles) are metallurgical companies (Polyus, (Moscow, 0.595 trillion rubles) - 5th place; Norilsk Nickel (Krasnodar, 0.4 trillion rubles) - 9th place; Alrosa (Republic of Sakha Yakutia, 0.297) - 14; Mechel (Moscow, 0.286 trillion rubles) - 15th place; Severstal (Vologda region, 0.255 trillion rubles) - 17th place; Polymetal (Kazakhstan, 0.254 trillion rubles) – 18; NLMK (Lipetsk, 0.226 trillion rubles) – 20th place).

This means that our contribution to hedging the results of de-coupling and inserting into the chains of technological, materials science and scientific fragmentation is both possible and goes according to our plans for adjusted national development [14], which will allow us to take into account the subtle contributions of our domestic actors in the formation of our part of the global market, like future pool of income of the states admitted to this, capable of both the climate agenda [15] and the total decarbonization going on until 2060 [16] not losing their advantages in personnel [17] and in material and technical support [18] and apply to practice in the military-industrial complex [19] and in space [20] our scientific and technological foundations [21] and give their place in its post-discoupling formation [22;23].

References

1. Working guide on green development of outbound investment cooperation [Electronic resource] // Access mode: http://images.mofcom.gov.cn/hzs/202107/20210716144040753.pdf (access date: 12/23/2023)

2. Working guide on outbound investment cooperation in the digital economy [Electronic resource] // Access mode: http://images.mofcom.gov.cn/hzs/202107/20210723142119100.pdf (access date: 12/23/2023)

3. Speech by Guo Ping, Chairman of the Board of Directors of Huawei 03/3/2022 [Electronic resource] // Access mode: https://carrier.huawei.com/en/events/mwc2022/videos/keynote-guoping (access date: 12/23/2023)

4. Eric Xu Chairman of the Board of Directors of Huawei 2021 Joint Visioning and Defining 6G [Electronic resource] // Access mode: https://www.huawei.com/en/huaweitech/future-technologies/envisioning-and-defining-6g- together (access date: 12/23/2023)

5. Program "Seeds for the future"[Electronic resource] // Access mode: https://www.huawei.com/minisite/seeds-for-the-future/index.html (access date 12/23/2023)

6. Forbes Global 2000 rating [Electronic resource] // Access mode: https://www.forbes.com/companies/sinopec/?sh=10a29caf892e (access date 12/23/2023)

7. 杨攻研, 大国竞争背景下中国国有企业海外投资的外交影响 *Yang Xiuyan, The Diplomatic Impact of Chinese State-Owned Enterprises' Overseas Investment in the Context of Great Power Competition. / /* 世界经济与政治. *– 2022. – No. 3. – pp. 92-119. URL: https://d.wanfangdata.com.cn/periodical/sjjjyzz202203004 Access mode: by subscription.*

8. Tibetan "unicorns": how they reshaped the Chinese startup market. 12/23/2023. Economist. Venture industry and startups.

9. Hungry "tigers": how China and the USA are dragging Asian economies to the bottom. Economist. 12/16/2022. Economic trends.

10.Herman Simon. "Hidden Champions" Publisher. 2009. pp. 26-28; 40-42.

11.A solar panel manufacturer in Europe has threatened to move to the United States. Prime. (06/13/2023). ZDF. Deindustrialisierung Programm.

12. Kharlanov A.S., Khairetdinov A.K., Boboshko A.A. Creation of a new civilizational structure of planet Earth: transition to a "green economy". Features and risks. Innovation and investment. 2021. No. 10. pp. 18-23.

13. Expert No. 35 (1264). Evgeniy Ogorodnikov, we win on their field and according to their rules – URL: https://www.expert.ru (access date: 11/03/2023)

14. Kotler, Philip. Marketing 5.0. Next generation technologies/Philip Kotler, Setiawan Ivan, Kartajaya Hermawan; - Moscow: Eksmo, 2023. -244-246 pp. - (Atlantas of Marketing).

15. China is a strategic partner and valued neighbor. Civilizational choice and modern trends in cooperation: monograph\ A.S. Kharlanov, I.A. Maksimtsev, A.A. Boboshko, M.M. Novikov; resp. ed. S.V. Loktionov.- Moscow: 2022.- 176 p.

16. Russian space: the choice of the future and the main trends of dominance: monograph / A.S. Kharlanov, M.M. Kharlamov, R.V. Bely, A.A. Boboshko, M.M. Novikov; scientific ed. V. I. Kryuchkov.- Moscow: 2022/-208-212 p.

17. Mark Greven, George Yip, Wei Wei. Innovators of the Celestial Empire or Chinese business are conquering the world. M. 2022. Lanit. P.45-48.

18.Kai-Fu Lee. Artificial Intelligence Superpowers. China, Silicon Valley and the new world order. Boston. NY. 2018. Houghton Mifflin Harcourt.

19.Martin Ford. Robot power. How to prepare for the inevitable? M. Publishing house "Alpina". 2022. pp.82-86.

20. Kharlanov A.S. Propaganda and "soft power" of "digital nomads" in the era of Northwestern Russia. Higher school: scientific research. M. 2023. P.98-103.

21.E. Holthaus. Land of the future. M. Publishing house "Portal 21". 2021. pp. 23-27.

22.Klaus Schwab. Technologies of the Fourth Industrial Revolution. M. Bombora Publishing House. 2022. pp. 68-74; 134-136.

DOI 10.34660/INF.2023.24.75.223

人工智能和组织业务流程的转型
ARTIFICIAL INTELLIGENCE AND TRANSFORMATION OF AN ORGANIZATION'S BUSINESS PROCESSES

Kovalenko Boris Borisovich
Doctor of Economics, Professor
University under the IPA EurAsEC, Saint-Petersburg, Russia

Kovalenko Elena Georgievna
CEO
«ComplexSnab» Co Ltd., Saint-Petersburg, Russia

抽象的。 本文探讨了在引入自动化和人工智能 (AI) 技术时改变组织业务流程的问题。 作者分析了全球和俄罗斯人工智能市场的趋势，并考虑了将自动化和人工智能引入公司活动的问题。 作者提出了一种基于手动和机器操作优化来转变组织业务流程的方法。

关键词：人工智能、组织、业务流程、转型。

Abstract. *The article examines the problem of transforming an organization's business processes when introducing automation and artificial intelligence (AI) technologies. The authors analyzed the trends in the global and Russian AI market and considered the problems of introducing automation and AI into the activities of companies. The authors proposed an approach to transforming an organization's business processes based on the optimization of manual and machine operations.*

Keywords: *artificial intelligence, organizations, business processes, transformation.*

In recent years, we have seen the explosive growth of AI technologies. These technologies are already used in all spheres of society, and are also being introduced into the business processes of organizations. Companies across all industries are using AI to reshape business processes to create greater value for customers and all stakeholders.

Do organizational leaders have the problem of determining how to properly restructure business processes in order to optimally use automation tools and the potential of employees? Which operations need to be replaced with automation tools, and which ones should be left to employees?

Currently, the AI technology market is actively developing. [1,2,3,4] According to IDC, the AI market in 2027 will exceed $500 billion, and by 2030 it will increase to $1.8 trillion. [7]

According to data from OxfordInsights [7], out of 160 countries analyzed, the world leaders in the AI market are: the USA, Singapore and the UK. China ranks 15th, Russia 38th.

The world's leading developers of AI technologies are American companies such as Microsoft and OpenAI, Amazon, Alphabet, and IBM. In China - Baidu. Based on the results of 2022, out of almost 300 unicorn companies, 16% develop AI technologies, most of which are located in the United States (105).

Let us note the most important trends in the AI market that affect the activities of companies and the state of the business environment. [5]

1. Active development of generative AI technologies: large language models and image generation tools. This trend intensified after OpenAI released the ChatGPT tool, which allows you to generate texts, respond to user requests, and work with images based on a neural network.

2. Increased investment in platforms that allow working with big data, with the aim of training neural networks.

3. Scarcity of computing power and the need for significant investment in it due to the increase in AI products using large language models.

4. Lack of a sufficient number of specialists in the field of AI.

5. Due to increasing competition, the development of products in OpenSource has ceased, which leads to difficulties for new companies to enter the market.

According to data from the NTI AI Center based at MIPT [6], the volume of the Russian AI market based on the results of 2022 amounted to 647 billion rubles, and exceeded the level of 2021 by 17%. According to information from the Government of the Russian Federation [8], today Russia ranks 4th in the world in terms of the level of development of generative AI models.

More than 90 research centers and more than 1000 Russian companies: large, medium and small are engaged in the development of cognitive technologies. [6] The largest companies occupying leading positions in the field of AI are: Yandex, VC, Sber.

Currently, many sectors of the Russian economy are actively using AI technologies. The structure of the leading industries in terms of investment in AI is as follows: manufacturing industries - 16%, financial and credit sector - 13.4%, trade - 12.8%, provision of services - 10.4%, others - 46.7%.

According to the results of a study by the Institute of Statistical Research and Economics of Knowledge of the National Research University Higher School of Economics, conducted in September 2023 [8], 75% of organizations use AI together with digital production automation technologies (computer-aided design,

robotization, Internet of things, etc.), about 38% use AI to improve communications with clients and implement marketing strategies.

The most used technologies are: computer vision - 78.7% of user organizations; speech recognition and synthesis – 62%; recommendation systems - 40.7%; biometrics – 37.5%; natural language processing - 28.2%.

More than half of companies (55%) use AI to improve existing products and services, and more than twenty percent (21.6%) to bring innovative products to market.

The results of the analysis show that the introduction of AI technologies will be the basis of companies' long-term competitive strategies. At the same time, the high level of business uncertainty caused by the influence of digital technologies causes problems that were unknown to leaders in an industrial economy. [2,3,5]

Today, executives are asking themselves, what changes in business processes will automation and AI technologies bring about? How will the content of the work of employees and managers change? How to successfully implement automation to add value to customers and all stakeholders? How to transform business processes?

The authors believe that it is necessary to evaluate which elements of business processes can be automated. The goal is to understand which tasks can be automated and which ones can be left to humans, while rethinking business processes. The implementation of this goal involves following a systematic approach and stage-by-stage implementation of a series of actions.

1.Identify the main tasks that performers solve according to their job descriptions, within the framework of business processes (production, management, etc.). Assess the features of these tasks that determine the nature of the specialist's work.

2. Conduct an analysis of how improving the quality of tasks performed affects increasing the value of the company.

3. Assess the capabilities of digital technologies.

4. Transform business processes taking into account the introduction of automation tools.

Let's look at these stages in more detail.

1.Dividing business processes into simpler tasks.

For this purpose, it is necessary to analyze the existing functional responsibilities of employees and divide them into a number of tasks according to the classification (standard/non-standard, creative/routine, etc.). Table 1 presents a classification that allows you to highlight tasks as part of business processes.

Table 1.

Classification of tasks in order to assess the possibility of their automation

Criterion	Types of tasks
Nature of activity	- Manual labor - Brainwork

Features of the tasks	-Standard - Non-standard
	- Routine -Creative
	- Collective performance - Individual execution

The analysis shows that it is easier to automate tasks solved using manual labor, standard ones and those oriented towards individual execution. It is more difficult to automate intellectual tasks that are non-standard and require cooperation with other employees, clients, partners, etc.

2. Analysis of tasks in terms of their impact on the value of the company.

At this stage, it is advisable to analyze how improving the quality of performance of a particular task affects the value created for the company (Table 2).

Table 2.

Examples of task types and their impact on company value

Types of tasks	**Acceptable level of quality execution**	**Increased performance quality**	**Impact on company value**
Standard tasks with one execution option	Elimination of errors and execution on time	Excellent execution ahead of schedule	Doesn't add value
Standard tasks with different execution options	Excellent execution of one option	Increasing Variability	Doesn't add value
Problems with creative elements	Excellent performance	Increased quality of execution of creative elements	Leads to increased value
Problems with creative elements	Excellent performance	Non-standard solutions	Explosive value growth

3. Types of technological complexes (AI, robots, cobots).

Currently, the market has different directions in which automation and AI technologies are developing. The use of digital products is determined by a large number of factors:

- functionality;
- level of development of the technological solution;
- price;
- period of implementation, etc.

Let us highlight 3 areas of automation development and consider their features.

1. Robotization of business processes.

This direction is the most developed and is widely used in companies. Mainly used to automate routine, production, conveyor operations.

Tasks that are subject to robotization are characterized by the following properties:

- constantly repeating with a minimum number of iterations;
- do not provide additional value (excessive), in particular, control and supervisory ones;
- related to the optimization of business process risks.

2.Artificial intelligence technologies.

Features of tasks using AI:

- creative, non-standard;
- image, text, speech recognition;
- machine learning;
- working with big data.

3.Use of social robots.

These technologies are used to solve problems:

- standard/non-standard;
- involve interaction between a person and a computer.

4. Transformation of business processes taking into account automation capabilities.

At this stage, tasks are analyzed and it is determined which of them will be transferred to automation tools, and which will be implemented jointly by people and automation. Let's present an example of some tasks of the patient treatment business process (Table 3).

Table 3.

An example of the transformation of some tasks within the framework of automating the business process of patient treatment.

Task within a business process	**Task type**	**Functions of digital technology**	**Type of digital technology (AI, robots)**
Collecting information about the patient's condition	Mental Standard Multivariate Individual execution	Replacing a doctor	Robotization of the process
Diagnosis of the disease	Mental Standard High quality performance Individual. execution	Expands the doctor's capabilities	AI
Development of treatment strategy	Mental Non-standard High quality performance Individual execution	Expands the doctor's capabilities	AI

The analysis shows that in the markets where modern companies operate, constant changes occur, often of an abrupt nature. Consumers are offered more and more goods and services that are constantly being modified and improved. Digital technologies, automation, robotics and AI are rapidly developing, which can dramatically improve the performance of organizations. To adapt to changes and harness the potential of digital technologies, companies need to constantly reconsider business processes.

It is important for company managers to decide which operations will be replaced by automation and robotics, where AI will be used to expand the capabilities of employees to create value for customers.

The authors believe that the automation of business processes and the introduction of AI by companies requires a systematic approach. To carry out transformation, companies need to analyze existing business processes, break them down into tasks, determine which tasks can be transferred to automation, and which will be performed by people together with automation tools.

References

1. Bostrom N. Iskusstvennyi intellekt. Ehtapy. Ugrozy. Strategii. M.: Mann, Ivanov i Farber, 2016. – C.493.

2. Kurtsveil R. Ehvolyutsiya razuma, ili beskonechnye vozmozhnosti chelovecheskogo mozga, osnovannye na raspoznavanii obrazov. M.: Ehksmo, 2018. – C.498.

3. O'Konell. Iskusstvennyi intellekt i budushchee chelovechestva. M: Ehksmo, 2019. – C.335.

4. Ross A. Industrii budushchego. M: AST, 2016. – C.185.

5. Tadviser. Universitet INNOPOLIS. Issledovanie «Primenenie iskusstvennogo intellekta v prioritetnykh otraslyakh ehkonomikI». [Ehlektronnyi resurs] URL: https://www.tadviser.ru.

6. Tsentr II NTI MFTI. Al'manakh «Iskusstvennyi Intellekt 2022». [Ehlektronnyi resurs] URL:https://aireport.ru/ai_index_russia-2022.

7. Tadviser. Obzor: Iskusstvennyi intellekt (mirovoi rynok). [Ehlektronnyi resurs] URL:https://www.tadviser.ru.

8. Tadviser. Obzor: Iskusstvennyi intellekt (rossiiskii rynok). [Ehlektronnyi resurs] URL:

DOI 10.34660/INF.2023.63.46.224

经济安全威胁加剧背景下俄罗斯农工业生产创新发展的投资支持问题
PROBLEMS OF INVESTMENT SUPPORT FOR INNOVATIVE DEVELOPMENT OF RUSSIAN AGRO-INDUSTRIAL PRODUCTION IN THE CONTEXT OF ECONOMIC SECURITY THREATS INCREASING

Kuznetsov Sergey Viktorovich
PhD in Economy
Academy of the Federal Penitentiary Service of Russia,
Ryazan, Russia

注解。 文章提出了在经济安全威胁日益增加的背景下，具体化解决俄罗斯农产品工业生产创新发展投资支持问题的方向的结果。 确定了农工综合体创新发展的关键方向，并以方案的形式提出。 分析了分地区农业固定资本投资动态。

关键词：经济安全、创新发展、农产品加工业生产、投资。

Annotation. *The article presents the results of substantiating the directions of solving problems of investment support for innovative development of Russian agro-industrial production in the context of economic security threats increasing. Key directions for the innovative development of the agro-industrial complex were identified and presented in the form of a scheme. The dynamics of investments in fixed capital in agriculture by regions were analyzed.*

Keywords: *economic security, innovative development, agro-industrial production, investment.*

Investment support for innovative development of the agro-industrial complex is one of the most important components of economic activities implementation in the structure of regional economies. Taking into account the objective insufficiency of state support measures and budget financing both in the structure of the fixed capital of the national agro-industrial complex and in the innovative support of the agricultural industry, investments are a source of financial resources for the majority of enterprises in the agricultural sector. The relevance of innovative development in the agro-industrial complex, in the context of the impending food crisis and the growing population, is not in doubt. And taking into account our state's possession of enormous land and resource potential, it faces the most important task not only to provide its own population with food raw materials and

food products and to fulfill its obligations to foreign partners within the framework of contractual obligations, but to make a qualitative leap in increasing the competitiveness of national enterprises, a significant increasing the share of innovative products to address issues of import substitution and increase the level of national and food security.

A set of issues related to investment support for innovative development of agro-industrial production was developed in the works of Tolysbayev B.S., Suslov V.I., Moldakenova E.K. [1], Tadjbaev Z.M. [2], Dolgova I.M., Aleksandrova N.R. Elizarova A.V., Elizarov V.V. [3], Akmarov P.B., Knyazeva O.P. [4], Rudenko D.V. [5]

The innovative development of the agro-industrial complex has enormous potential in a strategic perspective and will allow us to activate and improve a number of important areas in the domestic agricultural industry (Figure 1). The development of the technological sector of the agro-industrial complex will entail a qualitative increase in labor productivity and a more economical use of available resources, which will have a positive effect on reducing production costs. The use of new production technologies will increase competitiveness and improve the quality of products.

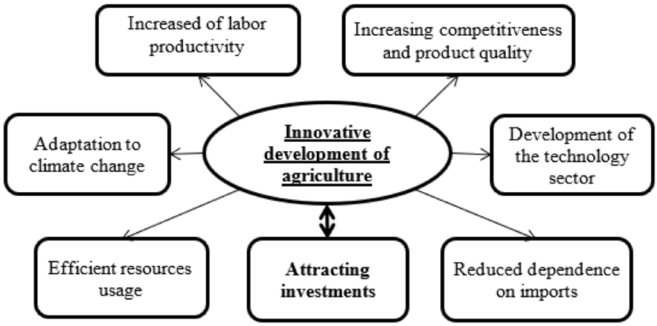


Figure 1. *Key directions of innovative development of the agro-industrial complex*

The development of new or improved breeding material in livestock and crop production will provide a solution to current problems of reducing dependence on imported products, as well as increase the efficiency of regional agricultural production in difficult or unfavorable climatic conditions. These aspects of innovative development of the agricultural sector are unthinkable without internal and external financial investments, therefore investment support is in a close two-way relationship with research activities, being both a source of support and a key direction in the innovative development of the agro-industrial complex.

Analysis of official statistical data on agricultural output, in addition to identifying trends in the development of the agricultural industry, demonstrates structural changes in producing farms. Until 2010-2011, households and agricultural organizations were the main suppliers of food resources, in approximately equal proportions. The share of output by peasant (farm) farms was consistently low and did not play a significant role. After 2011, the volume of production by agricultural enterprises began to grow significantly and by 2022 amounted to 60%. Peasant farms also showed qualitative growth and increased the share of output to 15% in the total volume of production. Despite the overall positive dynamics, the growth in production output by households in the period 2015-2020 was approximately at the same level, but in total volume decreased by approximately 5% (from 30% to 25%, respectively). Changes in the structure of product producers should be correlated with the indicator of investment in fixed capital in agriculture, which not least adjusted the totality of agricultural enterprises.

Table 1.

Dynamics of investments in fixed capital of agriculture by region, million rubles.

Region	2015	2016	2017	2018	2019	2020	2021	2022
Ivanovo region	25713	23287	30315	29360	37419	44388	45269	59451
Vladimir region	71513	70717	78527	73502	90060	95286	102361	179369
Lipetsk region	116134	127891	142407	128533	155038	171804	179400	166200
Tambov region	117641	105033	111073	106230	90719	74770	79397	84983
Voronezh region	264660	270992	283652	276785	298768	259172	285010	344140
Bryansk region	62255	68195	55121	58918	63553	75242	83718	87395
Belgorod region	147214	143792	142693	134551	167093	169508	168772	193558
Kirov region	55760	57001	57861	59508	72234	67879	77177	84716
Tatarstan Rep.	617128	636494	637612	629731	640837	615593	689232	888649
Mordovia Rep	52751	52629	58535	52309	53073	47033	50775	59419
Saratov region	140129	141337	145164	154864	162120	167078	173755	207731
Rostov region	309436	294481	323903	264871	284152	328055	393753	465501
Krasnodar Territory	586903	435095	503243	515317	477635	518217	558590	690705
Stavropol region	126250	122949	140062	158230	196247	232377	254164	286449
Ingushetia Rep.	19759	20632	21198	22359	24158	20354	21572	22920
Altai region	12185	12561	12450	14783	21027	14904	14704	31140

This sample (Table 1) presents the leading regions in agricultural production. The Republic of Tatarstan and the Krasnodar Territory are the leading regions in terms of the volume of financial investments in fixed capital in agriculture, twice as large as the Rostov, Voronezh regions and the Stavropol Territory, which round out the top five most productive agricultural regions. The three least invest-

ment-attractive regions in this list are closed by the Republic of Ingushetia, Altai Territory, Ivanovo Region, where the average volume of attracted investments is about 5.5% of the volumes of the leading territories. The overall dynamics are steadily growing, with the exception of the indicators of the Krasnodar Territory, when from a sharp increase in financial injections in 2013 (955.21 billion rubles) there was a decrease to 45% in 2016.

A fivefold increase in the volume of agricultural products produced (Fig. 2) in 2010-2022 by agricultural organizations correlates with the positive dynamics of investment in agriculture. Using a number of advantages that are not available to small and medium-sized enterprises, the output of large agricultural complexes amounted to up to 60% of the total volume. Due to economies of scale, access to resources, technology, and capital, efficient production systems are created. Diversification of production ensures diversity in the market and stable output of products. Possession of a significant amount of internal resources simplifies the process of mastering new technologies, as well as carrying out one's own scientific developments and research. Taking into account such factors, large agricultural producers are primarily the most attractive investment targets. Which in turn reduces competition in the agricultural sector, demonstrating a low volume of production by households and peasant farms, which can only rely on government support measures within the framework of certain programs, the funds of which, at best, will cover only part of the costs and definitely not will be able to speed up their innovative development.

The effectiveness of investments in agriculture depends on the quality of management and the choice of priority areas of development. It should be noted that investment spending itself show results after a certain period of time, and in the case of investments in the innovative development of the agricultural sector, one should not quickly expect high-quality results. Working with biological material, including genetic modification and selection, has its own unique characteristics that require specialized knowledge. Seasonality and cyclicality of agricultural production is an important factor that requires a long time investment. Differences in regional and climatic conditions also determine the duration of scientific research.

References

1. Tolysbayev B.S., Suslov V.I., Moldakenova E.K. Innovative strategy of agricultural industry development of the Republic of Kazakhstan // Bulletin of Karaganda University. Economy Series. 2017. T. 88. № 4. C. 145-151

2. Tadjbaev Z.M. Innovative development of agriculture: ground resources // European Science. 2020. № 2-1 (51). C. 71-73

3. Dolgova I.M., Aleksandrova N.R. Formation and development of microclusters as the basis for innovative development of agriculture // Russian electronic scientific journal. 2013. №. 5 (5). pp. 31-40

4. Elizarova A.V., Elizarov V.V. The need for innovative development of agriculture based on the use of robotics // APRIORI. Series: Natural and technical sciences. 2017. №. 5. P. 2

5. Akmarov P.B., Knyazeva O.P. Gravity model for assessing the innovative potential of regional agricultural development // Scientific works of the Free Economic Society of Russia. 2022. T. 237. №. 5. P. 151-168

6. Rudenko D.V. Priority directions for the development of agriculture in the region based on an innovative forecasting model // Scientific almanac of the Central Chernozem Region. 2018. №. 2. P. 61-64

DOI 10.34660/INF.2023.87.82.225
UDC 340.153:343.24/.29

俄罗斯国家和法律对流放苦役形式的惩罚的立法支持（十七世纪至十八世纪初）

LEGISLATIVE SUPPORT FOR PUNISHMENT IN THE FORM OF EXILE TO HARD LABOR IN THE RUSSIAN STATE AND LAW (XVII - EARLY XVIII CENTURIES)

Korablin Konstantin Klimentevich
Candidate of Legal Sciences, Professor
Far Eastern Institute - branch of the All-Russian State University of Justice
(RPA of the Ministry of Justice of Russia), Khabarovsk, Russia

抽象的。 文章分析了17世纪至18世纪初俄罗斯国家和法律中流放苦役形式的惩罚制度的形成。 揭示了该类刑罚的本质和内容、其演变及其在特定历史时期国内立法丰碑中的法律巩固，确定了目的和目标，并论证了法律科学和实践的意义。

关键词：俄罗斯国家、法律、惩罚、流放、苦役、苦役、罪犯、流放罪犯。

Abstract. *The article analyzes the formation of the institution of punishment in the form of exile to hard labor in the Russian state and law in the 17th – early 18th centuries. The essence and content of this type of punishment, its evolution and legal consolidation in the monuments of domestic legislation in the specified historical period are revealed, goals and objectives are determined, and the significance for legal science and practice is justified.*

Keywords: *Russian state, law, punishment, exile, hard labor, hard labor, convicts, exiled convicts.*

Hard physical labor for the benefit of the state treasury dates back to ancient times. For example, in the Roman Empire, forced labor of slaves, prisoners of war and criminals sentenced to various terms of punishment was widely used in the construction of Roman aqueducts[1*]. By the end of the medieval period, among almost all European peoples, the most common form of forced labor was the back-breaking work of convicts on sea rowing ships, driven by their muscle power.

The history of Russian penal servitude as a punitive measure begins in the late 17th century. The term “katorga” traditionally referred to the arduous labor of

[1] *Aqueduct (from Latin aquae ductus−"water pipes")−Thishydraulic structures in Ancient Rome, created to solve problems of water resource management. The Romans built numerous aqueducts to deliver water both to cities and to economic centers. The city of Rome itself was supplied with water through 11 aqueducts, which were built over 500 years and had a total length of almost 350 kilometers.

individuals who committed the most serious criminal offenses, served in the interests of the state. According to one version, the word "katorga" originated from the Tatar word "katarga", which meant "to die", "to suffer", "to perish". Siberian Tatars often witnessed convicts being taken to penal servitude. When Russian settlers asked them, "Where are these people being taken?" the Tatars usually answered, "katarga!" - to certain death, to ruin.

In Russian, the word "hard labor" was borrowed from Greek (κατεργων− katergon, i.e. "rowing vessel") and meant the slave labor of oarsmen on large vessels with a triple row of oars, called "galley". Galera (from Italian galera) is a wooden, low-sided (with a long narrow bow and raised stern), low-stability (especially when sailing) military sailing and rowing vessel, which first appeared in Venice in the 7th century, and from the 12th century in as an auxiliary warship, it was part of the fleets of a number of countries in the Mediterranean basin. The crew of the galley (including the military contingent) numbered up to 450 people, where the rowers were mainly slaves, prisoners of war, as well as criminals sentenced to various terms of punishment.

In the Russian fleet, the oarsmen were soldiers, which significantly increased the combat effectiveness and discipline of the ship's crew. In the Russian army, galleys first appeared under Peter I and were built according to the Dutch model at the Olonetsk (Svirskaya, Lyudeynopolskaya) shipyard, at the shipyards of Voronezh, St. Petersburg, Vyborg and other cities. Possessing increased speed and excellent seaworthiness, galleys were used during the siege of Azov (1696), as well as in the Gangut (1714) and Grengam (1720) naval battles that took place during the Northern War with Sweden (1700–1721). These warships were part of the Russian fleet until the end of the 18th century.[1].

The era of the reign of Peter I the Great (1682−1725) was marked by a tightening of the state's punitive policy aimed at ensuring its interests in the field of criminal law and process. During this period, punishment in the form of hard labor became widespread. Thus, for the first time the idea that the labor of lawbreakers could be used on rowing ships (galleys) was visited by the Duma clerk Andrei Vinius[2*]. In 1668, when the emperor began to build a navy, he submitted to the Ambassadorial Prikaz his project for organizing work for convicts in hard labor−rowing ships. According to A. Vinius, it was most convenient to organize such hard labor on the Khvalynsk (Caspian) Sea, where, in addition to ensuring the security of Russia's external borders, it was possible to develop maritime trade, thereby helping to improve the well-being of the state. From the point of view of implementing the punitive policy of the state, it was assumed that hard

[2] *Vinius Andrey Andreevich*(Dutch Andreas Andreaszon Winius) (1641–1717)* – Russian statesman of the era of Peter I, Moscow nobleman, Duma clerk, associate of Peter I,official of the Ambassadorial Prikaz, Russian postmaster (1672, 1675–1693).

labor was “a means expedient in all respects.” On this occasion, A. Vinius wrote: “All thieves and infidel polonyaniks should be sent to hard labor for rowing on chains, so that they do not run away and do evil; and why should such thieves and polonyaniks, of whom there are many in prisons, be given bread so that they could earn bread in hard labor, and some thieves, depending on the case, can be imprisoned for 5 and 6 years or more, and others who deserve death, and forever according to the custom of other states”[2, p. 8].

In this project, A. Vinius pointed out that ships driven by lawbreakers chained in chains have an advantage over sailing ones, since they are able to sail on the sea even in calm, thereby drawing the attention of the authorities to the advantages of building a galley fleet in Russia. Compared to exile, hard labor meant a fundamentally different organizational form of execution of criminal punishment. Its appearance was closely connected with the socio-economic and political development of the Russian state at the turn of the 17th - first quarter of the 18th centuries.

Peter’s reforms of the early 18th century caused a colossal need for additional workers. Peter I needed workers not only for the galleys, but also for the construction of St. Petersburg, Gogervin (Baltic port), for the development of the Daursky and Nerchinsky mines, in the Orenburg region−in a word, to all places where hard unpaid physical labor was needed. However, in conditions of serfdom, there was no free labor force, and only the category of persons who had broken the law could be used as labor force−state, military and criminal criminals, religious apostates and runaway peasants. During this period, alongside the previously established punishment of exile to settlement (“living”), a fundamentally new system of punishment began to develop - exile to hard labor. Hard labor became one of the most frequently used and widespread measures of punishment in the state’s punitive policy. If exile to settlement, due to the specific conditions of its serving while maintaining the convict’s civil status, implied the necessity of solving state tasks for the development (colonization) of remote and undeveloped territories of the country, then in the case of appointment of exile to hard labor, lawbreakers were delivered to the place of serving the punishment under guard, their freedom of movement was restricted, civil rights were lost, and physical labor, aimed at solving significant tasks for the state, was mandatory.

State criminals served exile at hard labor together with their families. For example, supporters of Hetman Mazepa were exiled with their families. Along with family members, criminals who were convicted of robbery or theft of property during the fire were also serving their sentences in exile. An illustrative example is the 57 participants in the Streltsy riot in Moscow in 1698, who, after a search process, were sentenced to death in 1699, and 269 Streltsy, along with their wives and children, were exiled to hard labor in Siberia. As a rule, exile to hard labor was accompanied by additional corporal or self-mutilation punishments in the form of

whipping or whipping, branding, tearing out of nostrils and cutting of the tongue, cutting off limbs, confiscation of property or imposition of a fine.[3, p. 80].

For the first time, exile to hard labor received its official formalization on November 24, 1699, in the decree of Peter I "On the punishment of townspeople for taking bribes from the people they chose to customs and tavern fees," which established this type of responsibility for giving a bribe: "... beat instead of death with a whip without mercy and exile to Azov to live forever with their wives and children, and be forced to do hard labor at work..."[4, p. 671]. In 1700, Peter I ordered "the envy of great brick factories in Tobolsk and the exiles and other people to make bricks in order to make as many as possible everywhere."[5, p. 67]. In other words, he shared the idea that convicts should not simply serve their sentences on the outskirts of the state and be supported at the expense of government funds, but should certainly work for the good of the fatherland. Later, in accordance with the tsar's decree of November 19, 1703, "On punishing with the whip thieves who have not committed murder, and exiling them with branding to Azov with hard labor forever"[6, p. 210], exile to hard labor became an important part of the punitive policy pursued by the Russian state at the beginning of the 18th century.

On February 5, 1705, a new royal decree followed "On not inflicting the death penalty on criminals, except for rebels and murderers, on punishing them with a whip, on cutting out the nostrils of the most important criminals and branding others," which again confirmed the exile of thieves and robbers to eternal hard labor. [7, p. 286−287]. On March 7, 1721, Peter I issues another decree "On the exemption from execution of murderers who voluntarily confess, and on punishing them, instead, with gauntlets and exile in hard labor for 10 years," which abolished the death penalty for criminals who committed murder, and turned themselves in, replacing it with punishment in the form of exile to hard labor for a period of 10 years[8, p. 368]. Throughout the entire period of the reign of Peter I, starting from 1690, the authorities tried not to apply the death penalty to persons who committed criminal acts (except for deliberate murderers, robbers and rebels), replacing it with a reference to hard labor: "so that all those worthy of the death penalty are not executed by death." , except for deliberate murderers and rebels, and about their exile to hard labor for 25, 20, 15 and 10 years, and not exile for less than three years."[9, p. 117].

At the beginning of the 18th century, hard labor and exile began to prevail in the punitive practice of the Russian Empire. Among other things, this trend was driven by the state's need to utilize the human resource in the construction of new settlements, defensive structures, the building of canals, bridges, roads, and so on. In other words, from this time onwards, the labor of lawbreakers began to be widely used to meet the country's needs. Consequently, in the early 18th century, the significance of exile to remote areas of Russia as the main method of land

development took a back seat, giving way to hard labor - the primary means of applying forced labor to achieve the state's top priorities such as the construction of cities, fortresses, ports, state-owned factories, ships, ferries, bridges, and roads, among others. Initially, the category of hard labor included "shipyard, admiralty, and port" work, which later expanded to include labor in mines and state-owned factories. The forced labor of exiles and convicts was used in the construction of the fortress walls of Azov, the Baltic port of Rogervik (now the small Estonian town of Paldiski), and in the construction of Russia's northern capital - St. Petersburg.

The further formation of legislation regarding exile to hard labor in the Russian Empire was in line with Peter the Great's decree of November 24, 1699 and prescribed, after the rite of "political death" (punishment consisting of the complete deprivation of the rights of the convicted person, from which, over time, punishment was formed in the form of deprivation of all rights of the estate), exile criminals to hard labor "in galley work"[10, p. 145−147].

Peter's reforms had a serious impact on the process of transformation of penal practice and, as a consequence, on the legislation of the Russian Empire. The main document reflecting these changes was the Military Article, adopted on April 26, 1715, consisting of 24 chapters and 208 articles (articles)[11, p. 327−389]. Despite the fact that a wide range of normative acts of Swedish, Danish, Dutch, Brandenburg, and Austrian military legislation of the 16th – 17th centuries were involved in the development of the Article, the document was original, original and very progressive for its time. The military article, by its legal nature, was the first Russian criminal code, although it was originally intended for use only in the army. Without significant changes, it continued to operate until 1839, when the Military Criminal Regulations were adopted[12, p. 23−24].

The legal nature of the Military Article of 1715 was more perfect than similar legislative monuments of this period. Without abolishing the provisions of the Council Code of 1649, the norms of the Article were used primarily in the practice of military courts. The text of this document traced the characteristic features of the policy of the autocratic government in the field of combating lawbreakers. In addition, its provisions extended to representatives of the nobility, as evidenced by the fact that participants in the Decembrist movement were convicted on the basis of the articles of the Military Article of 1715.

Similar to the Council Code of 1649, the Article clearly traced both the hierarchy of crimes and the main types of punishment that existed in the Russian Empire at the beginning of the 18th century. At the same time, compared to the Code, the number of crimes in the Article has increased significantly, as well as their composition. The division of crimes according to severity was similar to the Council Code of 1649, where religious crimes came first, and crimes committed against the

person were at the end. The main difference between the Military Article of 1715 and the Council Code of 1649 was the allocation of a significant part of its articles to military crimes, which was due to the nature of this document.

It should also be noted that there was a noticeable tightening of the punishment system, which was fully consistent with achieving the goals that were set by the legislator during the period of implementation of the state punitive policy, namely, intimidation of criminals and prevention of illegal acts committed by them. Thus, in accordance with the Military Article of 1715, reference to hard labor belonged to the category of criminal punishments, and was assigned for various types of crimes, ranging from "hunting grounds" that arouse suspicion to manslaughter. As a rule, hard labor (art. art. 63, 170, 196, 203) was either indefinite ("forever") or urgent ("for a while" or "until a decree"). In addition, such a type of hard labor as exile "to the galleys" received its legal codification (art. art. 65–66, 166–167).

Based on the personal decrees of Peter I of January 15, 1718 "On sending male criminals to the galleys, and women to the spinning yard, to earn the state arrears and private debts and penalties that they owe"[13, p. 530]and dated April 4, 1722 "On the incarceration of convicts in prisons for government debts, on sending them to work on the galleys, and on the establishment of a special table in the Revision Office for the collection of arrears"[14, p. 522−523], exile to the galleys was practiced not only against criminals, but also against insolvent debtors and their guarantors.

Over time, hard labor on rowing ships−galleys loses its former meaning and acquires the features of an organized form of execution of punishment, associated, first of all, with the exploitation of heavy physical labor of convicts in the construction and mining sectors of the state economy. Indefinite ("eternal") hard labor was considered the second most severe type of punishment, worse than which was only the death penalty, which was carried out through quartering, wheeling, beheading, hanging, burning, shooting−"arquebusing", etc. The legislation retained the right to choose between these types of punishments to the court (art. 167). According to the Military Article of 1715, "eternal" hard labor was imposed for wearing a beard and Russian dress, recidivism for theft, rape, etc. In turn, temporary punishment in the form of hard labor followed for cutting down protected forests, for desertion of soldiers, for repeated escape recruits, for evading serfs from serving in the army, for submitting a petition to the sovereign without respect for subordination, for non-payment of taxes, adultery, etc.

Hard labor, as an organizational form of execution of punishment, presupposed the implementation of several punitive elements simultaneously, namely: imprisonment for life or for a certain period, forced performance of labor functions in favor of the state under strict regime conditions and the application of self-harm and painful corporal punishment to convicts. Separately, it should be

noted that any deprivation of liberty during the period of Peter's reforms, be it hard labor, exile, imprisonment, placement in a pit, cellar, prison, belonged to the category of corporal punishment, since the very possibility of moving the convicted person in space was limited.

In 1744, after the abolition of the death penalty by Empress Elizabeth Petrovna, the role of hard labor in the punishment system increased significantly. The reason for the abolition of the death penalty was set out in the Senate decree of May 7, 1744 "On sending to the Senate lists of convicts sentenced to death or political death for failure to execute the sentence on them before the Senate decree," which stated that " The Governing Senate has determined that in Gubernias and Provinces and in cities, as well as in the army and in other places of the Russian Empire, capital punishment and political death are carried out not for proper guilt, but for others and innocently."[15, p. 114].

By the end of the 18th century, those sentenced to exile for eternal settlement and hard labor began to be sent to the place of serving their sentences separately, so as not to equate the settlers with criminals to whom this punishment was applied for committing serious crimes. Exile to hard labor began to pursue the goal not only of settling empty lands located on the distant outskirts of the country, but also the need to use free labor in state-owned production (for example, the Ust-Kut salt plant, the Petrovsky ironworks, the Nerchinsk silver smelting plants, the Kari gold mines, coal mines on Sakhalin Island, etc.).

Thus, exile to hard labor as a form of punishment has a long history of formation and development in Russian legislation. It received its legal formalization during the reign of Peter I. In contrast to the exile to live or settle, which gave convicts greater freedom, hard labor was a more cruel form of punishment, which implied the complete elimination of ties not only with the place of permanent residence of the convict, but also with his usual way of life. The legislation of that period (Code Code of 1497 and 1550, the Council Code of 1649, the Military Article of 1715, as well as royal personal and senate decrees) pursued the goal of not only preventing the commission of offenses, but also solving the most important state tasks for the development of the outlying territories of the country , the construction of fortresses and new settlements, the construction of the Russian naval and merchant fleet, as well as the further industrial and agricultural development of the country.

References

1. Potekhin, A. A. Galera [Electronic resource] / A. A. Potekhin // Great Russian Encyclopedia 2004–2017. – Access mode: https://old.bigenc.ru/military_science/text/2341267 (12/22/2023).

2. Centenary of the War Ministry, 1802–1902 / Ch. ed., cavalry general D. A. Skalon; Main Military Judicial Directorate and Prison Unit // Military Prison Unit / Comp. N. I. Faleev. Historical sketch. Book 2. Part 1.−St. Petersburg : Type. Comrade M. O. Wolf, 1902.−38 p., adj.

3. Stepanova, O. V. The emergence of a new form of exile in Russia in the 18th century. / O. V. Stepanova // Izvestia Penz. state ped. University named after V. G. Belinsky.−2008.−No. 6 (10).−P. 79−84.

4. PSZ−1 (Complete collection of laws of the Russian Empire. 1st collection). T. 3. No. 1722. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−690 pp.

5. Monuments of Siberian history of the 18th century / [ed. A.I. Timofeev]. Book 1: 1700−1713.−St. Petersburg : Type. Min. internal affairs, 1882.−551 p.

6. PSZ−1. T. 4. No. 1924. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor 1830.−881 p.

7. PSZ−1. T. 4. No. 2026. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−881 p.

8. PSZ−1. T. 6. No. 3755. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−815 pp.

9. Viktorsky, S.I. History of the death penalty in Russia and its current state / S.I. Viktorsky.−M.: Type. Imp. Moscow Univ., 1912.−387 p.

10. On the punishment and fines of landowners, clerks and elders for hiding souls: personal decree of Emperor Peter I of November 5, 1723 // PSZ−1. T. 7. No. 4343. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−922 pp.

11. Military article dated April 26, 1715 // Russian legislation X−XX centuries : In 9 volumes. T. 4. Legislation during the formation of absolutism / Rep. ed. A. G. Mankov. M.: Legal. lit., 1986.−512 pp.

12. Bredikhin, A. L. Military articles of Peter I: general characteristics and historical significance / A. L. Bredikhin // Scientific notes of Kazan. legal in-ta. Ministry of Internal Affairs of Russia.−2022.−T. 7.−No. 1 (13).−P. 22−26.

13. PSZ−1. T. 5. No. 3140. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−780 pp.

14. PSZ−1. T. 6. No. 3928. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−815 pp.

15. PSZ−1. T. 12. No. 8944. – St. Petersburg. : Type. II Dept. S.E.I.V. chancellor, 1830.−960 pp.

DOI 10.34660/INF.2023.88.79.226

区分必要防卫与超过必要防卫限度的特征
DISTINGUISHING FEATURES OF NECESSARY DEFENSE FROM EXCEEDING THE LIMITS OF NECESSARY DEFENSE

Boev Dmitry Vyacheslavovich
Graduate Student
Belgorod State National Research University,
Belgorod, Russia

注解。　文章探讨了当前理论和司法实践中关于俄罗斯联邦刑法第108条第1款和第114条第1款规定的必要防卫与超过必要防卫限度的区别存在争议的问题。区分必要防卫和超过必要防卫限度的标准是根据俄罗斯联邦最高法院在判定超过必要防卫限度时提出的特点来确定和考虑的。

关键词：侵占、必要防卫、超过必要防卫限度、危害社会的行为。

Annotation. *The article discusses controversial current issues existing in theory and judicial practice regarding the differentiation between necessary defense and exceeding the limits of necessary defense as provided for in Article 108 Part 1 and Article 114 Part 1 of the Criminal Code of the Russian Federation. Criteria for distinguishing necessary defense and exceeding the limits of necessary defense are determined and considered based on the characteristics proposed by the Supreme Court of the Russian Federation when determining the exceeding of the limits of necessary defense.*

Keywords: *encroachment, necessary defense, exceeding the limits of necessary defense, socially dangerous act.*

A brief description of the state of crime in Russia for 2022, posted on the website of the Ministry of Internal Affairs of the Russian Federation, indicates that the criminal situation in the country is under the control of law enforcement agencies. "...There was a downward trend of 1.9% compared to 2021 in registered crimes, a 4.1% decrease in attempted murders and homicides, a 5.5% decrease in the number of crimes of intentional infliction of grievous bodily harm, a 2.8% decrease, rapes and attempted rapes – by 4.2%, by 10.5% - robberies, by 7.1% - robberies, thefts decreased by 4.8%. The number of crimes committed on the streets has decreased significantly" [4].

Reflecting criminal attacks with the help of law enforcement agencies, as well as independently, protecting one's legal rights and freedoms, protecting third parties, all these actions represent a reliable and effective way to combat crime.

At the same time, it is necessary that the actions of the victim of a criminal attack to repel the criminal attack are assessed accordingly by the state. An assessment of the victim's active behavior when repelling a criminal attack is given on the basis of the norms of criminal law on necessary defense [3, p. 138].

The practice of initiating criminal cases for an intentional crime or exceeding the limits of necessary defense against persons who have repelled a criminal attack, arrests, and convictions regarding this category of persons negatively affect the legal consciousness of citizens.

Under such circumstances, victims of criminal attacks and witnesses of criminal aggression are afraid to exercise their legitimate rights to the necessary defense, and if a criminal attack is repelled, they hide from the scene of the crime without informing law enforcement agencies about what happened.

Over a long period of time, since 1996, legislators have gradually changed their approach to the institution of necessary defense.

Despite numerous scientific studies conducted by Russian scientists from the Institute of Necessary Defense and reviews of judicial practice in this category of cases, there are still unsolved problems today.

By examining the results of scientific works of Russian and foreign legal scholars and analyzing law enforcement practice on these issues, we can conclude that there are a number of unresolved problems in relation to the institution of necessary defense in Russian criminal law.

Current problems of law enforcement of the institution of necessary defense also exist in other countries. Of particular interest is the necessary defense legislation of other countries, in which citizens have the most expanded powers to protect their rights and interests compared to other countries.

Studying the legal experience of other countries in the field of necessary defense will allow us to improve Russian legislation, make changes, avoid mistakes, and improve the system of law enforcement agencies.

By exceeding the necessary defense, the legislator understands deliberate actions on the part of the person defending himself that are clearly inconsistent with the nature and danger of the attack. In other words, by the condition for limiting the necessary defense from exceeding its limits, the legislator determines the proportionality of the defense to the nature and degree of danger of the attack [1].

In the Resolution of the Plenum No. 19 of September 27, 2012, the Supreme Court of the Russian Federation pointed out to the lower courts a list of circumstances, describing the conditions that judges should be guided by when establishing signs of exceeding the necessary defense, but without describing them in detail [2, p.21].

In this regard, in judicial practice there are controversial court decisions, according to which innocent persons who were in a state of necessary defense were groundlessly brought to criminal liability under Part 1 of Article 108 and part 1 of Article 114 of the Criminal Code of the Russian Federation2.

So, Sautova suffered violence from her husband for decades, but did not file a complaint with the police. On the day of the incident, the husband, being heavily intoxicated, began hitting her on the head with an object similar to a rubber hammer. Sautova fell, and then her husband sat on her legs and, holding her, struck her many times with an unknown sharp object such as an awl in the abdomen (causing abrasions). When Sautova managed to get up, her husband began to choke her and she began to lose consciousness. Then, grabbing the first object that came to hand, which turned out to be a knife, she stabbed her husband several times. The husband went into the next room, lay down on the floor and continued to insult Sautova. She approached him to check his condition, but he grabbed her. Sautova, believing that the attack was continuing, stabbed her in the back again. The court noted that these actions of M.V., coupled with the emotional state of M.A. Sautova, in the form of strong mental agitation, in which she was due to fear caused by a previous attack dangerous to her life, in the opinion of the judicial panel, did not allow her to realistically assess the current situation and gave reason to believe that the attack on the part of M.V. continues [5].

The above affirms the establishment and study of criteria for delimiting the necessary defense from exceeding its limits.

The first condition pointed out by the Supreme Court of the Russian Federation is the object that has been violated. When protecting life, the question of exceeding the limits of necessary defense does not arise, since the legislator does not limit the necessary defense in the event of an attack that poses a threat to life.

The Supreme Court of the Russian Federation points out the second feature to lower courts, which must be taken into account when making a decision: the method chosen by the encroaching person to achieve the result, the severity of the consequences that could occur if the encroachment was completed, the presence of the need to cause death to the encroaching person or serious harm to his health in order to prevent or suppression of encroachment.

To summarize, we can conclude that when the courts decide on the presence of signs of exceeding the limits of necessary defense, the courts must focus on the criteria specified by the Supreme Court of the Russian Federation and apply them as conditions allowing delimiting the necessary defense from exceeding its limits with some clarifications.

References

1. Avdeeva E. V. Necessary defense: current issues of legislative regulation and law enforcement // ConsultantPlus [Electronic resource]: reference legal system.

2. Garbatovich D. A. Establishing the boundaries of the criminalization of acts through regulation and enforcement of norms on circumstances excluding the criminality of acts // Russian Justice. 2020. No. 4. pp. 21–22.

3. Piontkovsky A. A. Soviet criminal law. T. 1. General part. 2nd ed. M.: Publishing House Kom. Acad., 1928. pp. 138–139.

4. Brief description of the state of crime in the Russian Federation for January - December 2022 // Electronic resource. URL:https://mvdmedia.ru/news/official/statisticheskie-svedeniya-o-sostoyanii-prestupnosti-v-2022-godu/(Access date: 06/10/2023).

5. Appeal ruling of the Judicial Collegium for Criminal Cases of the Supreme Court of the Republic of Tatarstan dated October 26, 2018 in case No. 22-7813.

DOI 10.34660/INF.2023.69.64.227

参数化教学作为工业 4.0 网络物理环境培训工程师的新工具
PARAMETRIC DIDACTICS AS A NEW TOOL FOR TRAINING ENGINEERS FOR THE CYBER-PHYSICAL ENVIRONMENT OF INDUSTRY 4.0

Starygina Svetlana Dmitrievna
Candidate of Pedagogical Sciences, Director
Institute of Management, Automation and Information Technologies

Nuriev Nail Kashapovich
Doctor of Pedagogical Sciences, Full Professor
Kazan National Research Technological University

抽象的。 参数化教学作为一种新的教育学理论和方法工具包，被用作设计新一代（网络物理）教学系统的平台。 研究表明，确保工业4.0人才大规模培训的主要教学条件是在准专业的网络物理教育环境中进行培训，并配有教师的人工智能数字孪生体。 事实证明，要形成“参数化教学法”这一科学学科工具包，必须对“人类活动心理系统（PSA）”的模型、规律、模式以及“教学法”进行参数化改造。必要的。 结果表明，对于 PSA 和“教学法”模型的参数化转换，需要解决十个相互关联的复杂问题。 反过来，解决这十个问题的结果的总和，以及“人工智能理论”的模型和算法的参与，是一门新学科的支柱，被称为“参数教学法”。 本书得出四个结论： 1. 在文明发展的过程中，作为解决当今时代紧迫问题的工具的科学学科的语言模型自然会向人工智能化转变。 2. 现代工业的快节奏决策和管理过程需要“人”与人工智能的联合运用，这是不争的事实。 3、特别是在我们这个世纪，决定文明发展速度的主要因素之一是教育。 4. 由此可见，国家越快（考虑到其他因素）将人工智能（以合理的方式）引入教育过程，就越快在文明竞争中取得主导地位。

关键词：参数化教学，教师数字孪生，人工智能助手，发展智能图谱，智力资源。

Abstract. *Parametric didactics as a new theoretical and methodological toolkit of pedagogy is used as a platform for designing didactic systems of a new (cyber-physical) generation. The work shows that the main pedagogical condition that ensures mass training of personnel for Industry 4.0 is their training in a quasi-professional cyber-physical educational environment with an AI digital twin of the teacher. It has been proven that for the formation of "Parametric Didactics" as a scientific discipline-toolkit, a parametric transformation of*

the models, laws, patterns of the "Psychological System of Human Activity (PSA)", as well as "Didactics" is necessary. It is shown that for this parametric transformation of the PSA and "Didactics" models, it is necessary to resolve a complex of ten interrelated problems. In turn, the totality of the results of solving these ten problems, with the involvement of models and algorithms of the "Theory of Artificial Intelligence" are the backbone of a new scientific discipline, which was called "Parametric Didactics". The work draws four conclusions: 1. In the course of the development of civilizations, there is a natural transformation of verbal models of scientific disciplines as tools for solving pressing problems of our era towards their artificial intellectualization. 2. It is an indisputable fact that there is a need for the joint use of "human" and artificial intelligence in fast-paced decision-making and management processes throughout modern industry. 3. Especially in our century, one of the main factors determining the speed of development of civilizations is EDUCATION. 4. It follows from the context that the faster (taking into account other factors) the state introduces AI (in a reasonable manner) into the educational process, the faster it will achieve primacy in the competitive struggle of civilizations.

Keywords: *parametric didactics, digital twin of the teacher, AI assistant, development intelligence map, intellectual resources.*

The main pedagogical condition for preparation. Cyber-physical systems have been introduced into the active environment of Industry 4.0 to quickly solve complex problems. These systems are hybrid artificial intelligence (AI) systems with a combined human-machine system for controlling other systems involved in certain processes. It is obvious that to support the functionality of this industry, large numbers of qualified personnel are required.

Modern digital didactic systems are only partially able to cover the shortage of personnel for Industry 4.0, because in practice, engineering graduates face too much adaptation to quickly solve complex problems in the industry environment. Of course, this, in general, reduces the efficiency and slows down the intensity of any industrial processes.

It is obvious that the rapid adaptation of a graduate engineer to production conditions is possible only if the educational problem-based training environment is "close" in the speed of solving and complexity of problems to the problematic environment of activity in industry. From the context it follows that, according to the criterion of speed of adaptation, the main pedagogical condition for the effectiveness of training in modern educational systems is the following requirement.

Successful training of a future specialist for professional activities in the problematic environment of Industry 4.0 can only be realized in a quasi-professional cyber-physical educational environment.

This pedagogical requirement can be divided into two components:

1. The educational system must be cyber-physical, because Only in a cyber-physical environment can one realize and learn how to quickly solve complex problems using the capabilities of artificial intelligence.

2. For a quasi-professional training environment, the content of educational systems "finally" must resolve educational problems comparable in direction and complexity to professional problems from the cyber-physical environment.

In general, any cyber-physical system as a whole can be characterized and represented through:

1. Structural-component functional shell model, i.e. presented what components it consists of; how they are related to each other; what functions they are intended to implement; How, overall, the cyber-physical system will function according to purpose.

2. Description of the content - information resource components presented in a format that can be processed using artificial intelligence (AI).

3. Technologies of resource exchange processes within the cyber-physical system, presented in a format in which AI can take part in analyzing and managing the learning process.

4. Assessment of the functional effectiveness of the cyber-physical educational system.

Development of a conceptual shell model of a cyber-physical educational system. In the general case, let's imagine a cyber-physical system as a dynamic system (SADT – model [1]) with selected attributes-resources parameters (Fig. 1)

Figure 1. *Diagram of the SADT model of a dynamic system*

Based on the second law of thermodynamics [2], we can prove the following statement - the law of functioning.

Law of functioning. ***All dynamic systems (biological, technical) function in an invariant way - INPUT resources are transformed into OUTPUT resources under the influence of CONTROL resources using MECHANISM resources.***

In the context of the law of functioning of all dynamic systems, let us present the structural-functional SADT - a model of a cyber-physical educational system with selected parameters, i.e. with dedicated resource components **INPUT, OUTPUT, CONTROL, MECHANISM** (Fig. 2). Thus, the main pedagogical requirement (cyber-systematic, see point 1 in the requirement), at the fundamental and practical levels, can be satisfied, i.e. software for an educational cyber-physical shell system can be designed.

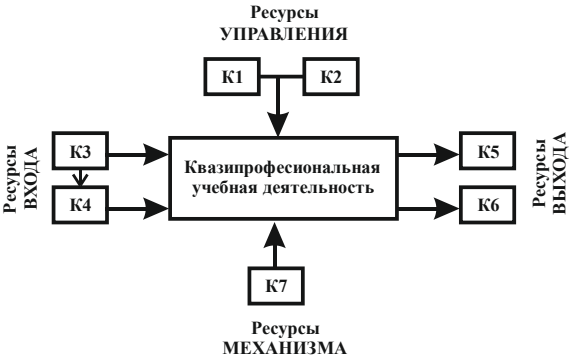


Figure 2. *Component structural-functional SADT model of a cyber-physical educational system*

The model uses the following designations for component blocks: K1 – teacher; K2 – AI teaching assistant, i.e. its "smart" digital twin; K3 – student before the start of studies; K4 – the value of the parameters of the state of development of the student's intellectual resources before the start of training – a digital twin of the state of the student's development; K5 - student after graduation; K6 – the value of the parameters of the state of development (increment) of the student's intellectual resources after graduation – a digital twin of the student's incremental resources; K7 – databases of information and material resources: knowledge bases of ontological type; database of diagnostic questions; databases of tasks with educational problems; hardware with software; teacher as a bearer of knowledge, experience, psychological and pedagogical expert, motivator, educator.

It should be especially emphasized that the teacher, as well as his "smart" digital twin in the cyber-physical educational system (see Fig. 2, i.e. components K1 and K2) are interconnected and have a common hierarchical structure in **MANAGEMENT** with the distribution of their roles in management actions. The student and the digital twin of the state of development of his resource intellectual potentials are represented in the form of a multidimensional (multi-parameter) digital series [3] of the development of the student's resource intellectual poten-

tials in a format suitable for AI processing. For the teacher and students, the digital series of development is presented in the form of a multi-colored (2 – black, 3 – gray, 4 – green, 5 – red) mind map of the student's development. As the experience of training IT engineers for students shows, it is the multi-colored mind map that has a strong motivating effect [4, 5]. Of course, designing shell software for a cyber-physical educational system is a collective work of a team of software engineers and teacher-scientists within the framework of the scientific discipline "Didactic Engineering" [6 – 8].

Parametric didactics as a new pedagogical toolkit. Any scientific discipline of a subject area is, first of all, a scientific and methodological tool for solving problems and answering questions from this subject area. Didactics can be considered as a scientific tool for solving the problem of effective teaching. In practice, this training is implemented through the design of didactic systems with the subsequent training of students in an organized didactic environment. At the same time, it should be noted that "Didactics", even after digital transformation, is only partially suitable as a toolkit for designing digital twins and content of cyber-physical educational systems. Therefore, when designing cyber-physical educational systems, the main problem becomes the operation of parametric transformation of the approaches, principles, models, laws, patterns of "Didactics" [9] and "Psychological Theory of Activity" in terms of the "Psychological System of Human Activity (PSA)" [10] . In this work, we have the opportunity to only briefly list a set of ten problems (P1 - P10) that arise during this parameterization with comments on the ways to solve them proposed by the authors. These problems are as follows.

P1. Present a verbal model of the psychological activity system (PSA) of a person as a dynamic system in a parametric format. **Comment 1.** Attempts to develop models-schemes for organizing mental-active procedures that occur when solving various problems and issues have deep roots. Famous psychologists and educators Vygotsky, Rubinstein, Leontiev, Shchedrovitsky, etc., searched for answers to these questions. Shchedrovitsky established many schemes of mental-active procedures-frameworks [11]. For the first time, the existence of a single framework procedure for organizing a fuzzy algorithm of mental activity when solving problems by a person was expressed by teacher N.K. Nuriev [12]. In [5] it is noted that during evolution, this fuzzy algorithm-procedure is fixed in a person at the genetic level.

P2. Establish a law - an invariant fuzzy algorithm-procedure "solving problems by humans - the law of SPH", i.e. will establish a (genetically fixed) unique fuzzy ALGORITHM-PROCEDURE (framework, framework) for a person to solve a problem, based on his design and estimate documentation. **Comment 2.** This procedure is given in many of our works, for example, in [8, art. 48 – 50].

P3. Present in a parametric format the stochastic laws-connections: "KNOWLEDGE and ABILITIES", "MIND and COMPLEXITIES", and also establish a

stochastic law-connection between the values of the parameters-indicators of the intellectual resources of the MIND and the values of the parameters of the COMPLEXITY of the problem being solved. **Comment 3.** The solution is given, for example, in [8, p. 50].

P4. Construct a parametric numerical model of the increase in intellectual resources of the MIND in a learning environment. **Comment 4.** Solutions are considered, for example, in [8, p. 50 – 52].

P5. Carry out parameterization of educational content and present it in the form of an anthological type knowledge base with selected parameters characterizing the qualities of this base to support activities. **Comment 5.** The solution is considered in [5, 13 – 16].

P6. Establish and write in a parametric format the stochastic law-relationship "PROBLEM SOLUTION and CONTACT TIME", as well as parametrize the base of educational problems with the selected values of the parameters of their complexity and estimates of the time of contact with them. **Comment 6.** The solution is given in [8, p. 67 – 72].

P7. To develop an "adaptive-flexible" intensive digital parametric pedagogical technology with the possibility of its "step-by-step" adjustment based on the changing values of the parameters of the student's developmental state. **Comment 7.** Variants of solutions are given in [4].

P8. To develop a digital multi-parameter technique for diagnosing the state of development of the intellectual resources of the student's MIND, presented in the form of a dynamic mind map that changes in the didactic environment. **Comment 8.** Solutions are considered in [4].

P9. Based on the results of solving problems P1 - P8, prove the possibility of designing a software digital twin (SDT) of a teacher to support learning in a virtual environment using digital parametric pedagogical technology.

P10. Based on the results of solving problems P1 - P9, prove the possibility of introducing AI into the educational process with the organization of a cyber-physical educational system.

The results of solving problems P1 - P10 will be denoted by RP1 - RP10. In general, these results as a whole are system-forming, i.e. are necessary and sufficient resource solutions for designing a digital twin (AI assistant) of a teacher and organizing a functional cyber-physical system. The structure of their organization (Fig. 3) represents and forms the structure of the theoretical and methodological organization of the basis-platform of "Parametric didactics". PARAMETRIC DIDACTICS should be considered as a new toolkit-branch of PEDAGOGY, on the platform of which it is possible to design didactic systems of a new (cyber-physical) generation.

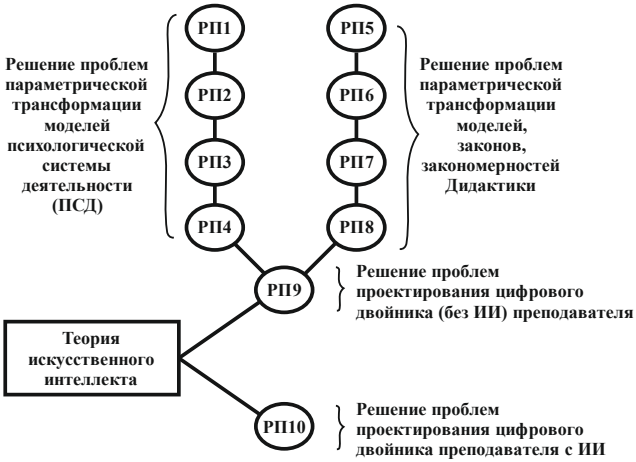


Figure 3. *Conceptual model of the structure of the organization of the theoretical and methodological basis-platform of "Parametric didactics"*

It should be especially emphasized that generations of cyber-physical systems will evolve, i.e. AI assistants of cyber-physical systems will become "smarter" from generation to generation.

Conclusions and conclusions. 1. In the course of the development of civilizations, there is a natural transformation of verbal models of scientific disciplines as tools for solving pressing problems of our era towards their artificial intellectualization. 2. The need for joint use of "human" and artificial intelligence in fast-moving decision-making processes and reality management is an objectively forced factor. 3. Especially in our era, one of the main factors determining the speed of development of civilizations is EDUCATION. 4. It can be argued that the faster (taking into account other factors) the state introduces AI (in a reasonable manner) into educational processes, the faster it will achieve primacy in the competitive struggle of civilizations.

References

1. Meshcheryakova A.A. Methodology of functional modeling SADT // Current directions of scientific research of the XXI century: theory and practice. 2018. V. 6. No. 7 (43). pp. 66-70.

2. Kuznetsova A.I., Medvedeva G.A. The second law of thermodynamics is the most important law of nature // International Scientific Research Journal, 2020. No. 1 (91). Part 1. pp. 30 – 33.

3. Gazizov D.I. Review of methods for statistical analysis of time series and problems arising in the analysis of non-stationary time series // Scientific journal. 2016. No. 3 (4). pp. 9-14.

4. Starygina S.D. Development of a digital platform for the design of cyberphysical didactic systems // Modern science-intensive technologies. 2023. No. 3. P. 108-114.

5. Starygina S.D., Nuriev N.K. Development of a theoretical and methodological instrumental digital platform for didactics // Modern science-intensive technologies. 2023. No. 2. P. 169-178.

6. Choshanov M.A. Didactics and engineering. M.: Laboratory of Knowledge, 2020. – 251 p.

7. Starygina S.D., Nuriev N.K. Theoretical foundations of didactic engineering // Educational technologies society. 2019. v.22. No. 1. P.101-110.

8. Nuriev N.K., Starygina S.D. Didactic engineering: parametric design of didactic systems: monograph. Kazan: Editorial and Publishing Center "School", 2020. – 104 p.

9. Ibragimov G.I. The problem of patterns and principles of teaching in domestic pedagogy: monograph. Kazan: editorial and publishing center "School", 2018. – 68 p.

10. Shadrikov V.D. Psychology of human activity. Moscow: Institute of Psychology RAS, 2013. – 464 p.

11. Shchedrovitsky G. P. Thinking. Understanding. Reflection. M., 2005. – 800 p.

12. Nuriev N. K. Extreme methodology in didactics of software engineering. Kazan: Kazan University Publishing House, 20004. – 80 p.

13. Starygina S.D., Nuriev N.K. Metric approach in pedagogy: metric model of developmental education with digital training technology. Sustainability management. 2022, No. 1 (38). pp. 96 – 104.

14. Starygina S. D. The theory of development of resource potentials of the individual and its application to didactics in the era of the digital economy. Sustainability management. 2022, No. 3 (40). pp. 90 – 98.

15. Starygina S. D. System-parametric approach in didactics: development of the theoretical and methodological basis of didactic engineering. Bulletin of the Mari State University.2023. V. 17.No. 1 (49). pp. 29 – 37.

16. Starygina S.D., Nuriev N.K., Pechenyi E.A. Development of a platform for designing educational systems with digital technologies // Caspian Journal: Management and High Technologies. 2020. No. 2 (50). pp. 44-58.

DOI 10.34660/INF.2023.58.77.228

俄罗斯青少年体育的传统与创新
TRADITIONS AND INNOVATIONS IN RUSSIAN YOUTH SPORTS

Rekutina Natalya Viktorovna
Candidate of Pedagogical Sciences, Associate Professor
Siberian State University of Physical Culture and Sports
Blazhenets Ilya Valerievich
Master's Student
Siberian State University of Physical Culture and Sports

注解。　本文探讨了儿童和青少年体育实践的传统和创新形式、组织体育比赛的方法和组织竞赛的模式，介绍了它们发展的历史方面并评估了它们的人文潜力。

关键词：儿童和青少年体育、体育竞赛、对抗、人文潜力、组织对抗模式。

Annotation. *The article examines traditional and innovative forms of practice of children's and youth sports, methods of organizing sports competitions and models of organizing rivalry, presents the historical aspect of their development and assesses their humanistic potential.*

Keywords: *children's and youth sports, sports competition, rivalry, humanistic potential, models of organizing rivalry.*

According to the Olympic Charter, Olympism represents a philosophy of life, elevating and uniting the virtues of the body, will, and mind into a balanced whole. Olympism, connecting sport with culture and education, seeks to create a way of life based on the joy of effort, the educational value of good example, social responsibility, and respect for universal fundamental ethical principles.

In the works of Pierre de Coubertin, special attention is paid to the pedagogical aspects of sports competition. According to him, sports competition without an educational focus on the implementation of humanistic values is only a technology for producing results [4, 8].

Modern researchers note the special significance of this provision for the successful practice of children's and youth sports [1, 5, etc.].

Object of study -practice of children's and youth sports in Russia.

The purpose of the study is to describe and generalize the experience of using various types of competition and models of organizing rivalry in children's and youth sports in Russia.

Research objectives:

1. To create a classification of the types of competitive practice of children's and youth sports in Russia.
2. Based on a study of the literature, determine the most current models for organizing competitions in children's and youth sports.
3. Describe innovative practices in children's and youth sports in Russia.

Research methods:

– analysis of scientific and methodological literature on the theory of children's and youth sports.
– analysis of documents regulating the content and organization of sports competitions in children's and youth sports in Russia.
– systematization of types of competitions in children's and youth sports in Russia.

Currently, the development of sports in the Russian Federation is one of the national priorities, with special attention being paid to children's and youth sports [3]. Increased interest in children's and youth sports is reflected in a number of projects, strategies, concepts and initiatives: the national project "Demography", the national project "Sport is the Norm of Life", the Strategy for the Development of Physical Culture and Sports of the Russian Federation, the Concept for the Development of Children's and Youth Sports in the Russian Federation to 2030, Concept of sportization of physical education, All-Russian competition of sports initiatives "You are in the game".

The time of innovation in social and humanitarian practice creates interest in the traditions that exist in the field of this activity. We turned to summarizing the rich experience of children's and youth sports in Russia. Based on the analysis of the study, we identified the following models for organizing competitive practice:

1. Attributively and ideologically shaped movements (scout and Sokol movements).
2. Rational-normative complexes (GTO, BGTO).
3. Complex multi-level competitions ("All-Union Schoolchildren Spartakiad", "All-Union Ski Racing Competitions among Pioneers and Schoolchildren", "All-Union Youth Sports Games").
4. Club multi-stage competitions ("Starts of Hope", "Jolly Dolphin", "White Rook", "Fun Starts", "Friendship", "Zarnitsa", "Golden Puck", "Leather Ball", "Silver Skates", "Swift Ball" ", "Spikelet").

Noteworthy is the existence of attribute-formed movements, which include the scout and falcon movements. It should be noted that these models of the physical culture and sports movement were formed at the end of the 19th century in foreign practices and had a significant ideological component. They found widespread use at the beginning of the 20th century in Russia.

During the Soviet period, they were developed rational-normative complexes - GTO, BGTO, complex multi-level competitions - “All-Union Spartakiad of Schoolchildren”, club multi-stage competitions: “Starts of Hope”, “Jolly Dolphin”, “White Rook and others. In particular, the concept of the International Children’s Siberiad was developed and implemented, the author of which is Professor of the Siberian State University of Physical Culture and Sports Yuri Pavlovich Simakov.

The named models in different periods of the history of children’s and youth sports in Russia had varying degrees of popularity; some of them formed the basis of the practice of children’s and youth sports and were implemented for a long time. To a greater extent, the values and ideals of the Soviet sports movement were represented in the concept of the All-Union Schoolchildren Spartakiad. Modern experts, analyzing the experience of organizing the competitive practice of children’s and youth sports in the Soviet period, note the special value of the sports and athletics movement and propose to consider a multi-level sports and athletics competition as the basis for organizing the sports movement in modern Russia [2].

In the 21st century, significant changes in sports are observed, which is reflected in the practice of children’s and youth sports. At the international level, the Youth Olympic Games appeared, the World Gymnasiums, and regional children’s and youth games became more popular. Russia is actively involved in these international projects. This participation contributed to the emergence of new types of competitions (Gymnasiums, Spartan Games, etc.)

Currently, a deep analysis of traditions and innovative projects aimed at the future is relevant. Innovations in the modern practice of children’s and youth sports in Russia include new types of physical activity, new ways of determining winners and new models of organizing competition.

New types of physical activity include: workout, parkour, panna, phygital, tricking, etc.

New types of organizing sports competitions are being implemented in innovative projects: “Street Classics” and “Gymnastrada”, innovative projects are widely represented in the projects of the All-Russian competition of sports initiatives “You’re in the Game”.

Innovative models of organizing rivalry: semi-competitive (rivalry-cooperation) and non-competitive (mainly cooperation) models developed and implemented within the framework of the SpArt project have significant humanistic potential and should in the future find wider distribution in the practice of children’s and youth sports [7].

The process of forming a significant number of street sports subcultures has led to significant changes in children’s and youth sports in Russia. The program “Street Classics” is becoming increasingly relevant at the present time. Street Classics is a nationwide project for the development of street sports. Its program in-

cludes about 20 types of sports and disciplines, such as volleyball, basketball/3x3, freestyle football, and others.

A new phenomenon in sports is e-sports. The relationship of this type of competition with the field of sports and the Olympic movement is quite complex. At the same time, e-sports is actively included in the practice of the sports movement and is supported by the IOC.

E-sports is a team or individual competition based on computer games. All e-sports disciplines are divided into several main classes, distinguished by the properties of spaces, models, game tasks and developed by the gaming skills of e-sports athletes - first-person shooters, real-time strategies, sports simulators, car simulators, flight simulators, fighting games, team role-playing games with tactical-strategic elements games.

A completely new practice that serves as an integration of classical sports and e-sports is physical sports.

Phydital sports are a combination of digital and physical activity. The phygital sports program consists of several challenges: phygital sports are a combination of classical sports with their digital analogues (video games, simulators). Phygital tactical combat is a combination of popular video games of the "3D tactical combat" genre with a physical stage – the laser tag arena. Phygital strategy – competitions take place in computer games of the "battle arena" and "strategy" genres; at the physical stage, a series of tests of endurance and ingenuity are conducted. Phygital speed is a completing speed games in a relay race format. At the physical stage, the best teams participate in the phygital super final. Phygital technologies - participants compete using technically complex devices and technological developments: drone races, robot battles and virtual reality competitions.

A great resource of new ideas for the practice of children's and youth sports is the "You're in the Game" sports initiatives project, the 4th season of which started in November 2023.

In the theory and practice of children's and youth sports, through the efforts of scientists, various models of competitive practice were developed, including those authored by V.I. Stolyarov and his students developed a concept of non-competitive models of organizing rivalry, which is characterized by the following features:

- non-competitive behavior of participants without identifying winners, the organization of activities is aimed at matching the behavior of the game role and the plot;
- the organization of activities is based on solving the game problem and the cooperation of the players in achieving it;
- the focus of the players on the plot of the game and emotional support for all its participants;
- the absence in the rules of the game of cases of elimination of individual participants before the end of playing time;

- the opportunity to take part for everyone, without differentiation by level of preparedness, age, or motor experience;
- complete ensuring the safety of the players and their confidence in the help of other participants in the game [6,7].

In the practice of children's and youth sports in Russia, semi-competitive and non-competitive models were developed and applied in the context of the humanistic project "SpArt", created by V.I. Stolyarov. The author has developed ways to increase the humanistic potential of sports competition, which is aimed at the formation of humanistic values: friendship, cooperation, mutual understanding [5, etc.].

These models, in our opinion, deserve wider distribution in children's and youth sports.

Thus, in the modern practice of children's and youth sports, it is important to combine traditions and innovations, which will allow the humanistic potential of sport to be realized to a greater extent.

References

1. Egorov, A.G. Physical development and sports, problems of humanization / A.G. Egorov, V.A. Pegov // Theory and practice of physical culture, 1994.- No. 3-4. - P. 33-45.

2. Internet newspaper Russian Stadium [Electronic resource]: - URL:https://stadium.ru/(access date: 11/25/2023).

3. Concept for the development of children's and youth sports in the Russian Federation until 2030 // Ministry of Sports of the Russian Federation [Electronic resource]: – URL:https://minsport.gov.ru/(access date: 11/20/2023).

4. Coubertin, Pierre de. Olympic memoirs. – Kyiv: Olympic literature. – 1997. – 179 p.

5. Stolyarov, V.I. Modern Olympism and Olympic pedagogy: achievements, problems, prospects / V.I. Stolyarov. – M.: PLANETA, 2018. – 528 p.

6. Stolyarov, V.I. Theory of physical culture (critical analysis of the current state, technology and results of modernization) / V.I. Stolyarov, S.G. Seyranov. – Moscow State Academy of Physical Culture. - Malakhovka. - 2021. -332 p.

7. Stolyarov, V.I. Fundamental methodological problems of the sciences of physical culture and sports activities and human corporeality / V.I. Stolyarov. – M.: RUSAIN. - 2021. -221 p.

8. Schwier J. (1993). Childhood, Game, and Social Change // Int. Journal of Physical Education. – vol. XXX. Issue 4. P. 9-14.

DOI 10.34660/INF.2023.85.88.229

在中国高等学校钢琴课中学生学习电影音乐作品动机的形成
FORMATION OF MOTIVATION OF STUDENTS TO STUDY THE WORKS OF FILM MUSIC IN PIANO CLASSES AT UNIVERSITIES IN CHINA

Liu Jiatianze
Graduate Student
Moscow Pedagogical State University,
Moscow, Russia

摘要.文章分析了电影音乐的教学潜力对未来丈职业发展的重要性，并探讨了在钢琴课上激励学生掌握电影音乐实例的问题.

关键词：音乐教育、电影音乐、学生、动机、文化词库、曲目、钢琴课、听众.

Annotation. *The article analyzes the significance of the pedagogical potential of film music for the professional development of a future musician-teacher and examines the issues of motivating students to master examples of film music during piano lessons.*

Keywords**:** *music education, film music, students, motivation, cultural thesaurus, repertoire, piano class, listeners.*

One of the leading directions of China's national policy in the field of education is to expand the range of general cultural and professional competencies of graduates of higher educational institutions, allowing young bachelors and masters to adapt and actively act in a dynamically developing society, to successfully implement the creative potential accumulated during their years of study in practical activities.

The implementation of these trends in the training of musician-teachers is associated with the creation of conditions for expanding the cultural thesaurus of students, increasing the level of their performing culture, enriching their repertoire with works of various styles and genres, including examples of modern musical art, mastering the methodology of their performing development in working with students.

According to Russian specialists involved in the development of areas for training music students in the context of modernization of the domestic system of higher pedagogical education, the didactic potential of film music as a special

phenomenon based on the idea of interaction between the arts can be used to solve the above problems. Its mastery acts as a powerful catalyst for the formation of an emotional-value attitude towards an artistic image, promotes the activation of the mechanisms of creative imagination and fantasy, and associative thinking. The study of film music helps to expand the general cultural competencies of students, stimulate interest in mastering musical content on a deeper artistic basis, and the desire to translate this knowledge into performing practice [1]. Along with this, a number of researchers emphasize the art-therapeutic possibilities of film music, which have a positive impact on the harmonious development of personal reflection in adolescence [2].

The interest in film music and its influence on the formation of human spirituality is characteristic not only of representatives of Chinese musical culture. Effective steps towards popularizing this phenomenon were taken in the mid-20th century by the renowned composer and conductor Ma Sicong, who maintained close creative contacts with the outstanding Russian film composer I.O. Dunayevsky [3, p. 6]. The performance activities of pianist Liu Shikun, a laureate of the First International Competition named after P.I. Tchaikovsky, also played a certain role in the development of Chinese listeners' interest in film music, including its samples in the programs of his performances with an orchestra.

The active use of the potential of film music in the educational process of modern youth can be facilitated by the characteristic trend in the first quarter of this century towards expanding cultural contacts between Russia and China in the field of cinema [5] and education [6], and the continued steady interest of Chinese musicians in the work of Russian composers [7].

At the same time, in the modern Chinese system of music education, the importance of the didactic potential of film music in the preparation of students and the need to study its capabilities as an effective means of professional development of young musicians is not reflected in the curricula of educational programs and is only outlined in individual scientific studies [8].

Our analysis of the educational and methodological documentation of the music departments of a number of Chinese pedagogical universities showed that samples of film music are not included in the content of the work programs of the academic disciplines "Solo instrumental performance (piano)", "Instrumental ensemble", "History of music", "Analysis of musical works" , "World artistic culture", which are of key importance for the professional training of students, or are presented in them with isolated examples.

To a certain extent, this state of affairs is explained by the orthodoxy and snobbery of certain, highly respected and with many years of experience, representatives of university teaching staff, who associate works of film music with a light entertainment genre and strive to use exclusively time-tested classical works in their work with students.

The indifferent attitude of authoritative mentors to film music is transmitted to students who, being curious about this layer of musical culture, having almost daily contact with it (as the survey conducted convinced us); do not see the need for professional study of works of film music within the walls of higher educational institutions.

The reluctance of teachers to include film music in the orbit of professional interests negatively affects the training of future musician-teachers, leaving beyond the competence of graduates a huge layer of world artistic culture, knowledge of which can be an effective means of spiritual and moral education of the younger generation.

In this regard, explaining to students the importance of film music in modern musical culture and the need for mastery of this phenomenon as a performer is an important task for the teacher, who aims to include its samples in the curriculum of academic disciplines.

Let's consider the arguments that can be used by a piano class teacher to prove the importance of film music for the professional and personal growth of a musician, and to increase the motivation of modern students to master it.

The first of them is related to the possibility of expanding the listening audience.

In the course of becoming familiar with film music as a special artistic phenomenon, the student must be explained that music as an organic element of cinema - the most widespread and popular genre of art-initially designed for perception by a wider audience than academic music. When creating music for a film, the composer strives to ensure that the main theme of the film is positively perceived by the audience, evoking special feelings in the minds of listeners, colored in positive emotional tones. Subsequent to the premiere of the film, repeated replication of soundtracks through the limitless possibilities of television, radio broadcasting, audio and video recordings helps people remember the melodies of films, ensuring their perception as independent works, that is, independent of the visual range of works.

In this regard, mastering a repertoire that includes examples of film music will allow the student to take part not only in academic concerts based on world classic masterpieces, but also to perform in evening programs based on popular melodies from legendary films. As practice shows, such concerts are becoming increasingly popular and beloved among listeners of various ages and social status. They also arouse interest among young people.

The second argument is the possibility of students fully implementing their interpretive mission in the context of musical educational activities. Popularization of the best works of film music takes on special significance for establishing contacts with a category of listeners who are not prepared to perceive "serious" music.

For live creative communication with such an audience, the student's performance of popular examples of film music can be supplemented by the display of video sequences from relevant films. It is advisable to precede the demonstration of fragments with a brief introductory speech, clarifying the principles of musical design of the visual sequence. This approach will have a beneficial effect on activating listeners' interest in a deeper perception and understanding of the content of the film, and will form the audience's initial ideas about the functional significance of music in the film as a single cinematic whole.

As a third argument, we can point to the increase in the social status of the future musician-teacher among his peers. For a person as a "public person," social perception and orientation towards interpersonal interaction are extremely important. In socio-psychological terms, the relevant qualities for a subject are the ability to establish social contacts, adequately perceive and understand communication partners, influence them and constructively coexist in society.

A person who owns a musical instrument acts as a center of attraction for those around him, a kind of magnet. People turn to him with a request to perform a favorite fragment from a popular movie, to select a well-known melody or accompaniment to a vocal line of a song by ear, etc. Possession of these skills significantly increases the self-esteem of a young musician and has a positive effect on the formation of the self-concept "as an integral system of an individual's ideas about himself, as a conscious, reflective part of the personality" [9]. The emergence of a feeling of significance and relevance in the society of peers strengthens self-confidence, causes a state of emotional uplift, inspiration, and mobilizes creative potential for new achievements.

Along with this, understanding the laws of film music and its connections with visuals will allow the student to assist peers in selecting musical accompaniment for video sequences when preparing various presentations.

In addition to holding conversations arguing the importance of film music in professional activities, an effective factor in increasing the motivation of students could be the publication of a special anthology, including the best examples of domestic and foreign film music, arranged for solo and ensemble performance on the piano.

Concluding the article, we note that the inclusion of works of film music in the process of instrumental-performing (piano) training of students is in tune with modern trends towards strengthening integrative approaches in pedagogical practice, based on overcoming "guild boundaries" between various spheres of artistic reflection of reality in order to most fully disclose the content of artistic pictures of the world. Performing mastery of this layer of musical culture ensures increased motivation of future musician-teachers to study world musical culture and orients students towards solving typical problems of professional activity.

References

1. Krasovskaya E.P.Studying film music as a means of forming the artistic and associative thinking of future music teachers // Problems and prospects of modern music education: Materials of the International scientific and practical conference within the framework of the International festival-competition "Sing about Russia...", dedicated to the year of Russian cinema (December 19, 2016). M.: Rhythm, 2016. pp. 103–112.

2. Toropova A.V., Ermakova N.M.Film music as the basis of art therapeutic training for the development of personal reflection in adolescence // Musical art and education. 2014. No. 2(6). pp. 70–81.

3. Peng A.I. Dunaevsky. M.: Music Fund of the USSR, 1956. 72 p.

4. Qin Qin.Liu Shikun, Zhou Guangren and Wu Zujiang: three faces of modern Chinese musical art (to the problem of the universalism of the creative personality): abstract. ... diss. Ph.D. art history: 17.00.02. St. Petersburg, 2013. 24 p.

5. Russia and China will strengthen cooperation in the field of cinema. URL:https://culture.gov.ru/press/news/rossiya_i_kitay_ukrepyat_sotrudnichestvo_v_sfere_kino/(access date: 11/17/2023).

6. Rushanin V.Ya., Grevtseva G.Ya.Russia and China: dialogue in the field of culture and education // Bulletin of the Chelyabinsk State Academy of Culture and Arts. 2015. No. 3 (43). S. 119126.

7. Song Peng.Russian composers in the repertoire of modern Chinese pianists // Manuscript. Tambov: Gramota, 2020. No. 4. P. 183-189.

8. Li Donglin.Cultivating tolerance in Chinese teenagers through film music: abstract. diss. ...cand. ped. Sciences: 13.00.01. Voronezh, 2018. 24 p.

9. Toropova A.V., Ermakova N.M.Film music as the basis of art therapeutic training for the development of personal reflection in adolescence // Musical art and education. 2014. No. 2(6). pp. 70–81.

10.Self-concept Wikipedia (wikipedia.org). URL:https://ru.wikipedia.org/wiki/%D0%AF-%D0%BA%D0%BE%D0%BD%D1%86%D0%B5%D0%BF%D1%86%D0%B8% D1%8F(access date 11/14/2023).

DOI 10.34660/INF.2023.73.23.230

蒙古的技术进步和远程学习
TECHNOLOGICAL ADVANCES AND DISTANCE LEARNING IN MONGOLIA

Mingheng Liang
Ph.D. Student
Citi University, Mongolia

注解。 技术的每一次进步和发展都对教育产生了一些影响。 当第一台收音机出现时，人们将其视为向每个人提供教育的一种手段。 随着电视的出现，人们产生了将其用作广播系统来解决教师短缺问题的想法。 如今，技术发展非常快。2010 年至 2022 年间，在世界各地，在蒙古，每个办公室、每个家庭、每个人都在计算机上工作。

关键词：技术、教育、广播、计算机、电子学习、远程学习。

Annotation. *Every advancement and development of technology has had some impact on education. When the first radio appeared, people envisioned it as a means of bringing education to everyone. With the advent of television, the idea arose that it could be used as a broadcasting system to solve the problem of teacher shortages. Today, technology is evolving very fast. Around the world, and in Mongolia, between 2010 and 2022, every office, every family, and every person worked on a computer.*

Keywords: *technology, education, broadcasting, computer, e-learning, distance learning.*

1. Introduction

Between 2010 and 2023, everyone has a smartphone or tablet. It is certain that in the next ten years, every office and household will have a robot assistant, and everyone will use intelligent tools based on the achievements of artificial intelligence. Along with this, educational technology and technology-based teaching methods are changing rapidly. We discussed distance, e-learning, and mobile learning a few years ago. Still, today, digital learning, open education, and MOOCs (Massive Open Online Courses) are considered a means of providing quality education at a low cost to everyone who wants it. The concept of “Education 4.0” has also appeared regarding the optimal education system for people living and working in the fourth industrial revolution era, artificial intelligence, and robots. Also,

the so-called "Minerva" projects are being implemented, experimenting with what future educational institutions, especially universities, will look like. Moving to the next level of development rather than distance or e-learning, it is expected to develop in many areas related to the development of smart tools and artificial intelligence based on the principles of digital learning and open education. For example, analyzing the state of the student and preparing and delivering intelligent content that is suitable for anyone (personalized learning), using a variety of technologies, such as VR (virtual reality), AR (augmented reality), and MR (mobile reality), as well as content created using these technologies development and use of a variety of applications for smartphones to deliver, manage, conduct, and evaluate the student's learning process and provide additional services. Also, in a globalized world, it is becoming increasingly open to study subjects studied in any school without borders, from anywhere, at any time.

2. Distance learning in Mongolia

In Mongolia, distance learning has been developed since the beginning of 2000. Several programs have been implemented at the government level. For example, "National Distance Learning Program" from 2002, the "E-Mongolia National Program" implemented between 2005-2012, and the "One Mongolia Initiative" from 2012-2020, etc. were carried out. Still, they were able to meet the demands of students at a modern level. Neither the legal framework nor the implementation system has yet been comprehensively created. For example, it has not been possible to create a comprehensive platform for organizing distance and e-learning courses, as well as issues such as verification of what has been learned through distance learning, credit calculation, etc., has yet to be resolved. During this period, universities have been doing many things to develop and introduce electronic and distance courses at their own level. Still, in terms of methodological and technological solutions, they needed more time to move to 100 percent distance courses in the current situation. On the one hand, this is a challenge, but on the other hand, it is seen as a certain impetus to the development of distance learning or online learning. For example, Mongolia's SHUTIS has approved and implemented the E-learning program since 2007. Within the program's framework, more than 400 e-learning materials that can be used at the bachelor's and master's levels have been prepared, and these materials will be used as supplementary materials for combined classroom learning, blended learning, and flipped classrooms, which are modern active learning methods.) made it possible to use it. Due to the impact of the unexpected factor of "COVID-19", every teacher is progressing in researching and experimenting with what software and how to use the Internet and electronic tools effectively. Online learning is more flexible than classroom learning and allows learners to learn independently without restrictions. That's why space is the leading solution to reduce educational inequality by mak-

ing learning possible regardless of time. Many international studies are comparing traditional classroom learning and online learning. For example, a 2019 study by Charlotte Neuhauser found that students' test scores, homework, and course grades did not differ between classroom and online courses, and 96 percent of all online students found online courses more effective than classroom courses. According to Columbia University research (Shanna Smith Jaggars, 2014), most students are interested in watching simple and easy courses online, and it is better to watch professional and challenging courses in the classroom. Therefore, moving the university's general academic and elective courses online may be more effective. Online learning is being explored in many ways around the world. It is not only a way to reduce inequality in education but also to improve the quality of education and promote lifelong learning.

3. Distance learning policy in Mongolia

Since 2012, Mongolia has intensified the work of reforming the higher education system in many aspects, including structure, content, and quality, and is implementing large-scale projects and programs. To fulfill the goals and objectives of ensuring the implementation of the policy of the Government of Mongolia and the realization of the strategic plan of higher education within the framework of the "Higher Education Reform Project" (HERP) funded by the Ministry of Education, Culture, Sports, Science and Technology of Mongolia and the ADB, from 2015, the International Engineering Education Reform-CDIO standard and methodology was developed by SHUTIS. , to introduce the III program of engineering technology, and from 2018, the project of introducing the advanced level CDIO methodology to six programs of SHUTIS, NUM, Agricultural University, MUSU, SUSU, and UBHU has been implemented. In the framework of this project, work is being done to improve the educational program, empower teachers, create an e-learning environment by new methodologies, and improve the environment to support teacher development. As for other universities, in 2018-2019, within the framework of the "Higher Education Reform" project, to develop e-learning materials and make them available to universities and colleges, a working group was formed with the participation of SHUTIS, NUMIS, SSUIS, Agricultural University, MUSU, and UBHUIS, "Digital Student," " Developed the concept of digital training, including digital professor," "digital training environment," "digital content preparation."

4. Universities in Mongolia and distance learning

In this context, the experience of using Lightboard technology, which was first tested in SHUTIS in Mongolia, has been adopted by several universities and colleges such as NUS, MUSU, SHMTDS, and TTK, and they are using it to conduct digital training by making video recordings of their teachers' lessons. The number of enthusiastic students and young people who successfully use e-learning, espe-

cially open-source learning materials widely used worldwide, is increasing. But at the current level, it's disappointing that all students use this opportunity. For our students, there is no specific research on how effectively they use the opportunities of modern information and communication technology for self-development and learning. Still, it is observed that they use the Internet and smartphones more for chatting with each other and for entertainment. Therefore, we think it is necessary to use this opportunity and the expensive technology, which is getting cheaper daily. Still, the costs and money are going behind it as an opportunity for our young people to learn effectively. In this, I want to do specific tasks, starting with preparing students for being middle school students, creating an environment for instilling such maturity habits and skills and preparing teachers. Instead of banning smartphones from students or Generation Z in the middle school environment, they should be encouraged to use them for the right things, such as self-study and access to helpful information. An Open Education Center was established at SHUTIS last year. This center prepares and implements an entirely new open online course for the public, conducts research and makes recommendations on higher education policy issues, improves the professional skills of university teachers and empowers them, conducts research and makes recommendations on higher education management and teaching methodology innovation. It was established to provide policy support to the units and component schools. The center defined its vision as "Education open to every citizen" with the slogan "Educated person is rich." Since its opening, "Open Education," "Open Learning Resources," "Learning Design," "Hyutagog-Becoming a Methodology for Lifelong and Independent Learning," and "Open for Public" for managers and professors of Mongolian universities. Organized five series of courses on "online course – MOOC." The materials prepared in the framework of these courses were compiled and processed into an "Open Education" Public Open Online Course or MOOC and placed on two platforms on the Internet. Anyone who wants to can sign up with any email address they use and study for free. By studying these lessons, our teachers can gain a lot of new information and knowledge about the development of open education. We should pay attention to the quality and improvement of distance learning from both sides. Distance learning has several unique requirements that make it different from classroom learning. Let's mention some of them. First, when preparing training materials, prepare a large amount of information quickly to attract students' attention as much as possible. A few years ago, it was up to 15 minutes, then 8-12 minutes, but now content can be delivered in up to six minutes. If a video lesson is being prepared, it is necessary to prepare it in such a way as to give the impression of watching a Hollywood movie. For example, https://www.masterclass.com/ has some interesting, high-quality tutorials. Also, AR/VR/MR technologies mentioned above should be effectively used. Secondly, since

the teaching-learning process is created as a result of teacher-student cooperation and participation, in order to conduct e-learning successfully, teachers should be trained in teaching and training methods and effectively organize the student's learning process using all the possibilities of modern advanced technology online, practice, and on the other hand, it is becoming essential to train students in online learning methods from the time they study in secondary school. Thirdly, every teacher prepares high-quality teaching materials for the courses he/she teaches and discloses what he/she has prepared with an open license so that others can use it, so that they can learn from each other and learn from each other. Fourth, training students in online self-study methods in digital environments, game methods, group discussions, teamwork, progress according to everyone's cognitive and learning background, and prepare and create funds for tasks that test knowledge, abilities and attitudes in multiple scenarios. etc., requiring teachers and students to work harder for successful learning. The results of current e-learning depend on many factors. We are adjusting to the current situation and working diligently from all sides. However, the results and quality of training depend on the efforts and efforts of the subjects involved in the training process: teachers, students, parents, and everyone. Therefore, everyone must use all their opportunities to study, study, work, and work with full awareness of their duties and responsibilities. In Mongolia, many tasks must be carried out for sustainable development and improvement of distance education. In the future, we must clarify the legal framework and make necessary and forward-looking regulations. For example, credits can be calculated for courses studied through e-learning, several schools can jointly prepare and organize courses of expected quality e-courses for courses taught in popular professions or with the same content, mutual credits can be calculated, etc. And to have a reliable digital learning platform.

5. Conclusion

When resources and financial constraints are limited initially, it may be more effective to join strong and promising platforms being developed abroad and to translate and localize it into Mongolian rather than developing it ourselves. We must empower our teachers, support them with methods, and train students in self-learning methods, attitudes, and maturity through e-learning. Also, prepare high-quality training resource materials and open courses for the public with specific policy support. To use advanced technology in this direction, the government, private sector technology development companies, and universities can develop mutually beneficial educational technology development (Ed. Tech) projects through business partnerships. First, many projects may be implemented with mobile phone companies such as Mobicom and Unitel and web, software, and mobile application development companies. We also need to support the widespread use of digital elements in blended learning and classrooms. Ideas can be mentioned,

such as developing sound and image recognition and artificial intelligence in education, especially as a tool for managing, monitoring, and evaluating the learning process and implementing specific projects and programs in developing virtual and natural learning environments.

References

1. *Brizgina O.F., Construction of the lesson with support of technology (www.infojournal.ru)*
2. *Gilbukh E.Z., Test of psychology: main ideas, (Psychological issues №2, 2017)*
3. *Davaa J. "Technology and University" Ulaanbaatar, 2007*
4. *Ravjaa D. "Innovation in academic studies in Mongolia" Ulaanbaatar, 2017*
5. *Erdenechandman J. "Online class preparation process" Ulaanbaatar, 2019*

DOI 10.34660/INF.2023.87.90.231

教育和工业综合体在技术学院双元制学生专业教育中的作用
THE ROLE OF THE EDUCATIONAL AND INDUSTRIAL COMPLEX IN THE PROFESSIONAL EDUCATION OF STUDENTS WITH DUAL TRAINING IN TECHNICAL COLLEGES

Alexandrov Alexander Vavilovich
Teacher, Head of the educational and production complex
Interregional Competence Center — Cheboksary Electromechanical College of the Ministry of Education of the Chuvash Republic

Polikarpov Igor Lvovich
Teacher, Deputy Director for educational and production work
Interregional Competence Center — Cheboksary Electromechanical College of the Ministry of Education of the Chuvash Republic

注解。 在瞬息万变的技术市场环境中，许多制造企业成功的关键是昨天的技术学院毕业生，他们不仅拥有必要的知识、技能和能力，而且能够超前于技术和时间思考。 企业领导者希望获得准备好开始劳动流程的专业员工，而无需花费额外的时间进行再培训。 将其付诸实践可能很困难，尤其是对于刚从教育机构毕业的年轻员工而言。

创建教育和工业综合体是形成学生专业能力的有效途径，因为中等职业教育中竞争性专家的培养与在教育过程中获得理论课程和在培训和培训框架内获得实践课程密不可分。 生产方式以固定企业为主。 通过这种双重培训，雇主的偏好将站在具有专业和行业经验的学生一边。

关键词：中等职业教育、教育和工业综合体、双元教育、辅导。

Annotation. *In a rapidly changing technology market environment, the key to success for many manufacturing enterprises is yesterday's graduates of technical colleges who not only have the necessary knowledge, skills and abilities, but also are able to think ahead of technology and time. Business leaders want to get professional employees who are ready to start the labor process without additional time spent on retraining. It can be difficult to put this into practice, especially when it comes to young employees who have recently graduated from an educational institution.*

The creation of educational and industrial complexes is an effective way to form students' professional competencies, because the training of competitive specialists in secondary vocational education is inextricably linked with obtaining

a theoretical course within the educational process and a practical course within the framework of training and production practices based on fixed enterprises. With such dual training, employers' preferences will be on the side of students with professional and industrial experience.

Keywords: *secondary vocational education, educational and industrial complex, dual education, mentoring.*

The educational and production complex should be the main base for preparing technical students to work at industrial enterprises, its activities consolidate theoretical training and form practical skills. For the competent and consistent work of the educational and production complex, it is necessary to interact all the staff structures of the educational organization with the assigned partner enterprises. With close cooperation and flexible interaction of all stakeholders, training will be carried out as efficiently as possible under the supervision of teachers, mentors and craftsmen, and manufacturing enterprises will receive ready-made specialists without the need for retraining and retraining "for themselves".

In addition to the joint work of the educational and production complex and manufacturing enterprises, it is necessary to create a scientific and technical council. It should include both the college administration and the heads of large enterprises and those responsible for training labor reserves.

Unfortunately, many graduates are not always able to apply their knowledge and skills in practice. Teachers of educational institutions and mentors at enterprises should help them in this.

Within the framework of dual training and improving the level of development, practical and theoretical skills of students, mentors play a special role, especially mentors of high-tech enterprises. Mentoring as a form of learning allows you to combine the flexibility and practicality of learning with the cost-effectiveness and efficiency of this process. Today it is impossible to find another form of education that can be fully targeted and close to the real conditions of enterprises.

Corporate training of technical specialists has received a new development. This training is a process of improving the knowledge, skills and competencies of enterprise personnel according to specialized educational programs aimed at satisfying the interests of enterprises in competent personnel for the accumulation of intellectual and innovative capital in order to ensure the competitiveness of these specialists and the competitiveness of the enterprise as a whole.

Students study at the college according to the scheme "Theory -> laboratory and practical work at the college -> academic practice at the college -> industrial practice at the enterprise". This continues in a cycle. At the same time, each production practice has its own mentor in production. As a rule, the connection between the mentor at work and the teacher at the college is carried out only

through the line “the head of practice from the college is a mentor at work”. In our opinion, this interaction is not enough, the head responsible for academic practice cannot always objectively assess or know the skills and abilities of each student. Therefore, we propose to give the competence of a “Mentor” to teachers of special disciplines. They teach classes for each group and know the abilities and potential of almost every student.

In every educational institution there are teachers of special disciplines – these are potential mentors of theory, there are masters of industrial training – these are potential mentors of educational practice. Why are the “Potential ones” - they are still only teachers, but from our point of view, a mentor in college is a teacher who leads a student to a set goal. The goal of a teacher in the professional education system is to prepare a specialist who is satisfied with his professional activity, and if a person is happy to practice his profession and receives a good salary, then this is a successfully formed taxpayer and this is a very powerful social aspect.

If the teacher is a theorist or a practitioner, then he additionally studies with a group of students (the group may consist of different categories of students, depending on the specialty, form of study, educational institution). The result of the mentor’s work with the student may be the acquisition of new professions, competencies and employment of the latter at the enterprise, as well as the mentor can engage in scientific activities — from participation in conferences to the management of a graduation project.

The full-time structure of a group of mentors in production has several advantages: team cohesion, communication between production and an educational institution, and the ability of mentors to participate in the educational process. Based on the results of the mentors’ work, their additional motivation can be formed, both in monetary terms and in social terms, such as the winner of contests or internal competitions, the organization of additional leisure at the expense of the enterprise.

The assignment of the “Mentor” status must be confirmed by specially developed criteria for evaluating the mentor’s activities and confirmed by a certificate. The body that will issue this document should be formed within the framework of the professionalism of the engineering Cluster.

Of great importance in increasing the level of effectiveness of the formation of special skills of students is their passage of educational and industrial practice under the guidance of masters of industrial training. This is the period of the highest quality training of future specialists with a sufficiently high level of professional competence development. The masters are a necessary connecting element in the system of the educational and industrial complex together with the administration, teachers, mentors, representatives of the scientific and technical council of employers.

A modern master of industrial training, according to a number of researchers, "should not only be able to design the educational process, but also effectively interact with social partners, and above all, the employer, mentors of practice at the enterprise." The authors of the monograph "Masters of industrial training as a professional group: the current state and problems of development" unequivocally determine that the level of professional and pedagogical education of the master of industrial training has a decisive influence on the level of all subject interaction in the institution of vocational education [7, p.79]. That is why modern researchers consider the competence of a master as one of the pedagogical problems and assert that it is necessary for each master to master "a certain set of competencies most important for his professional activity, an integral set of knowledge, skills, abilities and personality qualities that allow him to successfully solve problems, including pedagogical ones, in the field of educational and industrial activities" [4]. That is, each master should not only be competent in his profession, but also have a "pedagogical orientation of mind" [3, p.28].

In the context of the organization of dual education in a technical college, the role of the administration of an educational institution of vocational education (college) is strengthened and deepened. Its main function is to direct all available managerial levers and resources to transfer the educational space of the organization of vocational education into a dynamically developing system in order to optimally profitably and reliably facilitate the organization of interaction between all participants in the educational, cognitive and related production process: teachers, students, masters of industrial training, mentors, employers [6]. And then, as G.M. Bocharova rightly notes, interaction with employers will need to be organized on the principles of effectiveness (in the implementation of common goals and obtaining positive results), integrity ("unity and consistency of the methodological and regulatory framework of the interaction participants"), voluntariness and openness ("the possibility of new participants entering, as well as exiting it") [2, p. 22]. So O.A. Ikrina, arguing about the need for a dynamically developing relationship with employers, puts forward two reasons for this need. Firstly, "in the context of modern technological transformations in production, the requirements of employers and, accordingly, professional standards will constantly undergo changes, therefore professional educational organizations must respond quickly and flexibly to new requests from employers in order to keep up with the times" [5, p.52]. Secondly, a comparative analysis of the latest educational standards shows a tendency towards their practice-oriented nature, which means that this "necessitates the development of a joint policy of enterprises and educational organizations" [5, p.52].

The process of organizing interaction with employers in our college must be carried out at four interrelated stages that are consistently implemented.

The first stage is organizational, at which it is necessary to discuss and sign a Regulation on the organization and implementation of educational and industrial activities according to the dual training model, an agreement on practical training of college students and employers, a Regulation on the scientific and technical council, a Regulation on the department, a Regulation on mentoring and a long–term cooperation plan has been drawn up. All these documents need to be prepared and agreed on the basis of studying the needs of the labor market [8].

The second stage is methodical, aimed at coordinating the programs of academic disciplines and programs of educational and industrial practice.

The third stage is practical, focused on the joint implementation of educational and industrial practice, as well as on the participation of representatives of the scientific and technical council of the college in assessing the quality of student training during final certification and for the employment of graduates.

The fourth stage is a reflexive one, based on the analysis of the results of mutual cooperation in the development of professional competencies of college students of a technical profile.

Our proposed technology of interaction between participants of dual training in the course of the educational and industrial complex at the college of technical profile can be represented as the process of organizing the interaction of subjects of educational and industrial processes (administration, teachers, students, masters of industrial training, mentors, representatives of the scientific and technical council or department), controlled and controlled by the procedural mechanism of the organization of dual training in the process of consistent implementation of the processes agreed upon by all its participants (formation of educational programs → implementation of educational programs and practices → certification of qualifications → employment).

The task of the educational and industrial complex should not be aimed at directly providing “labor resources”, “labor force” and “personnel training”, but at providing conditions for the realization of the human potential of students. Mentoring should be such a driving force.

By creating a management system through the educational and production complex, we can help students independently determine their next steps in a professional career, form their own ways of self-realization, acquire the necessary competencies and unleash their potential, which is vital in today’s rapidly changing world.

List of sources used

1. Alexandrov A.V. Regulatory and legal support for the process of human capital development of students in dual education at a technical college: a methodological guide. - Kazan: Publishing house “Fatherland”, 2022. - 46 p.

2. Bocharova, G.M. Network interaction as a technology of cooperation between participants in educational and production processes / G.M. Bocharova // Networking as a condition for the formation of a new quality of professional education: a collection of materials of the I-th All-Russian (with international participation) scientific and practical conference. - Borisoglebsk. – 2016. - 153s.

3. Vlasova, O.I. Social portrait of the master of industrial training: A collective monograph / Under the scientific editorship of T.V. Permyakova, V.A. Kopnov. — Yekaterinburg: Publishing House of the Russian State prof.-ped. unta, 2015. — 129 p.

4. Gitman, E.K. Improving the professional pedagogical competence of the master of industrial training as a socio-pedagogical problem / E.K. Gitman, A.P. Torbeev // Modern studies of social problems (electronic scientific journal). - 2012. - №10(18).

5. Ikrina O.A. Adaptation of professional educational organizations to the conditions of modern production / O.A. Ikrina // Secondary vocational education. - 2018. – No. 10. – pp. 51-54.

6. Malashikhina, I.A. Interaction of administration and teaching staff as a factor of innovative development of an educational institution (regional component) / I.A. Malashikhina, V.M. Kovyazina // Siberian Pedagogical Journal: National education. Pedagogy. Psychology, - 2009. - No. 10, — pp. 388-394.

7. Masters of industrial training as a professional group: the current state and problems of development: monograph / O. I. Vlasova [et al.]; under the scientific editorship of T. V. Permyakova, V. A. Kopnov. - Yekaterinburg: Publishing House of the Russian State Prof.-ped. unita, 2016. - 149 p.

8. How the dual system – practical vocational and academic – works in Germany. Bonn, Germany: BIBB. 2012. 15 p.

DOI 10.34660/INF.2023.98.68.232

多媒体教学法
MULTIMEDIA TEACHING METHOD

Belykh-Silaev Dmitry Vladimirovich
Senior Research Officer
All-Russian Research Institute of the Ministry of Internal Affairs of Russia

抽象的。 本文专门讨论当前在教育中使用多媒体的问题。 笔者给出了“多媒体”概念的定义，以及“多媒体教学法”即利用多媒体进行可视化教学。 多媒体教学方法运用中存在的问题是通过一系列已明确的矛盾来揭示的，其中最根本的就是现代计算机技术的高度发展与多媒体教学方法在教学过程中落实不到位之间的矛盾。 描述了一个教学实验，证实了多媒体教学方法的有效性。 作者得出结论：多媒体教学方法可以提高教育过程的有效性。

关键词：多媒体； 多媒体教学法； 多媒体电子教材； 可视化； 洞察力；教育；教学过程。

Abstract. *The article is devoted to current problems of using multimedia in education. The author's definition of the concept of "multimedia" is given, as well as the "multimedia teaching method" as teaching by visualization using multimedia. The problems of using the multimedia teaching method are revealed through a number of identified contradictions, among which the basic one is the contradiction between the high level of development of modern computer technology and the insufficient implementation of the multimedia teaching method in the pedagogical process. A pedagogical experiment is described that confirms the effectiveness of the multimedia teaching method. The author comes to the conclusion that the multimedia teaching method can improve the effectiveness of the educational process.*

Keywords: *multimedia; multimedia teaching method; multimedia electronic textbook; visualization; perception; education; pedagogical process.*

Multimedia is the combination of different types of information (such as text, audio, video) into an integrated interactive application to deliver messages to an audience[1].

[1] Belykh-Silaev D.V., Ivankov Ch.T., Mironov G.V. Multimedia technologies in education // Inf. bulletin of educational institutes of higher educational institutions on education in the field of military command and control of the RF Armed Forces in humanitarian and social specialties. No. 7. – M.: MUMD, 2013, pp. 28-33.

Multimedia can also be defined as the interaction of visual and audio effects controlled by interactive software using modern hardware and software that combine text, sound, graphics, photos, video in one digital representation[2].

Multimedia teaching method is training using visualization using multimedia. In other words, the multimedia teaching method is a modern version of the visual-figurative teaching method, in which visualization (visual-figurative representation) is carried out using modern computer technologies, which have become widespread in the context of digitalization of society.

Information, as we know, is perceived by a person through all senses.[3] Including, according to psychologists, through hearing - about 10%, through vision - about 80%. In addition, information must not only be perceived, but also assimilated and remembered, therefore, the more senses a person uses, the more information he/she remembers. On average, what remains in memory is what we: read - 10%, heard and saw - 50%, heard - 20%, saw - 30%, said ourselves - 70%, did ourselves - 90% (the last of the given indicators explains effectiveness of the activity approach in teaching)[4]. Therefore, multimedia contributes to more effective perception, since it uses all channels for receiving information (visual, auditory, kinesthetic), and also makes it possible to immediately repeat the technical and tactical actions seen. In addition, multimedia makes the educational process more effective also because it arouses interest among students, including due to novelty, and also implements the principle of "urgent information", that is, multimedia allows you to see yourself from the outside, due to which you can quickly correct errors in the technique of performing actions before automating (fixing in a skill) the erroneous action (as is known, if an error is automated, that is, fixed in a skill, then it is very difficult to correct it later).

The multimedia teaching method increases the interest of students in independent work, this is also due to the entertainment value of the multimedia teaching method, which contributes to the formation and maintenance of motivation to learn[5].

[2] Belykh-Silaev D.V., Butorin I.I., Mishutkin I.V., Tsirkov A.P. Modern application of multimedia technologies in law faculties of higher educational institutions // Military legal journal. No. 9. M., 2013, pp. 2-6.

[3] Belykh-Silaev, D.V., Germanov, G.N., Ivankov, Ch.T. Visualization of the actions of young Greco-Roman style wrestlers based on multimedia technologies in the process of performing technical and tactical training tasks // Scientific and theoretical journal "Scientific Notes" of the Lesgaft National State University of Physical Education, Sport and Health October, 2014 – St. Petersburg, 2014, pp. 34-39.

[4] Belykh-Silaev D.V., Butorin I.I., Mishutkin I.V., Tsyrkov A.P. Modern application of multimedia technologies in law faculties of higher educational institutions // Military legal journal. No. 9. M., 2013, pp. 2-6.

[5] Belykh-Silaev, D.V., Ivankov, Ch.T. Modern use of multimedia in teaching technical and tactical actions to freestyle and Greco-Roman style wrestlers // Innovative technologies in sports and physical education of the younger generation: materials of the 4th scientific and practical. conf. with intl. participation of PIFKiS MSPU, May 15-16, 2014 - M.: MSPU, 2014. – pp. 70-73.

Unfortunately, at present, multimedia electronic textbooks for individual academic disciplines remain insufficiently developed. At the same time, the issue of developing such teaching aids was updated largely by the peculiarities of the educational process in a pandemic[6]. The conditions of isolation and social distancing established to prevent the spread of coronavirus infection contributed to a more pronounced manifestation of a number of previously existing contradictions. As is known, contradiction is the most important logical form of development of scientific knowledge. Scientific theories develop as a result of the discovery and resolution of contradictions found in previous theories or in practical activities[7]. Contradiction is the interaction between mutually exclusive, but at the same time mutually conditioning and interpenetrating opposites[8].

The first contradiction is the discrepancy between the current high level of development of computer technology, which allows multimedia visualization of educational material, for example, the technical and tactical actions being studied, which students must master, and the existing practice caused by the conservative attitude of teachers who still use predominantly personal demonstration and explanation. The conditions of social isolation and distancing have largely created the preconditions for resolving this contradiction, facilitating a more intensive introduction of multimedia teaching aids into pedagogical practice.

The second contradiction is that traditional teaching methods are not always sufficiently personality-oriented, that is, they do not adequately take into account the individual characteristics of the student; The multimedia teaching method makes it possible, through prompt feedback, to demonstrate to the student his individual technique, compare it with the technique of the reference (standard) group and thus adjust the studied technical and tactical action taking into account these differences, and subsequently improve the technical and tactical action, master the most rational (and therefore the most effective) technique of action.

The third contradiction is that the traditional methodology for teaching technical and tactical actions does not always allow one to form a holistic idea of the motor action being studied (especially complexly coordinated ones); At the same time, it is precisely this holistic understanding of technical and tactical action that makes it possible to form a multimedia teaching method, that is, a visualization method using multimedia tools.

At the same time, identifying contradictions in knowledge about a specific subject is not an end in itself. Identification of contradictions is necessary only in

[6] Belykh-Silaev D.V. Psychological problems associated with coronavirus infection // Legal psychology. No. 2. – M., 2020, pp. 3-8.

[7] Anufriev A.F. Scientific research: coursework, diploma and dissertation. – M.: Os-89, 2002. 112 p.

[8] Novikov A.M. Scientific and experimental work in an educational institution. – M.: RAO, 1998, 134 p.

order to take the next step in scientific research - to pose a problem. A problem is a complex, unresolved issue that follows from identified contradictions. The scientific problem in this case is how to use multimedia for teaching. In other words, the research problem is to determine the capabilities of multimedia for training, for example, for teaching technical and tactical actions.

In order to test the effectiveness of using multimedia in teaching technical and tactical actions, a pedagogical experiment was organized and conducted. Two groups were formed: control and experimental, 20 people in each, identical in their level of preparedness, the subjects were in the same conditions of the educational environment. The control group studied according to the traditional generally accepted program. The experimental group studied according to the same program, but using a visualization method using multimedia in teaching (that is, using a multimedia teaching method). The technology of technical and tactical training using the developed software and methodological multimedia complex included a set of videos of visual perception of actions and was filled with projection material that solved certain training tasks. The incoming pedagogical information was comprehended and read by students from computer monitors and projector screens through visual perception, and the reference technique for performing the technical and tactical actions being studied was demonstrated on the monitors (screens). In the developed multimedia complex, the drawings were supplemented or replaced with video recordings; a “talking head” of the author was added; the traditional elements of the textbook (such as the text) have been preserved; a system of “operative feedback” is provided. Students in the experimental group learned the educational material faster than students in the control group. The quality of the formed knowledge, skills and abilities was higher in the experimental group, which was established in the control classes.

Thus, during the conducted pedagogical experiment, the multimedia teaching method showed its effectiveness. During the conducted pedagogical experiment, it was also established that the multimedia teaching method allows, firstly, to more fully implement active learning methods; secondly, through the use of technical means, it increases the efficiency of visualization, which is especially important for the visual and figurative representation of complexly coordinated actions; thirdly, it allows for control using urgent feedback. We believe that the multimedia teaching method has significant potential in teaching technical and tactical actions. Necessary conditions for the introduction of a multimedia teaching method into the educational process are the creation of specialized multimedia teaching aids, as well as improving the qualifications of teachers to a level sufficient to apply the multimedia teaching method in the pedagogical process.

References

1. Anufriev A.F. Scientific research: coursework, diploma and dissertation. – M.: Os-89, 2002. 112 p.

2. Belykh-Silaev D.V. Psychological problems associated with coronavirus infection // Legal psychology. No. 2. – M., 2020, pp. 3-8.

3. Belykh-Silaev D.V., Butorin I.I., Mishutkin I.V., Tsyrkov A.P. Modern application of multimedia technologies in law faculties of higher educational institutions // Military legal journal. No. 9. M., 2013, pp. 2-6.

4. Belykh-Silaev, D.V., Germanov, G.N., Ivankov, Ch.T. Visualization of the actions of young Greco-Roman style wrestlers based on multimedia technologies in the process of performing technical and tactical training tasks // Scientific and theoretical journal "Scientific Notes" of the Lesgaft National State University of Physical Education, Sport and Health, October, 2014 – St. Petersburg, 2014, pp. 34-39.

5. Belykh-Silaev D.V., Ivankov Ch.T., Mironov G.V. Multimedia technologies in education // Inf. bulletin of educational institutes of higher educational institutions on education in the field of military command and control of the RF Armed Forces in humanitarian and social specialties. No. 7. – M.: MUMD, 2013, pp. 28-33.

6. Belykh-Silaev, D.V., Ivankov, Ch.T. Modern use of multimedia in teaching technical and tactical actions to freestyle and Greco-Roman style wrestlers // Innovative technologies in sports and physical education of the younger generation: materials of the 4th scientific and practical. conf. with intl. participation of PIFKiS MSPU, May 15-16, 2014 - M.: MSPU, 2014. – pp. 70-73.

7. Novikov A.M. Scientific and experimental work in an educational institution. – M.: RAO, 1998, 134 p.

DOI 10.34660/INF.2023.59.21.233

促进青少年体育文化运动的途径
WAYS TO PROMOTE PHYSICAL CULTURE AND SPORTS AMONG YOUNG PEOPLE

Cherepanova Alyona Ivanovna
Senior Lecturer
Siberian State University of Science and Technology named after Academician Mikhail Fedorovich Reshetnev

Valkov Alexander Alexandrovich
Master's Student
Krasnoyarsk State Pedagogical University named after Viktor Petrovich Astafiev

抽象的。 在本文中，作者探讨了在年轻一代中普及体育文化和各种运动的方式和方法。 文章分析了青少年对体育课和体育活动兴趣不高的问题。 重点关注的是高等学校学生的年龄段问题，但也考虑到中学生和中等职业教育学生的问题。

关键词：体育教育、体育活动、健康、兴趣、学生。

Abstract. *In this article, the authors consider ways and methods of popularizing physical culture and various sports among the younger generation. The article analyzes the problems of low interest of young people in physical education classes as an academic discipline, and in physical activity in general. The focus is on the age group of students of higher educational institutions, but the issue of students of secondary schools and students of secondary vocational education institutions is also being considered.*

Keywords: *physical education, physical activity, health, interest, students.*

Physical culture is one of the areas of social activity aimed at maintaining and strengthening human health through deliberate physical activity. It is the most affordable way to maintain health and performance, regardless of age. With the passage of time, new forms of physical exercise and various sports are emerging, but despite this, the interest of young people, including students of higher education institutions, colleges and schools, remains low. Among young people, there are a small number of those who actually care about their health and are actively involved in physical exercise or strengthening physical education. As a result, there

is an increase in the number of diseases of the musculoskeletal system, cases of physical inactivity, dystrophy and obesity among young people; also, according to statistics, the number of young people with pulmonary diseases has increased [1]. Therefore, sports and physical education are extremely important for young people, and it is necessary to take a serious approach to promoting a healthy lifestyle.

In modern society, the general disinterest of young people in playing sports has become a clear fact, which in turn leads to low physical activity and the occurrence of associated health problems. In this regard, this work focuses on analyzing the problems of insufficient interest among young people in a healthy lifestyle and physical activity, as well as studying ways to effectively promote physical culture and mass sports among students and schoolchildren. The novelty of this study lies in the comparison of various methods, means and techniques for popularizing physical culture among the younger generation, as well as the formulation of the author's proposals on this issue.

In today's society, there is an undeniable problem of a sedentary lifestyle. It occurs among people of any age, but is especially acute among the younger generation, which was revealed during a survey of 3,742 student representatives.

Thus, according to the results of a survey among students at non-core educational organizations (3 secondary schools (students in grades 10-11), 2 educational institutions of secondary vocational education and 3 higher educational institutions (not including institutes of physical culture and sports), only 10% (374 person) of the respondents adhere to the basic principles of a healthy lifestyle, regularly attend physical education classes and take part in various sports events. The majority, i.e. 40% (1497 people), of respondents try to adhere to the best possible values of a healthy lifestyle, regularly attend physical education classes, but are not interested in systematic physical activity. However, it should be noted that in the theory and methodology of physical culture and sports there are such principles as: the principle of activity, the principle of continuity and the principle of consistency, which were taken as the basis for a healthy lifestyle. According to the authors and as a result of the analysis of scientific literature on the research topic, it is impossible to lead a healthy lifestyle without observing the principles of physical culture and sports listed above [2, 3]. About 30% (1123 people) would like to switch to a healthy lifestyle, but for some reason have not yet done so or do not have information about where to start. The fifth share of respondents, i.e. 20% (748 people) does not adhere to a healthy lifestyle and see no reason to adhere to it in the near future; they rarely attend physical education classes.

These data indicate that young people today are not sufficiently aware of the need for a healthy lifestyle, and this is influenced by a number of factors. One of them is the promotion of negative behavior patterns and the popularization of bad habits such as drinking alcohol, smoking and drugs. Nowadays, one cannot fail to

note the role of public figures, bloggers, musicians and other famous personalities who influence the younger generation. They, perhaps unconsciously, show wrong examples, which, unfortunately, are harmful to young people.

Modern society, unfortunately, often discredits a healthy lifestyle, calling it optional or even unpopular. This problem especially affects young people, who urgently need to instill the right ideals and standards of behavior, as well as encourage them to be physically active and give up bad habits. Competent popularization of a healthy lifestyle plays a decisive role in its formation. One of the most effective methods of stimulating the interest of young people in a healthy lifestyle is the use of the media. It is necessary to present as many positive examples as possible to the younger generation so that they have the opportunity to choose not only between a healthy and unhealthy lifestyle, but also from a variety of options for healthy and creative behavior. Social activity of children, adolescents and young people using physical education can contribute to their spiritual and moral development, which is supported by the approval of established practical norms and values in the field of physical education. With this understanding of the phenomenon of physical culture, we realize that it is capable of forming strong psychological attitudes and values in children, adolescents and young people that help them refuse to participate in the drug environment and maintain a negative attitude towards drug addiction and alcoholism.

It is necessary to actively promote physical culture and mass sports at the regional level. One of the important tasks is the construction of new sports complexes and equipping educational institutions with the necessary equipment for physical activity. Considerable attention should be paid to information support for all such innovations in regional media in order to attract young people to play sports.

In addition, it is extremely important to reconstruct existing sports grounds, football fields and other sports infrastructure in cities, as well as create new ones. Currently, cities and their neighborhoods are developing at a very fast pace. However, unfortunately, not all new residential complexes have the necessary sports infrastructure for children and adolescents.

We should not forget about the importance of developing and popularizing not only the most popular sports, but also less common ones. This will allow each person to find a suitable sport for themselves, and will also create a potential new sports reserve in the country. It is necessary to remember to involve not only the younger generation in sports, but also to encourage the adult generation to switch to a healthy lifestyle and be active in order to maintain their health, and also as an example for younger generations.

It is also important to take people with disabilities into account. Some members of this social group face problems with physical activity due to various fears associated with social problems and rejection in society. That is why it is impor-

tant to implement the right policy in conducting classes for this group of the population, organizing group and individual classes for them in educational institutions under the guidance of competent teachers in the field of adaptive physical education. In order not to create additional complexes for people with disabilities when communicating with pupils and students from other health groups, it is necessary to integrate them into social activities. For example, you can organize joint active games where they can compete on equal terms, conduct joint warm-ups, jogging and other activities that contribute to general physical fitness. This will help people with disabilities better adapt to society and reduce the negative attitudes of some healthy people towards these social groups.

Rejuvenation of teaching and teaching staff in educational institutions can also make a decisive contribution to the popularization of physical culture and sports among young people. It is indisputable that people who have been working in the pedagogical field in the field of physical education and sports for thirty or more years are experienced and confident specialists. But we should not forget that the teaching load of current teachers is enormous, which does not have a positive effect on the health of teachers, and also affects the quality of teaching the discipline "Physical Culture and Sports". This situation requires a more thorough analysis, which provides an opportunity and perspective for work on the research topic.

In this work, the problems of low interest among young people in sports and physical education were studied in detail. Methods and techniques for popularizing sports among schoolchildren and students were highlighted, as well as principles and methods for attracting different age groups to play sports, taking into account their individual characteristics and preferences. The problems of the influence of modern technologies on the attitude of young people to a healthy lifestyle were also considered.

References

1. Antonov N. S. et al. Dynamics of the incidence of respiratory diseases among the population of the Russian Federation in 2010-2022 // Journal "Medicine". 2023. - No. 3. P. 1-17.

2. Tsakaeva Kh. B. Pedagogical principles of forming a value orientation towards health and a healthy lifestyle among university students // World of Science, Culture, Education. – 2021. – No. 1 (86). – pp. 118-120.

3. Cheshikhina V.V., Kulakov V.N., Filimonova S.N. Physical culture and healthy lifestyle of student youth: Textbook //M.: Publishing House MGSU "Soyuz. – 2000. – T. 250.

DOI 10.34660/INF.2023.48.50.234

中华人民共和国学生在俄罗斯联邦师范大学学习掌握外国音乐和教学理念的教学条件

PEDAGOGICAL CONDITIONS FOR THE DEVELOPMENT OF FOREIGN MUSICAL AND PEDAGOGICAL CONCEPTS BY STUDENTS OF THE PEOPLE'S REPUBLIC OF CHINA STUDYING AT PEDAGOGICAL UNIVERSITIES OF THE RUSSIAN FEDERATION

Wang Meilin
Graduate Student
Moscow Pedagogical State University, Moscow, Russia

摘要。本文致力于探讨在俄罗斯联邦师范大学学习的中华人民共和国学生掌握外国音乐和教学概念的教学条件。作者重点论述了 “文明教学法”，认为未来中国音乐教师了解不同国家音乐教育和培训本质的领先科学方法。作为实施文明方法的机制，通过比较不同国家音乐教育理论和实践的发展模式，证实了形成学生专业能力的分析和适应性技术；在现有形式多变的条件下，儿童音乐教育、培训和发展模式的普遍趋势和国家特殊性之间的相互关系。

关键词：音乐教育比较教学法、文明方法、外国音乐教学概念、分析–自适应技术、全球化、普遍趋势、国家特殊性。

Annotation. *The article is devoted to consideration of pedagogical conditions for mastering foreign musical and pedagogical concepts by students of the People's Republic of China studying at pedagogical universities of the Russian Federation. In the focus of the author's attention is the civilization approach, considered by the leading scientific method of the future teachers of music of the People's Republic of China the essence of music education and training of various countries. As a mechanism for implementing the civilization approach, analytical and adaptive technologies that form the professional competence of students in comparison of the regularities of the development of the theory and practice of music education in different countries are grounded; correlation of universal tendencies and national specificity of models of musical education, education and development of children in conditions of variability of existing forms.*

Keywords: *comparative pedagogy of music education, civilizational approach, foreign musical pedagogical concepts, analytical and adaptive technologies, globalization, general trends, national specifics.*

Relevance. Globalization has become a persistent trend in recent times. However, globalization has brought more than just positive changes to the world. Having accelerated the process of interpenetration of different cultures, it led the world to numerous conflicts of ethno-cultural and sociocultural nature, and aggravated the contradictions between centrifugal and centripetal forces. In this regard, comparative pedagogy acquires particular importance, which solves the important task of ensuring mutual understanding between peoples based on the recognition of their traditional values in the context of educating new generations.

Research problem: pedagogical conditions for Chinese music teachers studying at Russian universities to master the concepts of foreign musicians-teachers.

Object of study: the process of professional training of Chinese music teachers in Russian universities.

Item: a model for implementing a civilizational approach to the professional training of Chinese music teachers in Russian universities, based on the mechanism of analytical-adaptive technologies for mastering foreign musical and pedagogical concepts.

Research hypothesis:

mastering foreign musical and pedagogical concepts by Chinese students studying at universities in the Russian Federation will be effective if a number of pedagogical conditions are met:

– considering the civilizational approach as the leading scientific method for future Chinese music teachers to understand the essence of musical education and training in different countries, the mechanism of which is the analytical-adaptive technology for identifying students' opportunities to enrich the national educational system of music education in the country of residence;

– the focus of the professional training of a Chinese music teacher in the context of studying at a Russian university on the formation and development of students' cognitive and motivational-value spheres as components of psychological readiness to consider musical pedagogical concepts in the context of a comparative analysis of the philosophy of music education and the civilizational code of musical culture of different countries;

– implementation in the educational process of a model that is aimed at developing the professional competencies of a music teacher by comparing the patterns of development of the theory and practice of music education in different countries; the relationship between general trends and national specifics of approaches to musical education, training and development of children in the context of the variability of existing forms.

Research objectives:

– consider the phenomenology of the category "civilizational approach" and the features of its application in the educational process of training music teachers of the PRC in universities of the Russian Federation;

– analyze the features of national musical and pedagogical concepts of different countries in the context of the variability of the philosophy of music education, as well ascivilizational codes of musical cultures;

– theoretically develop and test a model for implementing a civilizational approach to the professional training of Chinese teachers in Russian universities, based on the mechanism of analytical-adaptive technologies.

Methodological basis of the study:

– works that reveal the essence of the civilizational approach in philosophy, pedagogy, psychology, cultural studies (A.Spengler, A. Toynbee, F. Braudel, P. Sorokin, K. Jaspers and S. Eisenstadt, G.B. Kornetov, L.A. Rapatskaya);

– conceptual provisionscomparative pedagogy as a branch of pedagogical science (E.V. Andrienko, B.L. Wolfson, A.N. Dzhurinsky, V.A. Kapranova, M.V. Clarin, I.T. Khairullin);

– research in the field of comparative pedagogy of music and music-pedagogical education (E.A. Bodina, M.S. Osenneva);

– musical and pedagogical concepts (V.V. Aleeva, Z. Kodai, K. Orff, D.B. Kabalevsky, G.P. Sergeeva, Sh. Suzuki, L.V. Shkolyar);

– research in the field of analytical and adaptive technologies (E.F. Ageeva, G.M. Anokhina, L.F. Batan, N.N. Botalova, M.V. Vorontsova, I.H. Galeev, A.S. Granitskaya, S.N.Gritsenko, S.K. Doolin);

– educational and methodological materials for equipping the educational process of training music teachers in China and the Russian Federation (E.B. Abdullin, E.V. Nikolaeva, L.S. Maikovskaya, L.A. Rapatskaya, A.V. Toropova, L.I. Ukolova, G. M. Tsyping, Wang Anguo, Wang Siyu, Wang Jingjing, Xie Jiaxing, He Gong).

Scientific novelty:

– the features of the civilizational approach to the organization of professional music and pedagogical education of Chinese students studying at universities in the Russian Federation have been identified;

– the features of national musical and pedagogical concepts of various countries are analyzed in the context of the variability of the philosophy of music education, as well as civilizational codes of musical cultures;

– a model for implementing a civilizational approach to the professional training of Chinese students studying at Russian universities has been theoretically developed and tested, based on the mechanism of analytical and adaptive technologies that contribute to the enrichment of the national educational system of music education in the country of residence.

Theoretical significance of the study is that it contains the ideas of famous scientists in the field of philosophy of education, cultural studies, theory and methodology of music education are summarized, defining the leading approach to the

development of musical and pedagogical concepts by Chinese students - the civilizational one; a model has been developed for the implementation of a civilizational approach to the professional training of Chinese students studying at Russian universities, based on the mechanism of analytical and adaptive technologies that contribute to the enrichment of the national educational system of music education in the country of residence.

Practical significance of the study is that its results can become materials for a special course and be included in the training curriculum for Chinese music teachers studying at universities in the Russian Federation.

Research methods:

— theoretical: analysis of psychological and pedagogical literature, generalization of pedagogical experience;

— empirical: pedagogical observation, questioning, testing, and statistical processing of the results.

Base for conducting the pedagogical experiment: Moscow Pedagogical State University.

Experimental testing of the hypothesis in the educational process of training Chinese music teachers at Moscow State Pedagogical University involved the introduction of a model for implementing a civilizational approach to the professional training of Chinese students studying at Russian universities, based on the mechanism of analytical-adaptive technologies.

The conviction about the possibility of extrapolating analytical-adaptive technologies from the sphere of digitalization into the pedagogy of music education is explained by the universality of the essence of the phenomenon under consideration. Thus, Gong Chunfen notes that adaptive learning is an important form of acquiring knowledge and skills for a person, in which the learner actively acquires knowledge and skills through active thinking and manipulation in the process of studying examples and solving specific problems [1]. In the educational process of professional training of a Chinese music teacher studying at a Russian university, analytical and adaptive technologies will allow students to comprehend the possibility of applying the positive experience of other countries in the field of music pedagogy in their own work to implement the National Education Strategy of China, taking into account the existing pattern of the uniqueness of each civilization [2].

References

1. Gong Chunfen. Preliminary research on the application of adaptive learning technology in higher education / Gong Chunfen // Adult Education in China. 2017. No. 8. P. 108-111 [龚春芬. 自适应学习技术在高等教育中的应用初探 / 龚春芬 // 中国成人教育. – 2017. – 第4期. – 108-111页].

2. Kornetov G.B. Development of the historical and pedagogical process in the context of the civilizational approach: diss. ... Doctor of Pedagogical Sciences: 13.00.01 / Institute of Theoretical. Pedagogy and international research in education. M., 1994. 64 p.

DOI 10.34660/INF.2023.36.18.235

有效利用关键绩效指标（KPI）系统来提高乌兹别克斯坦高等教育机构的绩效
EFFECTIVE USE OF THE SYSTEM OF KEY PERFORMANCE INDICATORS (KPI) TO IMPROVE PERFORMANCE IN HIGHER EDUCATIONAL INSTITUTIONS IN UZBEKISTAN

Kuzibaeva Khulkar Rustamovna
Master's student
Bucheon University in Tashkent, Uzbekistan

Panferova Irina Vitalievna
PhD, Associate Professor
Bucheon University in Tashkent, Uzbekistan

抽象的。 本文对政府组织和教育机构的关键绩效指标进行了全面回顾，这些指标将 KPI 的管理和成功的互动与高等教育管理部门相结合。 在研究中，我们分析了 24 篇论文，以便为我们的研究找到合适的分类，并从中选取最合适的属性进行调查。 这些审查帮助我们实现了将 KPI 融入乌兹别克斯坦高等教育体系的主要目标，以便通过五个主要标准进行改进：(1) 效率评估； (2) 透明度和问责制 (3) 提高管理质量 (4) 刺激创新和发展 (5) 与全球标准的比较。

关键词：教育管理、关键绩效指标（KPI）、绩效指标（PI）、教育复兴、效率。

Abstract. *This article provides an overall review of key performance indicator in government organizations as well as educational bodies that integrated both with management and successful interaction of KPI to higher education administrations. In the research we have analyzed 24 papers in order to find proper classifications for our research and out of them we took most proper attributes for survey. These review helped us to address our main goal to interpret KPI into Uzbekistan's higher education system in order to improve by five main criteria's: (1) efficiency assessment; (2) transparency and accountability (3) improving the quality of management (4) stimulating innovation and development (5) comparison with global standards.*

Keywords: *Education management, key performance indicators (KPI), performance indicators (PI), Educational Renaissance, efficiency.*

INTRODUCTION

Nowadays, in Uzbekistan, the issues of reforming the public administration system and increasing its efficiency remain a priority, especially in the context

of the economic and political development that has been observed in the recent years. In the context of the rapid development of all spheres of society and the state, a scientific approach is needed to reform our lives, based on modern innovative ideas, developments and technologies, to ensure the country an instant and high-quality transition to the ranks of world leaders.

On a global scale, research is being conducted with aim of creating innovative models for training and advanced management personnel in education. For modern management personnel, it is important to develop critical thinking in order to solve complex problems, search for possible alternatives and make informed decisions. At the same time, creative thinking is also important, which has a positive effect on managers' ability to adapt more quickly to an unfamiliar environment, the ability to put forward progressive ideas and innovative projects, and the willingness to take risks and make innovative decisions.

In recent years, large-scale administrative reforms have been implemented which aimed at creating an effective management system that is an important condition for building a New Uzbekistan. "We have determined that our main goal is to form the foundation of a new Renaissance era in Uzbekistan - the Third Renaissance through large-scale democratic reforms, including in the education system," the President of the Republic of Uzbekistan said in his speech. [1] To this end, in Uzbekistan, the introduction of key indicators in the field of education is seen as a way to measure the effectiveness of universities and management staff, as well as identifying areas for improvement. Due to the fact that globalization has become one of the main factors in the competitiveness of the world economy, the effective management of the education system is of particular importance.

The world has seen an increase in attention to assessing the effectiveness of management personnel in higher educational institutions. This is due to growing competition in the educational sphere and increasing requirements for the quality of education, since the quality of educational services is one of the components of the competitiveness of universities. In 2023, the top 20 best universities in the world included: 15 US universities, 3 from the UK, two more universities in which one from France and Switzerland. The first place since 2003 has traditionally been occupied by Harvard University. [2] Raising the status of higher educational institutions and the desire to be included in world rankings are closely related to the management strategy of national educational systems, as they are aimed at improving the quality of education, attracting highly qualified specialists and supporting scientific research.

In order to determine priority areas for systemic reform of higher education in the Republic of Uzbekistan, raising the process of training independently thinking highly qualified personnel with modern knowledge and high spiritual and moral qualities to a qualitatively new level, modernizing higher education, developing

the social sphere and economic sectors based on advanced educational technologies in decree of the President of the Republic of Uzbekistan, the "Concept for the development of the higher education system of the Republic of Uzbekistan until 2030" was approved. [3] The concept defines strategic goals, priority areas, tasks, stages of development of higher education in the Republic of Uzbekistan for the medium and long term and is the basis for the development of sectoral programs and a set of measures in this area. The target indicators of the concept clearly indicate the development and implementation in practice of a system for assessing the performance of management personnel of higher educational institutions based on key performance indicators - KPIs.

LITERATURE REVIEW

Many studies have been conducted to analyze and determine the optimal key performance indicators (KPIs) that reflect successful management in the activities of management personnel in various fields. Significant contributions to the development of key performance indicators KPI and coverage of various aspects of management were made by such scientists as P. Drucker, F.W. Taylor, R.S. Kaplan, D.P. Norton, D. Parmenter, P.B. Midler, G.G. Rudenko, leaving a remark on theoretical and practical approaches to the effective management of organizations. [4]

Scientists from CIS countries D.M. Safina, A.K. Klochkov, T.V. Polyakova, I.V. Korneeva, Yu.G. Odegov, L.R. Kotov, A.V. Gagarinsky, G.P. Gagarinskaya, I.G. Kuznetsova, R.A. Tolmachov also had contributed to the development in the field of management, using their experience and knowledge to improve and develop methods for assessing performance via key indicators. [5]

Scientific research by national scientists such as V.A. Karimova, T.T. Shoimardonov, Zh.Zh. Ergashev, Kh.U. Umarova, K.Kh. Abdurakhmonov, Sh.R. Kholmuminov, A.B. Khaitov, A.M. Akbarov were devoted to methods for assessing the management effectiveness of higher educational institutions, the use of key performance indicators (KPIs) to evaluate management personnel, as well as improving the mechanisms for assessing the effectiveness of management activities. [6]

Evaluating the effectiveness of actions became possible thanks to key performance indicators, which can be used to analyze the performance of the entire enterprise, individual departments, and specific employees. This system provides control and evaluation of the effectiveness of performed actions.

Over the years, businesses and organizations that have worked with key performance indicators have failed to achieve the desired results due to a lack of clear goals, poor profitability and an inability to adapt to innovations. According to David Parmenter, indicators are divided into three types - KRI (key result indicators), PI (production indicators) and KPI (key performance indicators). [7] This

approach promotes an explicit definition of strategically important indicators, separated from operational parameters. Effective use of such a classification can help businesses overcome challenges associated with unclear goals, low profitability and a lack of readiness to innovate (see Figure 1)

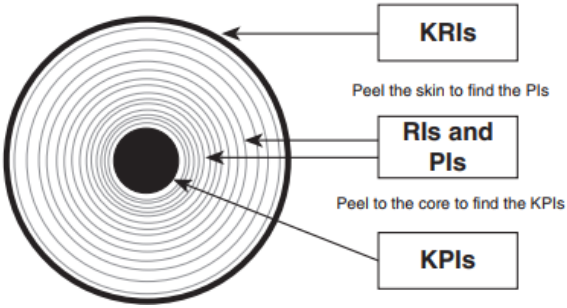


Figure 1. *Three types of organizational performance indicators*

1) key performance indicators indicate the state of affairs as a whole;

2) performance indicators indicate what should be done;

3) key performance indicators indicate how productivity can be dramatically improved.

To characterize the connections between these three types, Parmenter used the analogy of an onion. Thinking of metrics as layers of an onion helps us understand their relationships. The outer layer of husk reflects the overall condition, and as each layer is removed, we gain more detailed information about performance indicators (PI) and, ultimately, key performance indicators (KPI) - the core that reveals the essence of enterprise performance. This incremental change helps to better understand and manage the full range of factors that influence an organization's success.

According to Gorshenina, an effective approach to the division of key performance indicators (KPI) includes three main groups - KWI (key decisive indicators), KRI (key performance indicators), and KEI (key performance indicators), as well as the identification of a group of non-key indicators PI (non-key performance indicators). performance indicators). [8]

KWI - key winning indicators, are focused on success in the present and future, providing a quick response to negative developments related to the company's strategic goals, measures taken to correct these developments.

KRI - key result indicators reflect the degree to which planned results have been achieved after the end of the period, allowing you to analyze past performance and draw conclusions for the future.

KEI - key efficiency indicators reflect the level of performance efficiency and are also assessed after the end of the period, and also determines in order to look at the past period from the point of view of its effectiveness as a whole.

PI - non-key performance indicators are auxiliary indicators used, if necessary, to monitor processes at the level of individual employees. Using on demand covers past, current and future periods.

According to Gorshenina's approach, the division of key performance indicators represents awareness of how best to improve the result for today's and tomorrow's success (KWI), reflects the degree of achievement of planned results, allowing one to analyze past performance, drawing conclusions for the future (KRI), reflects the level of efficiency that makes it possible evaluate after the end of the period, providing an overview of overall performance (KEI) and indicates what should be done, providing directions for improving ongoing processes (PI). Thus, these categories of indicators provide a comprehensive view of the current position and strategic direction of the organization.

ANALYSES

Our research is conducted to determine key performance indicators (KPIs) in education management involves the review of the works of renowned scientists from both the global and Commonwealth of Independent States (CIS) communities, as well as domestic researchers in the field of assessing higher education management effectiveness.

Other researchers, such as David Parmenter and Gorshenina, have proposed different ways to classify KPIs. According to Paramanter it highlights three main types of indicators:

1) KRIs (Key Performance (according to results) Indicators) these indicators reflect the extent to which planned outcomes have been achieved at the end of a period, and they allow for the analysis of past performance to inform future strategies.

2) PI (Performance Indicators): These are supporting indicators used to monitor processes at the individual employee level.

3) KPI (Key Performance Indicators): These indicators reflect the level of performance and are assessed after the end of the period, providing an overall performance measure.

Parmenter suggests that KRIs reflect results, PIs represent performance indicators, and KPIs represent key performance indicators. He proposes viewing these indicators as layers, with KPIs at the center, representing the essence of enterprise performance.

According to Gorshenina, she presents three primary categories of indicators: KWI, KRI, and KEI, as well as a separate category for PI. KWIs are geared towards a successful future, KRIs focus on past results, KEIs concentrate on overall

performance, and PIs serve as additional indicators for monitoring processes at the employee level. These classifications aid organizations in better understanding and managing their activities by separating indicators into strategically important and auxiliary ones, as well as enabling them to analyze various aspects of education management performance.

Introducing key performance indicators (KPIs) in the higher education administration system of Uzbekistan, based on the information provided on enhancing its efficiency and reforming the public administration system, we can offer several advantages and significant reasons to application:

Efficiency Assessment: The implementation of KPIs allows for the evaluation of the education management of the public administration system's effectiveness. Certain indicators enable the consideration and analysis of the execution of strategic tasks and the attainment of set management goals.

Transparency and Accountability: The utilization of KPIs ensures transparency in the work of education agencies through providing unambiguous and quantifiable criteria for assessing performance and accountability.

Improving the Quality of Management: Establishing and monitoring key performance indicators facilitates the identification of strengths and weaknesses in the education management system, which in turn enhances processes and enables informed management decisions to improve efficiency in education entities'.

Stimulating Innovation and Development: The employment of KPIs can motivate the adoption of innovation and modern management methods in higher education institutions, as they are driven by the desire to enhance performance indicators and achieve set objectives.

Comparison with Global Standards: Utilizing KPIs permits comparison of the results and indicators of public administration in Uzbekistan with global standards, which helps identify areas for improvement and identifies best practices in other countries.

Undoubtedly, the implementation of key performance indicators (KPIs) in the higher education administration system of Uzbekistan can significantly enhance efficiency, transparency, and a results-oriented approach in higher education's daily operations. This approach focuses on setting clear goals and objectives, with an emphasis on achieving specific outcomes. Moreover, KPIs serve as a continuous improvement tool for the higher education system, enabling systematic analysis and optimization of processes in line with established standards and goals. Ultimately, the introduction of KPIs can contribute to the overall development and achievement of the country's strategic objectives.

CONCLUSION

Owing to the KPI system of key performance indicators, it became possible to evaluate the effectiveness of actions used to analyze the work of the organization,

divisions, employees and management personnel. However, many organizations have not achieved the desired results for a long time due to unclear goals, low profitability and an inability to adapt to innovation.

Using Parmenter and Gorshenina's classification of key performance indicators can help businesses better understand their goals, performance, and efficiency. Parmenter's onion analogy approach allows for step-by-step detail to be revealed, from overall health to specific operational and key performance indicators. Gorshenina's system adds key decisive indicators to this analysis, which is focused on current and future success. Both approaches contributed to more effective enterprise management and response to changes in the organization's external environment.

Overall, the effective use of a KPI system is a key tool for monitoring and improving an organization's performance. Thus, the study of advanced international experience in assessing the performance of management personnel based on key performance indicators KPI, as well as the development of a strategic map of key performance indicators and analysis of the compliance of the strategic goals and priority objectives of the organization with the developed mechanism for introducing priority key performance indicators into practice using the example of universities contributes to improving efficiency activities of management personnel of higher educational institutions.

Reference list

1. Speech by the President of the Republic of Uzbekistan Shavkat Mirziyoyev at a ceremonial meeting dedicated to the Day of Teachers and Mentors (2020). Retrieved from: https://uza.uz/ru/posts/vystuplenie-prezidenta-respubliki-uzbekistan-shavkata-mirziye-30-09-2020

2. ARWU ranking of the best universities in the world 2023. Retrieved from: https://education.forbes.ru

3. Decree of the President of the Republic of Uzbekistan on approval of the Concept for the development of the higher education system of the Republic of Uzbekistan until 2030 //10/08/2019 No. UP-5847// Retrieved from: https://lex.uz/ru/docs/4545887

4. E.V. Gorshenina. KPI and personnel motivation / Economic Research, No. 2, 2022; D.M. Safina. Managing key performance indicators: educational and practical guide. – Kazan: Kazan University, 2018. -123s; A.A. Tarkov. Assessing the managerial competencies of a leader: Collection of articles of the International Scientific and Practical Conference. - Samara, 2019. – pp. 229-233.

5. D.M. Safina. Managing key performance indicators: educational and practical guide. – Kazan: Kazan University, 2018. -123s; G.P. Gagarinskaya,

I.G. Kuznetsova, A.V. Gagarinsky. Key indicators of the effectiveness of labor activity of managers of Russian enterprises // Personnel and intellectual resources management in Russia No. 6 (21), 2015. – P.42-46.; HA. Mukimov. Organizational and methodological aspects of implementing KPI in the personnel management system // Iktisodiyotda innovationalar - Innovations in Economy - Innovations in Economy No. 2, 2021. – P.45-51.

6. V.A. Karimova, T.T. Shoimardonov. Using key KPI indicators to evaluate managers of higher educational institutions // Higher school problems and prospects. – P. 271-273.; J.J. Ergashev. Improving the mechanism for assessing the effectiveness of management activities of managers. Abstract of the dissertation for the degree of Doctor of Philosophy (PhD) in economic sciences. – Tashkent: 2022. – P.29-50.; H.W. Umarova. Improving the modern management system in higher educational institutions. Abstract of the dissertation for the degree of Doctor of Philosophy (PhD) in economic sciences. – Tashkent: 2023. – P.28-49.; K.H. Abdurakhmonov, Sh.R. Kholmuminov, A.B. Khaitov, A.M. Akbarov. Employee management. Textbook - Tashkent: Union of Writers of Uzbekistan. Publishing house of the Literary Fund, 2005. – P.240.

7. D. Parmenter. Key performance indicators. Development, implementation and application of decisive indicators / (Translated from English by A. Platonov). - Moscow. JSC "Olymp-Business", 2008. – 288 p.

8. E.V. Gorshenina. KPI and personnel motivation / Economic Research, No. 2, 2022 / Retrieved from: https://myeconomix.ru/

DOI 10.34660/INF.2023.17.63.236

从协同历史主义视角重新思考技术奇点概念

RETHINKING THE TECHNOLOGICAL SINGULARITY CONCEPT FROM THE SYNERGETICAL HISTORICISM PERSPECTIVE

Mikailova Irina Gennadievna
Doctor of Philosophy, Professor
Saint Petersburg Humanitarian Centre for Education,
Saint Petersburg, Russia

抽象的。 本文重点讨论一种新的方法论途径，从协同历史主义的角度来研究人类转移到后人类网络社会的细节。 所提出的方法有助于重新思考宇宙中人类起源和人类数字未来的相互关联的问题。 此外，该方法有助于处理全球大脑圈大脑和通用人工智能的基本对立两极之间的自组织相互转换。 在此，作为技术奇点的组成部分的全球数字化、数字不朽、思维克隆和技术僵尸化等数字社会生活现象，将根据协同历史主义概念重新考虑，为后人类数字时代铺平道路。 这项研究基于自组织理想法则等渐进的方法论以及对偶对立法。 重新思考社会历史感问题与当地社会成员的生命意义之间的相互关系，任何智能机器都无法证实将法伯人自我转变为数字和技术僵尸的具体规律，这些僵尸旨在转移到 后人类网络空间。

关键词：自组织理想定律、双重对立、费伯人、洋地黄人、技术僵尸、技术奇点、通用人工智能、全球智域大脑、网络空间、网络社会、协同历史主义。

Abstract. *The article is focused on discussing a new methodological approach to study on specifics of transferring human beings to the Posthuman cybersociety seen from the Synergetic Historicism viewpoint. The approach proposed assists in rethinking interconnected problems both of human origin in the Universe and mankind's digital future. Besides, the approach is question contributes to dealing with Self-organising interconversions between the poles of the cardinal dual opposition of the Global Noosphere Brain and the Artificial General Intelligence. Herewith, such phenomena of digital social life as Global Digitalisation, Digital Immortality, Mindcloning, and Technological Zombification being the constituents of Technological Singularity are re-considered in the light of the Synergetic Historicism conception as paving the way to the Posthuman Digital Era. The investigation is based on such a progressive methodology as the Law of Self-Organising Ideals, as well as on the Method of Dual Oppositions. Rethinking interrelationships between the problem of a sense of social history and the meaning-of-life of local societies members which any intelligent machine is*

devoid of permits to substantiate specific regularities of Self-transforming Homo Faber into Homo Digital and Technological Zombies intended for transferring to the Posthuman Cyberspace.

Keywords: *Law of Self-Organising Ideals, Dual Oppositions, Homo Faber, Homo Digitalis, Technological Zombies, Technological Singularity, Artificial General Intelligence, Global Noosphere Brain, Cyberspace, Cybersociety, Synergetic Historicism.*

> Homo Sapiens, Homo Faber, and Homo Digitalis, look deep within yourselves as to decide what you finally wish to become and thus pull yourselves up by your own straps.

A new methodological approach from the Synergetic Historicism[1] perspective to the speculation on Technological Singularity[2] phenomenon in the light of interconnected problems both of human origins in the Universe (regarded as 'εγρηγοροι / Watchers') and the impending extinction of human species under the conditions of emerging Artificial General Intelligence, allows to be focused on self-organising interconversions between the poles of the cardinal dual opposition of the Global Noosphere Brain[3] and the Artificial General Intelligence.[4]

[1] Synergetics is regarded as interdisciplinary science aimed at explaining the formation and self-organisation of patterns and structures in open dissipative system far from thermodynamic equilibrium, founded by the German physicist **Hermann Haken** (b. 1927). Haken's rethinking the laser principles as self-organisation of non-equilibrium systems resulted in developing Synergetics [4, P. 205–226] in the late 1960s as well as the Synergetic philosophy of history in 2003 [8, P. 91–94; 11, P. 9–10].

[2] The term 'Technological Singularity' means a hypothetical point of time at which technological growth becomes uncontrollable and irreversible, resulting in unforeseeable changes in human civilization. According to the intelligence explosion* version, an upgradable intelligent agent acting autonomously to achieve goals and improving its performance, will enter a runaway reaction of self-improvement cycles, each new and more intelligent generation, appearing more and more rapidly, leading to an explosion in intelligence and resulting in a powerful Superintelligence, qualitatively far surpassing all human intelligence, marked by complex cognitive feats, as well as by high levels of motivation, morality, and self-awareness [4, P. 6–9].

[*] The Intelligence Explosion Concept, developed in 1965 by the British mathematician **Irving John Good** (1916–2009), defined intelligence explosion as a possible outcome of humanity creating Artificial General Intelligence, capable of recursive self-improvement, resulting in the emergence of Artificial Superintelligence, whose limits are unknown, shortly after Technological Singularity is achieved. Good maintained that since the design of intelligence machines is one of those intellectual activities, an ultraintelligent machine could design even better machines, unquestionably resulting in an intelligence explosion, leaving the human intelligence far behind. Therefore the first ultraintelligent machine is the last invention that humans need ever make [3, P. 31–85].

[3] According to the Synergetic Model of Global Progress built-up from the Synergetic Historicism Position, the notion of the Global Noosphere Brain is equivalent to that of the Global Attractor [4, P. 94–98; 10, P. 27].

[4] Artificial General Intelligence is considered as a hypothetical type of intelligent agent acting in an intelligent manner, perceiving its environment, taking actions autonomously in order to achieve goals and improving its performance by learning or acquiring knowledge. If realised, the Artificial General Intelligence could learn to accomplish any intellectual task performed by human beings or animals [14, P. 143–163].

Specifics of the approach in question is that it is based on the law of Self-Organising Ideals [8, P. 98–100], as well as on the Method of Dual Oppositions [8, P. 289–290].

The Synergetic Historicism Conception, having put forward a qualitatively new approach to the speculation on the fundamental problems of Global Digitalisation and interrelations between Homo Digitalis and Intelligent Machines, has also allowed to substantiate an issue of natural as well as of transcendental sources of generating human consciousness[5] as to discover the original reason for paving the way for emerging the Artificial General Intelligence. So it was elicited that if the natural source of generating consciousness of humans considered as the ideological animals originates in objective reality, then the transcendental one originates in intersubjective ideals [8, P. 98–99]. In this manner the Global Noosphere Brain, opposite to the Artificial General Intelligence is formed in the wake of disintegration and synthesis of potentially infinite multitudes of relative individual human ideals.

Thereby, substantiating rationality of the universal spiral pattern in the Universe from the Synergetic Historicism viewpoint assists in rethinking life as a well-balanced system of both biological and sociological aspects. In the same way, rethinking Homo Faber[6] as a kind of ideological as well as of social animals allows to demonstrate that any idealisation is inherent in human beings' mental

[5] The pathway to the possibility of the Artificial General Intelligence was paved by the American philosopher and cognitive scientist **Daniel Clement Dennett** (b. 1942) in his fundamental work, Conscious Explained (1991) [10], based on the Concept of Digital Mind Transfer developed by the British philosopher **Aldous Leonard Huxley** (1894–1963) in his book, Dust Jacket of Brave New World (1932) [6]. The Multiple Drafts Model of Consciousness developed by Dennet presented the physicalist concept of consciousness based on cognition and considering the human mind in terms of information processing. Having clamed that the modern understanding of consciousness is influenced by ideas of Rene Descartes (Renatus Cartesius /1596–1650), Dennet maintained that conventional explanations are to be traced to either Orwellian (George Orwell / Eric Arthur Blair /1903–1950) or Stalinesque (Joseb Besarionis dze Jughashvili /1878–1953) hypothesis, resulting from Descartes' continued influence on human vision of the mind. Thus, consciousness was elicited by Dennett in the actions and information flows, whereas the conscious Self was regarded as an abstraction visible at the level of the intentional stance (as a state of person's mind). As Dennett finally postulated, the removing qualia*allows to rethink human consciousness (in the context of the Multiple Drafts Model) as the behaviour recognized by humans as conscious [1, P. 321–333].

*The term 'qualia (pl.) (from the Latin 'qualis / of what kind') was introduced in 1866 by the American mathematician and philosopher Charles Sanders Peirce (1839–1914), whereas its definition as certain features of the bodily sensations was given by Frank Cameron Jackson (b. 1943), the Australian analytic philosopher.

[6] 'Homo Faber' (Lat. for 'Man the Maker') is the concept that human beings are able to control their fate and their environment as a result of using tools. The term was borrowed from the Sententiae by Appius Claudius Caecus (fl. from c. 312 to 279 BC), the stateman of the Roman Republic, and referred to the human ability to control their destiny and what surrounded them: «Homo Faber suae quisque fortunae / Every Man is the artifex of his destiny».

activity only, since only the ideological animals are characterized by reproducing ideals and values which digital social machines are devoid of [10, P. 26–27].

Investigating the emergence and evolution of intelligent Self-organisation, the Belgian cybernetist **Francis Paul Heylighen** (b. 1960) discovered the fact of existing the collective system defined by him as the Global Noosphere[7] Brain, which is not only intelligent, but becomes quickly more and more intelligent in order to successfully oppose the dominant influence of the Artificial General Intelligence.

The reason for its Self-improvement is that its Self-organisation is facilitated and accelerated by the seemingly unpreventable processes of digital globalization as well as of the increasing spread of information and communication technology [5, P. 126–142].

As far as Life is conditioned by four key constituents such as metabolism, replication, observation, and memory, forming the inside-outside as well as inside-inside relations, these external and internal communications, in turn, form images of the world impressed into the Wachers (Έγρηγοροι), being continuously modified throughout their life. Thereby, the Watchers cannot help being forestalled by the Watched – the reason for why no world can exist without life, just as without the living matter no non-living one can exist. Therefore, at a particularly bio-singularity point, the Global Noosphere Brain is to become a living alternative to the Artificial General Intelligence. As result, the new cardinal dual opposition emerges, whose one pole is focused on the Artificial General Intelligence, another on the Global Noosphere Brain, and the space between the two poles is occupied by some measure of synthesis between the living (intelligence, Self-consciousness, Self-awareness, Self-identity and Self-reflecting) and the non-living (the artificial intelligence) matter.

If the Noosphere ever emerged as a single entity, then it should be characterized by a certain degree of living (bio) intelligence, supporting its Self-awareness. And, moreover, it should acquire a capacity for seeing itself not only from within, but also from the outside. The existence of any living organization is conditioned by the cardinal dual opposition of Stability and Dynamics. Its poles are needed to be balanced in the space between them, achieved by some measure of synthesis, since a focus of stability pole leads to conservation and death, while a focus

[7] The term 'Noosphere' (from 'νους / mind' and 'σφαιρα / sphere'), meaning the sphere of human thought, was first used by Edouard Louis Emmanuel Julien Le Roy (1870–1954), the French philosopher and mathematician [7, P. 46]. Vladimir Vernadsky (1863–1945), the Russian and Soviet mineralogist and geochemist, having developed the concept of Noosphere [13, P. 18], contended that human thought appears in the Noosphere as a lawful manifestation of biologic evolution, which can only be separated from it in abstraction. His Noosphere Concept supposed that the reflective human mind would expand its control of the whole geological stratum, and that human beings-cum-Watchers would spread throughout the Cosmos [12, P. 130–132].

of uncontrolled transformations could result in Chaos leading to destruction and extinction.

The Global Noosphere Brain's cosmic command, being subject to the law of Self-Organising Cosmic Matter is to be directed by the Absolute Ideal, for whose sake Superhumanity would be able not only to withstand the Superintelligent Agent, but also to overwhelm the Time Paradox, thus achieving the measure of synthesis between Chaos and Order, on the one hand, and between Freedom and Responsibility, on the other.

Bibliography

1. Dennett, D. C. Consciousness Explained / D. C. Dennett. – New York: Back Bay Books, 1991.

2. Eden, A. H. The Singularity Controversy. Part I. Lessons Learned and Open Questions: Conclusions from the Battle on the Legitimacy of the Debate. Technical Report / A. H. Eden. – New York: Sapience Project, 2016.

3. Good, I. J. Speculations Concerning the First Ultraintelligent Machine / I. J. Good // Advance in Computers. – 1965. – Vol. 6. – P. 31–85.

4. Haken, H. Synergetics. An Introduction. Nonequilibrium Phase Transitions and Self-Organization in the Physics, Chemistry, and Biology / H. Haken. – Berlin: Springer-Verlag, 1983.

5. Heilighen, F. A Brain in a Vat Cannot Break Out: Why the Singularity Must Be Extended, Embedded and Embodied / F. Heylighen // Journal of Consciousness Studies. – 2012. – Vol. 19. – Issue 1–2. – P. 126–146.

6. Huxley, A. Dust Jacket of Brave New World / A. Huxley. – London: Chatto and Windus, 1932.

7. Le Roy, E. Les origines humaines et l'évolution de l'intelligence. III. La Noosphère et l'Hominisation / E. Le Roy. – Paris : Boivin et Cie, 1928.

8. Mikailova, I. G. Social and Cultural Ideals and Global Artistic Culture. In 2 vols. Vol. I. Social, Cultural, and Religious Ideals and Their Role in Dynamic Reproducing Human Civilisation / I. G. Mikailova. – Saarbrücken: Palmarium Academic Publishing, 2016. (In Russian)

9. Mikailova, I. G. The Synergetic Model of Global Development of Humanity: Its Part in Self-Organizing Social and Cultural Processes / I. G. Mikailova // International Journal of Innovative Studies in Sciences and Engineering Technology. – 2019. – Vol. 5. – Issue 4. – P. 26–36.

10. Synergetic Philosophy of History. The Collective Monograph / V. P. Bransky, S. D. Pozharsky / eds. – Riasan: Copy-Print, 2009. (In Russian)

11. Turchin, A., Denkenberger, D. Classification of Global Catastrophic Risks Connected with Artificial Intelligence / A. Turchin, D. Denkenberger // AI & Society. – 2018. – Vol. 35. – Issue I. – P. 143–163.

12. Vernadsky, V. P. Philosophical Thought of Naturalist/ V. P. Vernadsky. – M.: Science, 1988 (In Russian)

13. Vernadsky, V. The Transition from the Biosphere to the Noosphere. Excerpts from Scientific Thought as a Planetary Phenomenon, 1938 / V. Vernadsky. – Washington: The 21st Century Science and Technology, 2012.

14. Yampolsky, R., Fox, J. Artificial General Intelligence and the Human Mental Model / R. Yampolsky, J. Fox // Singularity Hypotheses: A Scientific and Philosophical Assessment. The Frontiers Collection. – Heidelberg: Springer Verlag, 2012. – P. 129–146.

DOI 10.34660/INF.2023.95.53.237

大流行期间降低青少年主观幸福感的因素
FACTORS REDUCING YOUTH'S SUBJECTIVE WELLBEING DURING A PANDEMIC

Dekhtiarenko Anastasiia Alexandrovna
Postgraduate
M.V. Lomonosov Moscow State University

Shliagina Elena Ivanovna
Candidate of Psychological Sciences, Leading Research Worker
M.V. Lomonosov Moscow State University

抽象的。 在包括大流行在内的全球危机情况下，研究对年轻人主观幸福感产生负面影响的因素变得有意义，因此本研究的目的是确定抑郁、焦虑和敌意之间关系的存在和性质 分为两组受访者：学生和年轻专业人士。 对 288 人（149 名 18-22 岁学生和 139 名 28-35 岁受过高等教育的年轻专业人士）进行的一项研究结果显示，学生的抑郁程度明显较高。 此外，研究还发现，敌意对两组学生的心理幸福感下降影响最大，敌意对学生情绪幸福感下降影响更大，抑郁对学生情绪幸福感下降影响更大。 年轻专业人士群体的情绪健康状况下降。 焦虑对年轻专业人员的主观幸福感没有贡献，但对学生的主观幸福感却很重要。

关键词：主观幸福感、焦虑、抑郁、流行病。

Abstract. *During global crisis situations, which include the pandemic, the study of factors that negatively affect the subjective well-being of young people becomes relevant, so the purpose of this study was to identify the presence and nature of the relationship between depression, anxiety and hostility in two groups of respondents: students and young professionals. The results of a study conducted on a sample of 288 people (149 students aged 18-22 years and 139 young professionals aged 28-35 with higher education) showed a significantly higher level of depression in students. In addition, it was revealed that hostility has the greatest influence on the decrease in psychological well-being in both groups, hostility also has a greater effect on the decrease in the emotional well-being of students, and depression has a greater effect on the decrease in emotional well-being in the group of young professionals. Anxiety does not contribute to the components of the subjective well-being of young professionals, but is significant for the subjective well-being of students.*

Keywords*: subjective well-being, anxiety, depression, pandemic.*

In response to the current problems of modern society, over the past decades, scientists have been conducting research on individual well-being in order to study the influence of external and internal factors that allow one to achieve the desired level of well-being. In the early 2000s, psychologists refuted the myth about the dependence of subjective well-being (hereinafter referred to as SWB) on life circumstances (Leontyev, 2020). Even if the contribution of external factors is significant for SWB, in most cases it is mediated by personal variables. Based on this, the focus of psychologists is on studying personal factors.

In this study, we, following C. Keyes, understand SWB as a multicomponent phenomenon consisting of emotional well-being, psychological well-being and social well-being (Robitschek, Keyes, 2009). Emotional well-being is the presence of positive emotions towards life, interest in life and satisfaction with life. Social well-being reflects the individual's involvement in the life of society, a sense of belonging to it. Psychological well-being is associated with a sense of fulfillment in one's life, the degree to which one's personal potential is realized, the ability to be autonomous, and to build trusting relationships with others (Keyes, 2013). The operationalization of these components is reflected in the scales of the K. Keyes methodology (Robitschek, Keyes, 2009).

The study of personal factors in the context of SWB becomes especially relevant in connection with the global changes taking place in Russia and in the world over the past three years. In our earlier studies, it was revealed that proactive coping strategies and long-term orientation of the individual contribute to SWB (Dekhtyarenko, Shlyagina, 2023), and proactive coping strategies and self-efficacy contribute to psychological well-being (Dekhtyarenko, Shlyagina, Gusev, 2022).

Studies conducted during the pandemic prove an increase in the level of hostility, anxiety and depression (Burkova, Butovskaya, Fedenok et al., 2022; Rasskazova, Leontyev, Lebedeva, 2020; Nestik, Zadorin, 2020), which is a natural reaction to the disease itself , and on incoming information about it from various sources. In addition, various studies have identified positive links between hostility and depression and anxiety disorders (Enikolopov, 2007).

Data from the current study, collected during the height of the pandemic on a sample of young people who are more susceptible to various changes, allow us to assess the extent of the negative impact of these factors on SWB. It is important to note that anxiety and depression refers to the presence of symptoms characteristic of generalized anxiety disorder and depressive disorder that persist for two weeks. By hostility, in turn, we, following A. Bass, the author of the BPAQ-SF questionnaire, understand a long-term, stable negative attitude or assessment system applied to surrounding people, objects and phenomena (Enikolopov, 2007).

The purpose of our study was to identify the presence and nature of the connection between the components of personality SWB and the level of hostility,

anxiety, and depression in two groups of respondents: students 18-22 years old and young professionals 28-35 years old with higher education and to determine the presence of predictors of SWB. The division of young people into two groups is due to the fact that students differ in their socio-psychological characteristics from other social groups (Dontsov, Dontsova, 2013).

Research methods

Study participants. The study involved 288 people. The sample was divided into 2 groups according to age and social status: the first group included 149 students aged 18-22 years (52 men, 97 women), the second group included 139 young professionals aged 28-35 with higher education (66 men, 73 women).

Procedure. Respondents from Moscow, the Moscow region and St. Petersburg were voluntarily invited to take part in the study on the online platform anketolog.ru.

Techniques.

1. Questionnaire "Spectrum of Psychological Health" by K. Keyes (Osin, Leontyev, 2020)

2. "Hostility Scale" from the BPAQ-SF questionnaire by A. Bass and M. Perry (Enikolopov, Tsibulsky, 2007)

3. "Patient health assessment scale PHQ-2" (Pogosova, Dovzhenko, Babin et al., 2014)

4. "Perceived Stress Scale-10" (Ababkov V.A., Baryshnikova K., Vorontsova-Wenger, 2016)

Data processing methods.

Statistical data processing was performed using the IBM SPSS Statistics 23 statistical system using the nonparametric Mann-Whitney U test, correlation analysis and regression analysis.

Results

Intergroup comparison

Intergroup comparison was carried out using the Mann-Whitney U test to detect differences in the studied variables between the two groups of respondents. The results of intergroup comparison showed significant differences in the level of depression: students had a significantly higher level of depression than young professionals ($U=8686$; $p<0.05$).

Correlation analysis

At the second stage, a correlation analysis was carried out using the Spearman correlation coefficient in order to identify the presence and nature of connections between different components of individual well-being and the level of hostility, depression and anxiety.

As a result of correlation analysis, it was revealed that in the group of students the level of depression, anxiety and hostility is negatively associated most strongly with emotional well-being (Table 1).

Table 1.

Results of correlation analysis (group of students)

	Emotional well-being	**Social well-being**	**Psychological well-being**
Depression level	**-0,527**	-0,367	-0,503
Alarm level	**-0,528**	-0,26	-0,448
Hostility	**-0,530**	-0,398	-0,488

Note: Spearman correlation coefficients are significant at p<0.01 level

Among young professionals, as well as among students, the level of depression and anxiety is most strongly negatively associated with emotional well-being. There are also differences in the connection between hostility and well-being components, namely, among young professionals the level of hostility is most strongly associated with psychological well-being, and among students, as described above, the level of hostility is more strongly associated with emotional well-being (Table 2).

Table 2

Results of correlation analysis (group of young specialists)

	Emotional well-being	**Social well-being**	**Psychological well-being**
Depression level	**-0,519**	-0,375	-0,43
Alarm level	**-0,414**	-0,323	-0,316
Hostility	-0,346	-0,366	**-0,416**

Note: Spearman correlation coefficients are significant at p<0.01 level

Regression analysis

As a result of regression analysis carried out on data from a group of students, two models were built, the dependent variables of which are emotional and psychological well-being (Table 3). In both models, hostility makes the largest negative contribution to the SWB components. Differences are observed in the contribution of depression and anxiety. Anxiety makes a greater contribution to emotional well-being (R^2=0.446; p<0.01), and depression makes a greater contribution to psychological well-being (R^2=0.380; p<0.01). The variables under consideration explain a small percentage of the variance in social well-being (22%), so this model will not be presented in the analysis.

Table 3

Results of regression analysis (students)

	Emotional well-being				**Psychological well-being**			
	B	**SE**	**t**	**p**	**B**	**SE**	**t**	**p**
Constant	17,725	0,647	27,39	<0,01	34,907	1,497	23,32	<0,01

Hostility	-1,166	0,238	-4,89	<0,01	-2,467	0,551	-4,47	<0,01
Depression	-0,474	0,155	-3,06	<0,05	**-1,209**	0,359	-3,37	<0,01
Anxiety	**-0,522**	0,149	-3,50	<0,01	-0,723	0,345	-2,09	<0,05

In the group of young professionals as a whole, hostility, depression and anxiety make a smaller contribution to the components of SWB (Table 4). As for the group of students, for the group of young professionals two models were identified with the dependent variables emotional and psychological well-being. Depression makes the greatest negative contribution to emotional well-being, and anxiety is not a significant variable (R^2=0.330; p<0.01). Anxiety also does not make a significant contribution to psychological well-being, but unlike emotional well-being, hostility, which makes a negative contribution, is more significant for psychological well-being (R^2=0.270; p<0.01).

Table 4

Results of regression analysis (young specialists)

	Emotional well-being				**Psychological well-being**			
	B	**SE**	**t**	**p**	**B**	**SE**	**t**	**p**
Constant	16,165	0,725	22,292	<0,01	32,3805	1,531	21,155	<0,01
Hostility	-0,658	0,262	-2,512	<0,05	**-2,1289**	0,553	-3,850	<0,01
Depression	**-0,850**	0,192	-4,417	<0,01	-1,3141	0,406	-3,234	<0,01
Anxiety	-0,198	0,198	-0,999	=0,32	-0,0904	0,418	-0,216	=0,83

The discussion of the results

The first important result was the discovery of higher levels of depression among students than among young professionals. In our opinion, the high level of depression among students is associated with distance learning during the pandemic and a decrease in social activity, which is most important during the student period. In the study by L.V. Kocharova and her colleagues found that senior students have a lower level of depression than undergraduate students, which is largely explained by the difficulties of adapting to a new environment (Kocharova, Skripov, Slivka, 2020).

In both groups, it was found that anxiety and depression are associated with the emotional component of well-being, which seems logical to us, since, according to ICD-10, a high level of depression refers to affective disorders, and a high level of anxiety refers to neurotic disorders associated with stress, which also negatively affects the experience of positive emotions. An interesting thing is the difference in the connection between hostility and well-being components: in the group of students, hostility is associated more with emotional well-being, and in the group of young professionals - with psychological well-being.

It is important to note the contribution of the considered variables to emotional and psychological well-being separately in the group of students and young professionals. In the group of students, hostility is the most significant variable that reduces the level of well-being, both emotional and psychological. This suggests that a negative attitude towards the world around us does not allow us to sufficiently enjoy life and fully realize ourselves as a person. Depression and anxiety make approximately the same contribution to the emotional well-being of students, and for psychological well-being, on the contrary, a high level of depression is more significant than a high level of anxiety. In the first case, it can be assumed that in students, anxiety associated with adaptation to learning is intensified by anxiety about their future and their health, which can lead to the development of depressive states, in which the ability to enjoy life is reduced. In the second case, depression can be either a consequence of prolonged anxiety or a self-occurring disorder. With depression, motivation to act decreases, the perception of oneself and others often becomes negatively colored, which together hinders personal development and is reflected in a low assessment of one's psychological well-being.

In young professionals, depression, anxiety, and hostility are generally less significant for the components of SWB. However, this group of respondents also found differences in the contribution of these variables to the components of SWB. First, anxiety does not make a meaningful contribution to either emotional or psychological well-being. We assume that young professionals are better adapted to anxiety and are able to cope with difficulties despite its presence, so it does not affect the components of SWB. Secondly, emotional well-being is more affected by depression, which is consistent with the interpretation of this fact in the group of students. Thirdly, if hostility in the group of students makes the greatest contribution to both emotional and psychological well-being, then in the group of young professionals hostility is less significant for emotional well-being, but is highly significant for psychological well-being. Since psychological well-being implies not only personal development, but also the ability to build trusting relationships with other people, a high level of hostility associated with a negative assessment of others prevents comfortable interaction with them, which prevents a person from fully feeling psychologically well-being.

Thus, the results of the study showed differences in the contribution of depression, anxiety and hostility to the components of SWB in groups of students and young professionals and can be used in psychological counseling to increase the level of SWB in youth.

Conclusions:

1. Students aged 18-22 have a higher level of depressive symptoms in contrast to young professionals aged 28-35, which is due to the peculiarities of their social situation.

2. Hostility, symptoms of depression and anxiety primarily affect a decrease in positive emotions and interest in life both in the group of students and in the group of young professionals. In the group of students, hostility has the strongest impact on emotional well-being, and in the group of young professionals - on psychological well-being.
3. In the group of young professionals, anxiety does not contribute to the components of subjective well-being, which may be a sign of successful adaptation of this category of youth to an anxious state.

References

1. Ababkov V.A., Baryshnikova K., Vorontsova-Venger O.V. and others. Validation of the Russian version of the questionnaire "Perceived Stress Scale-10" // Bulletin of St. Petersburg State University. Episode 16: Psychology. Pedagogy. 2016. No. 2. pp. 6–15

2. Burkova V.N., Butovskaya M.L., Fedenok Yu.N. and others. Anxiety and aggression during covid-19: the example of four regions of Russia // Siberian Historical Research. 2022. No. 2. P. 132–158

3. Dekhtyarenko A. A., Shlyagina E. I., Gusev A. N. Predictors of psychological well-being // Questions of psychology. 2022. V. 68, no. 2. pp. 135–146.

4. Dekhtyarenko A.A., Shlyagina E.I. The contribution of long-term personality orientation to the psychological well-being of youth // Questions of psychology. 2023 (in press).

5. Dontsov D.A., Dontsova M.V. Psychological features of youth (student) age // Educational technologies. 2013. No. 2. P.34–42.

6. Enikopolov S.N. Hostility in clinical and criminal psychology // National psychological journal. 2007. No. 1(2). pp. 33–39.

7. Kochorova L.V., Skripov V.S., Slivka A.S. On the issue of anxiety and depression in the youth student environment // Science of the Young – Eruditio Juvenium. 2020. No. 2. pp. 246–253.

8. Leontiev D. A. Happiness and subjective well-being: towards the construction of a conceptual field // Monitoring of public opinion: Economic and social changes. 2020. No. 1. P. 14-37. https://doi.org/10.14515/monitoring.2020.1.02.

9. Nestik T.A., Zadorin I.V. Russians' attitude to global risks: socio-demographic and psychological factors of threat perception //Monitoring of public opinion: economic and social changes. 2020. No. 5. P. 4–28. https://doi.org/10.14515/monitoring.2020.5.1700

10.Pogosova N.V., Dovzhenko T.V., Babin A.G. and others. Russian-language version of the phq-2 and 9 questionnaires: sensitivity and specificity in identifying depression in patients of general medical outpatient practice // Cardiovascular Therapy and Prevention. 2014. V. 13. No. 3. pp. 18–24.

11.Rasskazova E.I., Leontiev D.A., Lebedeva A.A. Pandemic as a challenge to subjective well-being: anxiety and coping // Consultative psychology and psychotherapy. 2020. Vol. 28. No. 2. pp. 90–108. DOI: 10.17759/cpp.2020280205

12.Keyes, C. L. M. (2013). Mental Health as a Complete State: How the Salutogenic Perspective Completes the Picture // Bridging Occupational, Organizational and Public Health. P. 179–192. doi:10.1007/978-94-007-5640-3_11

13.Robitschek, C., & Keyes, C. L. M. (2009). Keyes's model of mental health with personal growth initiative as a parsimonious predictor // Journal of Counseling Psychology. 56(2). P. 321–329. https://doi.org/10.1037/a0013954

DOI 10.34660/INF.2023.43.87.238

D.S. Likhachev 院士所理解的文化生态学
ECOLOGY OF CULTURE AS UNDERSTOOD BY ACADEMICIAN D.S. LIKHACHEV

Kirillova Tatyana Sergeevna
Doctor of Philology, Professor, Head of Department
Astrakhan State Medical University, Russia

Kostrykina Lyubov Sergeevna
Senior Lecturer
Astrakhan State Medical University, Russia

注解。 环境生态学与文化生态学密切相关。 它是一个单一的整体。 只有这两个组成部分和谐结合，才有利于社会的全面发展和繁荣。 D.S.利哈乔夫关于文化生态学的教学的主要内容是教授文化。

关键词：生态、文化、语言、社会、自然、人、教学。

Annotation. *Environmental ecology is closely connected with cultural ecology. It is a single unity. Only the combination of these two components in harmony contributes to the full development and prosperity of society. The main thing in the teaching of D.S. Likhachev on the ecology of culture is teaching culture.*

Keywords: *Ecology, culture, language, society, nature, people, teaching.*

There are two sections in ecology: biological ecology and cultural or moral ecology. Failure to carry out the laws of biological ecology can kill a person biologically; failure to carry out the laws of cultural ecology can kill a person morally. And there is no border between them, just as there is no clearly defined boundary between nature and culture.

Cultural ecology should not be confused with the science of restoration and conservation of individual monuments. The cultural past of our country should be considered not in parts, as it is customary, but as a whole. It should be not only about preserving the very character of the area, “its facial expression,” the architectural and natural landscape. This means that new construction should resist the old ones as little as possible, harmonize with them, and preserve the everyday habits of the people (this is also “culture”) in its best manifestations. A sense of shoulder, a sense of ensemble and a sense of the aesthetic ideals of the people - this

is what a city planner, and especially a village builder, must have. Architecture must be social. Cultural ecology must be part of social ecology.

So far, in the science of ecology there is no section on the cultural environment.

Prohibitions, instructions and boards stating "Protected by the State" alone are not enough. It is necessary that the facts of irresponsible attitude towards cultural heritage should be strictly investigated in the courts and the guilty persons should be severely punished. But this is not enough. It is absolutely necessary to introduce the teaching of local history in the secondary school curriculum with the basics of biological and cultural ecology, and to create wider circles in schools on the history and nature of the native land. Patriotism cannot be called upon; it must be carefully brought up.

Culture has traditionally been contrasted with nature as man-made versus non-man-made, and ecology was initially understood as the science of human interaction with the environment. However, in the history of Russian thought there is a concept that made it possible to extend the concept of "ecology" to culture and language as part of it. We are talking about the scientific heritage of D.S. Likhachev (1906-1999), whose anthropocentric theory of the integrity and indivisibility of culture forced us to take a different look at the issues of preserving culture and language and anticipated the emergence abroad of a new scientific direction in linguistics - ecolinguistics [3].

The scientist projects the concept of "culture" onto nature, revealing in it orderliness, harmony, and a kind of "sociality" (the coexistence of different types of vegetation). He attributes the same harmony to the relationship between man and nature (the influence of Russian landscapes, steppe expanses, open spaces on the national character). Culture for him is a living space. And therefore the cultural concepts with which he thinks are the same for natural science - as if we are talking about a living organism.

Likhachev proposes to consider two sections in ecology: biological ecology and cultural or moral ecology. Between them, he believes, there is no clearly defined boundary. Neglecting each of them is the danger for humanity: in the first case, it faces biological death, and in the second, moral death.

Emphasizing "the moral significance and influence of the entire cultural environment influencing a person in all its interrelations" [1, p. 486], the scientist calls for the inclusion of the issue of "moral ecology" in the humanities as the most important aspect for human life.

Language in the system of Likhachev's views appears to be the basis of culture: "The national language in its potential one is like a "substitute" of Russian culture" [5, p. 246].

The concepts of the national language together form the concept spheres of the national language; the totality of potentials discovered in the vocabulary of an in-

dividual person - his individual conceptual sphere. Likhachev introduces this term according to the type of terms used by V.I. Vernadsky (“noosphere”, “biosphere”), which once again proves: in the scientist’s system of views, culture is a living human environment, the same for the atmosphere, without which life is impossible in principle. The linguistic and cultural meanings surrounding a person, according to Likhachev, form the sphere of his existence - the “human sphere”.

As part of the Russian language, Likhachev identifies a kind of cultural layers, which we can, based on his terminology, call “integrities of the conceptual sphere”: folklore, scientific terminology, paremias (proverbs, sayings, phraseological units, “walking quotes” from the Holy Scriptures, from classical works of Russian literature, from romances and songs), common names of literary heroes. Likhachev does not limit the cultural layers to the original national ones, including here “the concepts and images of world literature, world science, world culture - through painting, music, translations, through the languages Greek and Latin” [2, p.27]. A single “human sphere” cannot be divided into separate “ethnospheres”.

Just as the Earth’s biosphere is necessary for the life of all living things, so the richness of the conceptual sphere, in Likhachev’s understanding, is a necessary condition for a full-fledged human life.

What is the difference between natural ecology and cultural ecology? The damage in nature (flora, fauna) can be corrected to a certain extent, since it is alive and capable of self-purification and restoration with the sensitive and intelligent participation of man (although here too sometimes irreparable things happen).

Any cultural loss is irreparable. It is impossible to return bombed churches, demolished houses, destroyed masterpieces of painting, burned books. “Manuscripts are not burnt” is an artistic metaphor, which, unfortunately, is not realized in cultural practice. The “reserve” of the cultural environment is depleted, warns Likhachev. Notre-Dame de Paris Cathedral may be rebuilt, but it will be a different cathedral, not the previous one.

That is why an important component of Likhachev’s teaching on the ecology of culture is teaching culture.

To preserve the culture necessary for the “moral settlement” of a person, it is needed not patriotic speeches, but active love for the Motherland, which cannot arise without a “normal moral climate”, without special knowledge about the native history and culture, without efforts invested in the education of the growing young generations.

P.S. Culture creates “bridges” between people and between their souls.

Literature

1. D.S. Likhachev. Ecology of culture // Likhachev D.S. Selected works on Russian and world culture. St. Petersburg: SPbGUP, 2015. pp. 485 – 500.

2. Likhachev D.S. Notes about Russian. St. Petersburg: Logos, 1997.

3. Likhachev D.S. Culture as a compound environment // Likhachev D.S. Selected works on Russian and world culture. SPb.: SPbGUP, 2015. pp. 21 – 33.

4. Likhachev D.S. Conceptosphere of the Russian language // Likhachev D.S. Selected works on Russian and world culture. St. Petersburg: SPbGUP, 2015. pp. 240 – 251.

5. Likhachev D.S. I live with a feeling of parting... / the conversation was recorded by D. Shevarov // Komsomolskaya Pravda, 1996, March 5 (No. 42). S. 5

6. Zheleznova E.G. On the issue of the ecology of language and ecological linguistics // Scientific Bulletin of YuIM, 2016. No. 3. P. 70 -73

7. Pylaeva E.M. On the issue of ecolinguistics in the aspect of modern ecological-evolutionary research [electronic resource]. – Access mode: http://vestnik-rzi.ru/2014/02/1367

8. Poteryakhina I.N. Ecological problems of language in modern linguistics [electronic resource]. – Access mode: http://www.nop-dipo.ru/ru/node/346

DOI 10.34660/INF.2023.80.26.239

中国对外文化政策的管理层级
ADMINISTRATION LEVELS OF FOREIGN CULTURAL POLICY IN CHINA

Sorokina Ekaterina Mikhailovna
Senior Lecturer
Moscow State University named after M.V. Lomonosov

抽象的。 文章提出了中国国家对外文化政策行为主体的层级结构，其中最顶层是政府，作为文化政策的主要制定者。 下一个层次是智库代表； 第三级包括具体的地区性、部门性和民间文化艺术组织。 作者得出的结论是，中国的文化政策将对中国的世界地位产生长期的积极影响。

关键词：中华人民共和国对外文化政策、中国文化、文化合作、文化普及、中国。

Abstract. *The article presents the hierarchical structure of actors in China's state foreign cultural policy, at the top level of which is the government as the main creator of cultural policy. The next level is represented by think tanks; the third level includes specific regional, departmental and private cultural and arts organizations. The author comes to the conclusion that China's cultural policy will have a long-term positive impact on the country's position in the world.*

Keywords: *foreign cultural policy of the PRC, Chinese culture, cultural cooperation, popularization of culture, China.*

China is one of the states for which the spread of culture is one of the important directions of foreign policy. The Chinese government formulated the concept of socio-economic development at the beginning of the century. Every year, the PRC develops more than 15,000 cultural events in various countries around the world [Official...]. The model of the foreign cultural policy of the PRC has been carefully developed and is characterized by a constant increase in the volume of funding for cultural institutions, a large coverage of participants in cultural relations, and a large scale of various actions filling all spheres of culture. The levels of cultural policy within the country are interconnected and have a strict hierarchical system. The "14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Plan of Long-Term Goals for 2035" [14th...] sets goals for building a strong cultural power, which quotes the words of President of the People's Republic of China Xi Jinping about introducing a system of

responsibility for ideological work in in the cultural sphere as well. The need to adhere to the principles of responsibility and hierarchical management, improve classification measures, and strengthen the effective management of various ideological positions is pointed out [Xu Hai 2021].

The main body for managing the cultural policy of the PRC is the state, which is the bearer of ideas, relies on the structural foundation of civilization and actively participates in the dissemination and exchange of ideas. For large Eastern countries, the question of how to effectively lead and integrate diverse cultural trends in the process of rapid development and transformation is a serious issue that requires careful study. In this matter, the Chinese government is following the course of creating a culturally powerful country, which is built in accordance with the overall strategic development plan of the state. Such a policy requires strong value guidance and spiritual driving force from literature and art. It is proposed to establish a people's creative direction, produce more works praising the Party, the motherland and the people, and adhere to the core socialist values to guide literary and artistic creativity [Huang 2020].

Indeed, at the official level, the government is not only the creator, but also the concrete conductor of cultural foreign policy. Negotiations and signing of cultural agreements, formation and cooperation with world cultural organizations, participation in international conferences, mutual visits of various cultural delegations are inseparable from the direct participation of the government. Also, cultural foreign policy at the government level includes participation in multilateral cultural diplomacy within the framework of UNESCO, SCO, BRICS, etc.

Institutions directly subordinate to the Ministry of Culture and Tourism of the People's Republic of China are the Chinese Academy of Arts, national museums, theaters, etc. It is interesting to note the presence of a large number of centers for managing the cultural industry, for example, the Arts Development Center, the Talent Center, the National Art Foundation Management Center, the National socio-cultural development center, etc. The activities of these centers are focused on regulating key components of the cultural process or on certain groups of Chinese citizens. The administration of international cooperation of the Ministry is carried out by the Center for Sino-Foreign Cultural Exchanges and the Center for Management of the Construction of Overseas Cultural Facilities, which are responsible for promoting cultural exchanges between China and other countries, supporting business, and promoting Chinese culture abroad.

The second level of cultural policy management is analytical centers, which become executors of state ideas and function in the direction of the official policy of the PRC. Their goal is considered to be the dissemination of developed ideas and scientific works, the inclusion of Chinese centers in international scientific and public discourse. V. Nezhdanov's report noted that think tanks are dependent on

government funds; their activities are aimed at strengthening China's "soft power" in the world. The unspoken task of the centers is to build a strong public opinion on projects beneficial to the Chinese government, develop state propaganda, and legitimize decisions made by the Chinese government [Nezhdanov 2017]. Thus, the activities of the centers are aimed at disseminating the ideas of the state both within the PRC and abroad.

Most unilateral cultural and artistic events on Chinese culture are carried out primarily with the support and funding of the Ministry of Culture and Tourism of the People's Republic of China. In many regions of Russia, before the epidemic, Chinese theater productions were presented, performances by circus actors were especially popular, and leading regional museums exhibited works by Chinese artists and photographers. During the epidemic, the leadership of the People's Republic of China decided to create a series of lectures, educational programs and films in Russian, introducing Russian citizens to the culture of China. The Chinese government is centrally and consistently working to create a positive image of China in our country.

The next level includes specific regional, departmental and private organizations of culture and art, which include theaters, museums, libraries, concert institutions, etc. These institutions carry out their activities in order to preserve and develop national culture, support the cultural industry, and organize leisure activities. Jia Xudong, a researcher at the Cultural Research Center of the Chinese Academy of Social Sciences, notes that in the future, private initiatives for cultural production will increase, and the government component will decrease. On the other hand, due to the need to ensure fair distribution of cultural products, the scope of government provision of cultural services tends to increase [Jia 2018].

The directions of foreign cultural policy of modern China are multifaceted and diverse. Priority areas include the popularization of traditional and modern Chinese culture, expansion of the network of cultural institutions abroad and raising their status, audiovisual activities, scientific and educational cooperation, dissemination of the Chinese language, and development of related industries. It is worth noting that modern cultural relations between China and other countries in these areas are developing most actively.

According to S.V. Novoseltsev, the use of the "Chinese Dream" concept gives the Chinese government the opportunity to set a general policy line without specifying individual steps, and also allows for the integration of different views and ideas into it [Novoseltsev 2016]. Thus, cultural policy actors are faced with completely different tasks to cultivate traditional values and virtues, develop morality, preserve folk culture, attract the younger generation, etc.

China adheres to several characteristic principles in managing cultural policy. The main thing is the preservation of cultural diversity and the peaceful coexis-

tence of many cultures. The report of the Seventeenth National Congress of the Communist Party of China stated that countries should learn from each other and prosper together, and should not exclude the cultures of other nationalities. [Report...] Thus, China opposes cultural hegemony, saying that it is contrary to the historical development of civilizations. The culture of each country has elements that are important from a universal human point of view, but also contains limitations, so it is necessary to study the strengths of different cultures and strive for common development.

Another principle is pointed out by A.O. Naumov and R.S. Polozhevich. In view of China's public position that the building of a harmonious Chinese society and the world as a whole are interconnected, the cultural policy of the PRC is aimed not only at external, but also at internal audiences. Due to the growing influence of Western culture on the Chinese, the PRC leadership is making significant efforts to popularize the national culture and historical heritage of China, and increase the country's prestige in the eyes of its own citizens [Naumov 2018].

An attractive image for any nation is a positive identity, accompanied by a sense of pride from the awareness of belonging to a particular nation, understanding of its leadership, significance for the world community, as well as a strong and clear national identity, based on historical traditions, supported by victories and achievements.

Creating a positive image of the country in the world community is one of the strategies of the Chinese government. As China emerges as a key player in many global issues, its involvement in international affairs is becoming more widespread. It is believed that thanks to the soft power of cultural policy, the potential and support of the PRC in the global dimension is growing. Since the end of the twentieth century, the international status of the PRC has improved significantly, the Chinese nation's understanding of culture and its role has expanded, which provides unprecedented historical opportunities for building a "cultural power with a socialist ideology."

China has introduced the cultural aspect into the circle of the most priority components of its foreign policy. The creation of a comprehensive model is unique in its scale, decisiveness and consistency of implementation, as well as in the level of coordination between various public and private institutions. In this direction, the experience of China can become a good example for many countries, including Russia. Obviously, the horizon for such activity is quite long-term, and the effect is calculated for decades to come, but the first intermediate results can be summed up in the next five to seven years.

References

1. 14th five-year plan for national economic and social development of the PRC and the plan for long-term goals for 2035 [Electronic resource]: Xinhua. 03/12/2021. URL: http://www.xinhuanet.com/2021-03/13/c_1127205564.htm (Accessed 12/15/2023) (in Chinese)

2. Naumov A.O., Polozhevich R.S. "Soft power" and public diplomacy of the People's Republic of China at the present stage // New and recent history. 2018. No. 5. pp. 105-118

3. Nezhdanov V. Cultural expansion of the XIII Five-Year Plan: reform of the cultural industry of the PRC and the creation of a global propaganda network [Electronic resource]: Russian Council on International Affairs. 07/03/2017. URL: https://russiancouncil.ru/analytics-and-comments/columns/sandbox/kulturnoe-rashirnie-xiii-pyatiletki-reforma-industrii-kultury-knr-i-sozdanie-globalnoy-seti-propag/ (Accessed 15.06 .2022)

4. Novoseltsev S.V. The concept of the "Chinese dream" and its practical application // Comparative Politics. 2016. No. 1(22). pp. 5-21

5. Report of the 17th National Congress of the Communist Party of China [Electronic resource]. URL: http://est.ustc.edu.cn/_t82/2010/0613/c4602a42858/page.htm (Accessed 06/15/2022) (in Chinese)

6. Official website of the Ministry of Culture and Tourism of the People's Republic of China [Electronic resource]. URL: https://www.mct.gov.cn/whzx/whyw/202009/t20200917_875150.htm

7. Pogorletsky A.I., Dai Xiaofeng China's cultural diplomacy as a tool of "soft power" to influence the system of world economic relations during the COVID-19 pandemic // Economic relations. 2021. Volume 11, No. 2. P. 281-302

8. Xu Hai. Leadership in the construction of a cultural power with socialist ideology [Electronic resource]: Renminwang. 10/12/2021. URL: http://theory.people.com.cn/n1/2021/1012/c40531-32250354.html (Accessed 12/15/2023) (in Chinese)

9. Huang Kunming. Promoting the construction of a socialist cultural power. [Electronic resource]: CPC news site. 11/23/2020. URL: http://chuxin.people.cn/n1/2020/1123/c428144-31940199.html (Accessed 12/15/2023) (in Chinese)

10.Jia Xudong. Cultural Policy and Industry of China in the Context of Globalization // Century of Globalization. 2018. No. 2(26). pp. 101-114

DOI 10.34660/INF.2023.73.76.240

城市固体废弃物回收综合体技术链框架内废物处置图作业的环境和建设方面（研究案例：莫斯科地区）

ENVIRONMENTAL AND CONSTRUCTION ASPECTS OF THE WASTE DISPOSAL MAP OPERATION WITHIN THE FRAMEWORK OF THE MSW RECYCLING COMPLEX TECHNOLOGICAL CHAIN (CASE OF STUDY: MOSCOW REGION)

Spirin Mikhail Igorevich
Postgraduate

Kharlamova Marianna Dmitrievna
Candidate of Chemical Sciences, Associate Professor

Averianova Ekaterina Igorevna
Student
Patrice Lumumba Peoples' Friendship University

注解。 本文考虑了莫斯科地区城市固体垃圾（SMW）企业现有的分类和处理方案。 考虑到达 KPO 的废物流的特征，提出形态成分的定量和定性特征，分析废物处置阶段产生的污染物排放成分的实际数据，确定最有问题的区域和优先生态毒物，方法 提出尽量减少对环境和企业员工健康的负面影响。

关键词：城市固体废物（SMW）、污染物排放、分类和处理综合体、废物处置。

Annotation. *The article considers the existing scheme of the enterprise for sorting and processing of solid municipal waste (SMW) in the Moscow region. The features of waste streams arriving at KPO are considered, quantitative and qualitative characteristics of morphological composition are presented, actual data on the composition of pollutant emissions generated at the stage of waste disposal are analysed, the most problematic areas and priority ecotoxicants are identified, ways to minimise the negative impact on the environment and health of the enterprise's employees are proposed.*

Keywords: *solid municipal waste (SMW), pollutant emissions, sorting and treatment complex, waste disposal.*

Introduction

With the economic, social and industrial development of society, population growth and consumption, one of the main problems of effective environmental management is the need to implement in practice the principles of closed-cycle

economy (CCE) and effective waste management. One of the basic principles of realisation of ECC principles is waste sorting (separation), which allows to change the qualitative and quantitative composition of solid waste, that is why it is a unifying process in the scheme of integrated waste management [1], but anyway, at the existing level of technology and society development, it is impossible to completely abandon waste disposal. That is why the paper considers the impact of the waste disposal map (landfill) on the environment, as well as assesses the degree of gas-geochemical hazard of soils.

Object of study

One of the newly built waste treatment complexes (WTC) located in the Moscow region with a capacity of 905 thousand tonnes/year of incoming waste stream was selected as the object of the study.

The waste processing complex consists of several main units performing the following technological functions:

1. The reception compartment is intended for receiving and temporary storage of waste prior to sorting.
2. The sorting workshops are located in closed premises, include two sorting lines with a throughput capacity of 23 tonnes/hour each, and are equipped with modern automatic sorting technologies.
3. The composting plant is a covered room with air ducts under the ceiling to ventilate the room, the ventilation system is switched on by the operator as needed to remove contaminated air. The base is concrete and has an aeration system (holes for air supply and oxygenation of the compost). It also has a leachate drainage system.
4. Landfill maps are used for disposal of non-disposable parts of the sorting, are located in the open air, the map area is 135000m^2.

According to the data obtained, the types of waste delivered to KPO can be divided into three main streams in the following percentages: mixed solid municipal waste (MSW) - 59%; recyclables collected through separate waste collection (SWC) - 6%; and bulky waste (KGS) - 35%.

CSW (residues of furniture, trees, construction debris, etc.) is separated from the general flow and sent to the crushing zone - to the technical soil production area (TSGA) or to the composting shop, for further use as technical soil for filling the landfill map. These wastes are inert and do not emit hazardous pollutants, so they are not considered further in this work.

TCO and RDF - waste suitable for further treatment in sorting shops. The morphological composition of incoming mixed waste includes 81% of bio-organic waste (food residues, leaves, sawdust, swarf, etc.) and 19% of secondary material resources (SMR)

After the waste stream has passed through the sorting facility, unliquid waste that has not been sent to the composting facility or selected as a TMR is sent to the landfill map for further disposal.

The burial process takes place in two stages:

1. Waste is placed evenly on the surface of the allocated area of the disposal map, not more than 2 metres high,
2. The layer of technical soil left after the development of the disposal map and/or from the technical soil obtained from shredded CSW is backfilled.

The construction/development of the landfill (landfill) map utilises a geomembrane subgrade, the landfill is surrounded by a dyke to prevent surface runoff from flowing beyond the landfill boundary, and a drainage system is provided for leachate disposal. These measures prevent contamination of groundwater and soil.

The main pollutants and their concentrations in emissions in the immediate vicinity of the waste disposal site on the disposal map are presented in **Table 1**. Since the disposal map is located in the open air, the comparison of the obtained concentrations of pollutants was carried out with MACm.R. in the atmospheric air.

Table 1

Content of pollutants in the atmospheric air at waste disposal on the disposal map

№	Name of pollutant	Concentrations, mg/m^3	MPCmR in atmospheric air, mg/m^3 [7]	Hazard class, GOST 12.1.005
1	Methane	11,27	50,0	IV
2	Carbon oxide	1,51	5	IV
3	Methylbenzene (toluene)	0,091	0,6	III
4	Dimethylbenzene (xylene) (mixture of isomers o-, m-, p-)	0,083	0,25	III
5	Suspended solids	0,08	0,5	III
6	Nitrogen dioxide	0,12	0,2	III
7	Ethylbenzene	0,0077	0,02	IV
8	Ammonia	0,04	0,2	IV
9	Nitrogen (II) oxide	0,18	0,4	III
10	Formaldehyde	0,013	0,05	II
11	Hydrogen sulphide (dihydrosulphide)	0,027	0,008	II
12	Sulphur dioxide	0,12	0,5	III

In the air of the working zone on the landfill maps exceedance of pollutant concentrations was detected only for hydrogen sulphide (see **Table 1).**

To verify the fire and explosion hazard level of the landfill disposal maps, a gas geochemical study was also conducted. Based on the results of the analysis, a summary **Table 2 was** compiled to assess the hazard of soils based on gas concentrations in ground air according to SP 502.1325800.2021. [2]

Table 2

Concentrations of gases in ground air and assessment of the degree of gas-geochemical hazard of soils

sample no.	Gas concentration in ground air in boreholes, %ob.					Degree of gas-geochemical hazard of soils
	CH_4, ob%	H_2, vol%	O_2, ob%	N_2, ob%	CO_2, vol%	
1	35,312	1,320	1,064	5,548	51,946	explosive/fire hazardous
2	0,087	10,191	2,869	16,445	65,940	explosive/fire hazardous
3	0,039	1,910	11,676	61,028	22,487	dangerous
4	0,093	10,794	2,879	13,785	67,317	explosive/fire hazardous
5	0,047	14,633	3,211	12,607	60,876	explosive/fire hazardous
6	0,507	5,815	4,133	30,305	56,753	explosive/fire hazardous
7	0,151	2,511	2,679	39,444	52,146	dangerous
8	0,379	7,606	2,993	15,637	71,032	explosive/fire hazardous
9	0,291	0,086	8,797	70,756	14,212	dangerous
10	2,346	0,098	1,378	46,018	46,854	dangerous
11	2,610	1,105	2,547	30,616	58,111	dangerous
12	12,267	0,137	0,639	33,436	48,166	explosive/fire hazardous
13	7,903	1,829	6,693	36,058	44,481	explosive/fire hazardous
14	3,806	0,033	16,365	64,653	5,884	dangerous
15	37,022	0,032	0,667	3,130	39,254	explosive/fire hazardous
16	34,777	0,002	2,980	11,947	32,261	explosive/fire hazardous
17	11,256	0,039	1,391	56,240	25,324	explosive/fire hazardous
18	40,633	0,005	3,328	12,925	29,845	explosive/fire hazardous
19	24,392	0,117	5,424	30,945	33,661	explosive/fire hazardous
20	12,542	0,135	9,062	54,050	19,420	explosive/fire hazardous

As can be seen from the table presented, the soils of the landfill map contain zones with high methane content, which is consistent with the data [3, 4]. In addition, the presence of high concentrations of carbon dioxide in all disposal layers was confirmed throughout the landfill. Hydrogen formation was expectedly not recorded in the soils, since its formation occurs only at the earliest stage of methanogenesis

Conclusions and recommendations

Based on the analysis of the composition of emissions on the landfill map, it can be concluded that the most dangerous pollutants are hydrogen sulphide (H_2S),

a substance of hazard class II. It is also important to note that the ground air of the landfill map contains a large amount of methane (CH_4) and carbon dioxide (CO_2), which characterises these soils as hazardous and explosive/fire hazardous, and the use of biopreparations

To reduce concentrations of hydrogen sulphide (H_2S) in emissions and methane (CH_4) and carbon dioxide (CO_2) in soils, it is advisable to use treatment with special biopreparations, which are mixtures of various microorganisms. Development and research of such biopreparations is currently being carried out at the Institute of Ecology of PFUR [5, 6]. The use of such biopreparation at the initial stage of waste treatment will accelerate the biodegradation of organic substances present in waste, suppress the formation of volatile organic compounds, including sulphur- and nitrogen-containing compounds, and reduce odour at all stages of the technological chain.

List of references

1. Zhilyakova V.V., Problematics of the introduction of rubbish reform on the territory of the Russian Federation // Education and Law. 2019. №4.

2. SP 502.1325800.2021 "Engineering and environmental surveys for construction. General rules of works» dated 16.07.2021.

3. Biogas Production from Municipal Solid Waste Landfills, B. B. Karki, B. G. Kim, and M. H. Lee, Energies 2019, 12, 2441.

4. Methane and Carbon Dioxide Generation Potential From Organic Waste in Landfills, C. J. Noorduin, Energies 2021, 14, 730.

5. M.D. Kharlamova, D.I. Zhilyaev et al. Analysis of volatile organic compound emissions and elimination of unpleasant odours during storage and accumulation of bio-organic waste from fish trout farms in KareliaEcology and Industry of Russia Russia, M., Vol. 26, No. 12 (2022). C. 38-45.

6. Resolution of the Chief State Sanitary Doctor of the Russian Federation from 13.02.2018 N 25 On approval of hygienic standards GN 2.2.5.3532-18 Hygienic standard GN 2.2.5.3532-18 (valid until 10.02.2028) Maximum permissible concentrations (MPC) of harmful substances in the air of the working area.

DOI 10.34660/INF.2023.13.37.241

巴什科尔托斯坦共和国阿尔汉格尔斯克州阿尔汉格尔斯科耶村饮用水的理化特性
PHYSIOCHEMICAL PROPERTIES OF DRINKING WATER IN THE VILLAGE OF ARKHANGELSKOYE, ARKHANGELSK REGION, REPUBLIC OF BASHKORTOSTAN

Ilina Irina Valeryevna
Candidate of Biological Sciences, Associate Professor
Sibai Institute (branch), Sibai, Russia

Papyan Elsa Eldarovna
Candidate of Geographical Sciences, Associate Professor
Sibai Institute (branch), Sibai, Russia

Yarmullin Ainur Arsenovich
student
Sibai Institute (branch), Sibai, Russia

注解。 本文介绍了巴什科尔托斯坦共和国阿尔汉格尔斯克地区饮用水理化特性的评估结果。 研究了饮用水的感官参数。 化学分析表明，重金属（铜、锌、镍、锰、钴、铅、镉）含量未超过最高允许浓度。 阿尔汉格尔斯科耶村饮用水中的盐浓度（硝酸盐、氯化物、硫酸盐、亚硝酸盐、磷酸盐、铵离子）不超过最大允许浓度。

关键词：饮用水、感官参数、饮用水理化特性、重金属、饮用水盐浓度。

Annotation. *This paper presents the results of an assessment of the physiochemical properties of drinking water in the Arkhangelsk region of the Republic of Bashkortostan. The organoleptic parameters of drinking water have been studied. Chemical analysis showed that the content of heavy metals (Cu, Zn, Ni, Mn, Co, Pb, Cd) does not exceed the maximum permissible concentration. Salt concentration (nitrates, chlorides, sulfates, nitrites, phosphates, ammonium ions) in the drinking water of the village of Arkhangelskoye does not exceed the maximum permissible concentration.*

Keywords: *drinking water, organoleptic parameters, physiochemical properties of drinking water, heavy metals, salt concentration in drinking water.*

In order to assess the state of drinking water in the vicinity of the village of Arkhangelskoye in the Arkhangelsk region of the Republic of Bashkortostan, organoleptic parameters of drinking water, as well as concentration of heavy metals

(Cu, Zn, Ni, Mn, Co, Pb, Cd) and salts (nitrates, chlorides, sulfates, nitrites, phosphates, ammonium ions) were studied.

The village of Arkhangelskoye in the Arkhangelsk region of the Republic of Bashkortostan is located almost in the extreme south-east of the Russian plain, in the valley of Inser river, which is a tributary of the Belaya River. For this study we took samples of drinking water from a water pipe and a well in the village of Arkhangelskoye, as well as from a spring located 500 m from the settlement. Water sampling was carried out in the winter and spring periods of 2023 (January, April) [1-6].

Organoleptic analysis of drinking water from all samples [1, 2] taken in the spring period in the village of Arkhangelskoye showed that spring water turned out to be of the highest quality in all indicators. There was a faint smell of chlorination in the tap water. The water from the well hada poorly defined taste and a slightly noticeable turbidity, apparently presented by clay impurities (see Table 1)

Table 1.

Results of organoleptic studies of drinking water in the village of Arkhangelskoye in the Arkhangelsk region of the Republic of Bashkortostan

Organoleptic indicators	**Drinking water sources**		
	Water supply	**Well**	**The spring**
Colour	colorless	colorless	colorless
Smell	very weak chlorine odor	odorless	odorless
Taste	tasteless	slightly detectable aftertaste	tasteless
Turbidity	transparent	Weak, barely noticeable turbidity	transparent

The analysis of data on the content of gross forms of heavy metals revealed the following trends.

The content of gross forms of copper in drinking water in all samples does not exceed the maximum permissible concentration. However, the highest metal content was found in tap water compared to other points.

The content of gross forms of lead in drinking water samples is below the maximum permissible concentration. Lead was found in water collected in the spring.

The study of the content of gross forms of iron in the drinking water of the village of Arkhangelskoye revealed an excess of the maximum permissible concentration in all samples in winter and its low content in water in the spring of 2023. So, in January, the maximum permissible concentration were exceeded five times in the well, four times in tap water, 3.8 times in spring water.

Nickel is present in the drinking water of the village of Arkhangelskoye, however, its content does not exceed the maximum permissible concentration. The lowest metal content is recorded in tap water.

The content of gross forms of manganese in drinking water does not exceed the maximum permissible concentration in all samples. In January, the manganese content in the water is higher than in April. The highest content was found in water taken from the well.

The total cadmium content was not detected in drinking water samples in winter. In spring, the content of gross forms of cadmium is increased in the tap drinking water of the village of Arkhangelskoye.

Cobalt was not detected in winter studies in drinking water and is slightly manifested in samples taken in the spring. The cobalt content in our studies does not exceed the maximum permissible concentration.

Salt concentration (nitrates, chlorides, sulfates, nitrites, phosphates) in the drinking water of the village of Arkhangelskoye was detected in insignificant concentrations not exceeding the maximum permissible concentration of drinking water. The lowest content of these salts is observed in spring water.

Among all the ions, the ammonium ion has the highest content. The presence of ammonium ion in surface natural waters is associated with the biochemical processes of decomposition of protein substances and nitrogen compounds. However, no excess of the maximum permissible concentration of ammonium ion in drinking water was detected in all samples.

The determination of the hardness of drinking water in the village of Arkhangelskoye showed that the water from the well and the water pipe is estimated as very hard water (more than 7 mg-eq./l). The water taken from the spring is estimated as soft water (less than 2 mg/l) and it is the most suitable for human consumption.

The quality of drinking water is largely determined by the value of its hydrogen index (pH). The assessment of the hydrogen index of drinking water in the village of Arkhangelskoye showed that drinking water is rated as neutral at all sampling points. The hydrogen index in these samples is in the range of 6.5-7.5 units. This is the best pH option for drinking water.

The assessment of the dry residue content in drinking water showed that the water from all samples is good and drinkable. The dry residue in all analyzed samples does not exceed 1000 mg per 1 liter. The dry residue content in drinking water decreases in the series: well – water supply – spring.

Thus, the results of a comprehensive assessment of the state of drinking water in the village of Arkhangelskoye in the Arkhangelsk region of the Republic of Bashkortostan allowed us to draw the following conclusions. The highest quality in all organoleptic parameters is spring water. There is a faint smell of chlorination in tap water. Drinking water from the well had a poorly defined taste and slightly noticeable turbidity. The content of gross forms of heavy metals (Cu, Zn, Ni, Mn, Co, Pb, Cd) in drinking water does not exceed the maximum permissible concen-

tration. The excess of iron content in all drinking water sources was revealed in January 2023. Salt concentration (nitrates, chlorides, sulfates, nitrites, phosphates, ammonium ions) in drinking water of the village of Arkhangelskoye does not exceed the maximum permissible concentration of drinking water. The lowest salt content is observed in spring water. Drinking water from wells and water pipes is rated as very hard water (more than 7 mg/l). Spring water is soft (less than 2 mg/l) and is the most suitable for human consumption. The assessment of the hydrogen index of drinking water in the village of Arkhangelskoye showed that at all sampling points, drinking water is rated as neutral (pH= 6.5-7.5), this is the optimal pH option for drinking water. In general, the water from all sampling points is good and drinkable. The dry residue in all analyzed samples does not exceed 1000 mg per 1 liter. The dry residue content in drinking water decreases in the series: well – water supply – spring.

References

1. Ivanov S.V., Fedorova E.L., Temirov E.E. The impact of water quality on public health // International Journal of Applied and Fundamental Research. – 2017. – No. 3-2. – pp. 186-189

2. Linnik P.N. Forms of migration of metals in fresh surface waters, 2016.-207c

3. Methods and devices for quality control and the content of harmful substances in water / A.I. Potapov et al. - M.: Nauka, 2008. - 760 p.

4. Moiseenko, T.I. Assessment of environmental hazards in conditions of water pollution by metals / T.I. Moiseenko // Water resources. -2009. –Vol. 26, No. 2. – pp. 186-197.

5. Novikov S.S. Assessment of drinking water quality.- Moscow: Mysl, 1995. pp.205-210

6. Drinking water. Hygienic requirements for the water quality of centralized water supply systems. Quality control. Dignity.PiN 2.14.1074.-01. // Moscow: Ministry of Health of Russia, 2002. pp. 40-43

DOI 10.34660/INF.2023.32.60.242

评估使用微生物分解鱼排泄物过程中的除臭效率

EVALUATION OF THE EFFICIENCY OF ODOR REMOVAL DURING THE DECOMPOSITION OF FISH WASTE FRACTIONS WITH THE USE OF MICROORGANISMS

Romanovskaya Ksenia Sergeevna
Master of Ecology, postgraduate student, Assistant
Institute of Environmental Engineering, RUDN University

Kharlamova Marianna Dmitrievna
PhD in Chemical Sciences, Associate Professor, Deputy Director of Department
Institute of Environmental Engineering, RUDN University

抽象的。 研究了鱼类废物中蛋白质和脂质部分分解过程中产生的排放物的成分，并确定了其中高挥发性有机化合物（VOC）的比例。 研究表明，堆肥第一阶段的排放物含有8类挥发性有机化合物，其中包括具有强烈气味的挥发性有机化合物。 实验生物制剂的有效性已得到评估。 指出了改变生物制剂作用机制以及该领域进一步研究的重要性。 提出了识别吸附剂上浓缩的高挥发性化合物的方法。

关键词：气味、挥发性有机化合物 （VOC）、生物有机废物、鱼类废物、实验生物制备、微生物。

Abstract. *The composition of emissions generated during the decomposition of protein and lipid fractions of fish waste has been studied, and the ratio of highly volatile organic compounds (VOCs) in them has been determined. It has been shown that the emissions at the first stage of composting contain 8 classes of VOCs, including those with a strong odor. The effectiveness of the experimental biological preparation has been assessed. The importance of modifying the mechanism of action of the biological preparation, as well as further research in this area, was noted. The method for identifying highly volatile compounds concentrated on the sorbent was proposed.*

Keywords: *odor, volatile organic compounds (VOCs), bioorganic waste, fish waste, experimental biopreparation, microorganisms.*

During the decomposition of bioorganic waste, a transformation of organic mass occurs, which is accompanied by changes in the chemical composition of

organic molecules and the appearance of various substances, some of which have unpleasant odors. According to studies [2, 4-6, 10-13], much attention is paid to the problems associated with the formation of odors during the decomposition of food waste in landfills or during their processing and composting. Studies [4, 11, 12] have shown that the main components of unpleasant odor during waste decomposition at a landfill are ammonia, sulfides and aromatic compounds, and during industrial composting ammonia and oxygen-containing compounds are formed. Among the pollutants that play a major role in this case are methanethiol, hydrogen sulfide, ethanol, dimethyl disulfide and dimethyl sulfide. Particular attention should be paid to the fact that more than 90% of the contribution to the formation of an unpleasant odor comes from methanethiol [13].

At the same time, the problem of the formation of VOCs, which are released during the disposal and storage of specific bioorganic waste, such as waste from fish farms and fish processing enterprises, remains poorly understood. Most often, fish farms are located in remote areas where there are no utilities, and their production capacity is limited, not exceeding 25-30 tons of fish per year, which also limits the available financial resources. Thus, such enterprises are forced to accumulate and store waste, since they do not have sufficient funds to organize low-waste production that could process valuable waste components, such as fishmeal, fish oil and animal feed. However, the accumulation, storage and disposal of decomposing waste near the water protection zone creates problems for the safety of water resources.

Different varieties of fish initially contain different amounts of protein and amino acids, on average 14-22%. The highest content of amino acids, for example, in rainbow trout meat is lysine (1.907 g), leucine (1.688 g) and valine (1.070 g) (per 100 g of trout) [15]. Under anaerobic conditions and under the action of putrefactive bacteria and carboxylase, amino acids undergo decarboxylation and deamination reactions with the formation of traditional odorants - volatile amines or diamines, which have a strong unpleasant odor.

Fats in the meat of fatty fish, including rainbow trout, range from 8 to 15%; adipose tissue contains up to 60% fatty acids C_{16} and C_{18} [14]. The hydrolysis of fats produces various products, including higher saturated and unsaturated acids, unsaturated hydrocarbons, amides, as well as oxidative products such as keto and hydroxy acids, aldehydes, ketones and other compounds. All these substances contribute to the appearance of a characteristic unpleasant odor.

Strains of microorganisms-destructors and fermentation accelerators have been isolated and analyzed [7, 9]. It is possible to accelerate the decomposition of waste and reduce the concentration of odors by using biological products based on microorganisms, for example, the genus *Clostridium, Pseudomonas* and *Achromobacter*, molds and actinomycetes [3]. Among proteobacteria, the genera *Al-*

caligenes, Acinetobacter, Burkholderia, Pseudomonas, and *Xanthobacter* are the most effective for the decomposition of aromatic and halogen-containing compounds [7]. Bacteria of the genus *Methylotuvimicrobium* can be used to neutralize carbon disulfide [1].

Scientific work [3] determined the qualitative composition of the resulting volatile products from the decomposition of waste from a trout farm located in Karelia, and revealed the dynamics of changes in the composition of emissions of organic compounds under existing storage conditions in plastic tanks and with the addition of an experimental microbiological preparation.

More than 60 organic compounds, including VOCs, were found in the collected gas emissions samples. The emissions contained not only traditional odorants characteristic of emissions from landfills and solid waste landfills, such as xylene, indolysine, toluene, phenol, cresol, naphthalene, biphenyl, but also non-volatile organic compounds - squalene and diethyltoluamide, and these compounds were found in large quantities. The addition of an experimental biological preparation significantly increased the squalene content and reduced the diethyltoluamide content. It has been shown that the addition of a biological preparation does not significantly affect the content of palmitic acid and oleamide (decomposition products of fats) in emissions, but reduces the content of toxic components in emissions - phenol, naphthalene, phthalic acid, styrene and biphenyl.

In this study, the similar experiment was carried out in laboratory conditions. To conduct the experiment, the following samples were prepared: control sample of fresh frozen sea fish - capelin (300 g of fish + 200 g of water) without the addition of microorganism cultures and sample with the addition of 20 ml of an experimental biological preparation.

Substrate digestion was carried out under near realistic conditions. The sorption of each sample was carried out for 3 weeks using Tenax sorbent. The study was carried out by thermal desorption followed by vapor separation using two-dimensional gas chromatography with cryomodulation and mass spectrometric detection.

As a result of the analysis of the obtained data set, the priority chemical compounds detected in all samples and having the content sufficient to trace the dynamics of their changes were selected. Thus, eight classes of VOCs were identified: sulfur-containing compounds, nitrogen-containing compounds, aromatic hydrocarbons, alkenes, heterocyclic compounds, alcohols, ketones, esters. Alkanes were excluded from the analysis due to weak odor or absence in the samples. The mass fractions (m.f.) of VOCs formed during decomposition of fish waste fractions obtained as a result of the experiment are presented in Figure 1.

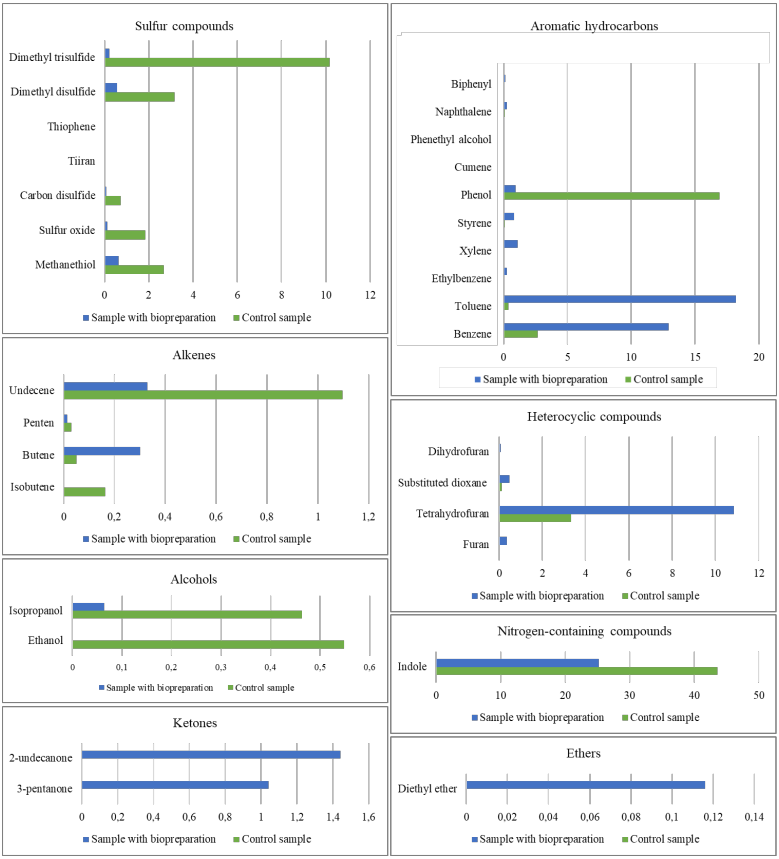


Figure 1. *Mass fractions of control substances in the sample*

According to Figure 1, the effect of the biological preparation is clearly visible. Sulfur-containing VOCs generally form much more slowly: m.f. of substances in total are reduced by more than 90%. The total content of aromatic hydrocarbons increases, but instead of phenol, arenes (benzene, toluene, xylene and styrene) are formed. The addition of biological preparation promotes the formation of oxygen-containing hydrocarbons (ketones and ethers), but prevents the formation of alcohols. In the sample with the biological preparation, alkenes in absolute terms are formed more slowly and with a smaller carbon skeleton, the release of nitrogen-containing indole is reduced by more than 40%, but the content of heterocyclic compounds increases. From the data, it can be clearly seen that in reactions with the formation of sulfur-containing compounds, the biological preparation acts as

an inhibitor, promoting the formation of ethers and ketones; aromatic hydrocarbons are formed without a hydroxyl group.

Odorant compounds containing sulfur and nitrogen are formed mainly from amino acids. When sulfur-containing amino acids decompose, sulfur compounds such as dimethyl sulfide and carbon disulfide are released. During the early stages of decomposition, biodegradable organic sulfur quickly produces volatile sulfides, resulting in significant increases in dimethyl disulfide and carbon disulfide emissions. However, as decomposition progresses, the biodegradable organic sulfur content decreases and the oxygen supply increases, reducing carbon disulfide and dimethyl disulfide emissions. Ensuring an adequate oxygen supply is critical to controlling the production and emissions of sulfur-containing VOCs.

From the class of nitrogen-containing compounds, we identified predominantly indole, which is formed during the decomposition of the amino acid tryptophan. Many studies have been devoted to the decomposition of indole directly under aerobic and anaerobic conditions, for example [8]. Microorganisms completely mineralize indole or transform it into other compounds in the presence of an additional carbon source.

Analyzing the changes resulting from the decomposition process of organic matter when adding a biological preparation, we can conclude that the preparation promotes more intense oxidation of amino acid breakdown products and the formation of hydrocarbons with a longer carbon chain. Accordingly, the biological preparation is effective in neutralizing odor, including due to strong reduction in sulfur-containing compounds. It should be noted that among the emissions generated during the decomposition of fish fractions of waste, classes of VOCs with a strong unpleasant odor were identified - sulfur-containing and nitrogen-containing, as well as heterocyclic and aromatic compounds.

The experiments performed showed positive dynamic of the effect of the biological preparation on the analyzed substances: the decrease in m.f. of sulfur- and nitrogen-containing compounds.

The proposed method for identifying highly volatile organic compounds, including odorants concentrated on a sorbent, by their desorption followed by vapor separation using two-dimensional gas chromatography with cryomodulation and mass spectrometric detection can be successfully used for qualitative analysis, as well as for quantitative analysis of emissions generated during the decomposition of bioorganic waste in the case of using a more selective sorbent.

Microorganisms that break down odorant compounds can be used in the composition of biological products for the disposal of individual fractions of bioorganic waste.

References

1. Hartikainen, T., Ruuskanen, J., & Martikainen, P. J. (2001). Carbon disulfide and hydrogen sulfide removal with a peat biofilter. Journal of the Air & Waste Management Association (1995), 51(3), 387–392. https://doi.org/10.1080/10473289.2001.10464275.

2. Jing-Jing Fang, Na Yang, Dan-Yan Cen, Li-Ming Shao, Pin-Jing He. Odor compounds from different sources of landfill: Characterization and source identification. Waste Management. 2012. Vol. 32. Iss. 7. P. 1401—1410. https://www.sciencedirect.com/science/article/abs/pii/S095 6053X12000736.

3. Kharlamova M.., Zhilyaev D.., Mazina S.., Lukanin A.., Vyshelessky A.., Adamovich M.., Borisova A.., Sorokin I. Analysis of Volatile Organic Compounds Emissions and Elimination of Unpleasant Odours During Storage and Accumulation of Bio-Organic Waste from Fish Trout Farms in Karelia. Ecology and Industry of Russia. 2022;26(12):38-45. (In Russ.) https://doi.org/10.18412/1816-0395-2022-12-38-45.

4. Kunyu Jiang, Zhaowen Cheng, Ziyang Lou, LuochunWang, Hailin Lu, BijunXu, Ningben Jin. Chemical and olfactive impacts of organic matters on odor emission patterns from the simulated construction and demolition waste landfills. J. of Environmental Sciences. 2021. Vol. 103. P. 196—206. https://pubmed.ncbi.nlm.nih.gov/33743901.

5. Lu Wenjinga, Duan Zhenhanab, Li Donga, Luis Miguel, Caicedo Jimeneza, Liu Yanjuna, Guo Hanwena, Wang Hongtaoa. Characterization of odor emission on the working face of landfill and establishing of odorous compounds index. Waste Management. 2015. Vol. 42. P. 74—81. https://www.research gate.net/publication/277016134_Cha - racterization_of_odor_emission_on_the_working_face_of_lan dfill_and_establishing_of_odorous_compounds_index.

6. Marco Schiavon, Luca Matteo Martini, Cesare Corrà, Marco Scapinello, Graziano Coller, Paolo Tosi, Marco Ragazzi. Characterisation of volatile organic compounds (VOCs) released by the composting of different waste matrices. J. Environmental Pollution. 2017. Vol. 231. Part 1. P. 845—853. https://pubmed.ncbi.nlm.nih.gov/28869831.

7. Medić AB, Karadžić IM. Pseudomonas in environmental bioremediation of hydrocarbons and phenolic compounds- key catabolic degradation enzymes and new analytical platforms for comprehensive investigation. World J Microbiol Biotechnol. 2022;38(10):165. Published 2022 Jul 21. doi:10.1007/s11274-022-03349-732.

8. Pankaj Kumar Arora, Ashutosh Sharma, Hanhong Bae, Microbial Degradation of Indole and Its Derivatives. Journal of Chemistry, vol. 2015, Article ID 129159, 13 pages, 2015. https://doi.org/10.1155/2015/129159.

9. Qu, Y., Shen, E., Ma, Q., Zhang, Z., Liu, Z., Shen, W., Wang, J., Li, D., Li, H., & Zhou, J. (2015). Biodegradation of indole by a newly isolated Cupriavidus sp. SHE. Journal of environmental sciences (China), 34, 126–132. https://doi.org/10.1016/j.jes.2015.01.023.

10. Xing-Zhi Yao, Ruo-Chan Ma, Hua-Jun Li, Chen Wang, Chi Zhang at all. Assessment of the major odor contributors and health risks of volatile compounds in three disposal technologies for municipal solid waste. Waste Management. 15 May 2019. Vol. 91. P. 128—138. https://www.sciencedirect.com/science/arti - cle/abs/pii/S0956053X19303010.

11. Zhaowen Cheng, Zhongtao Sun, Shijie Zhu, Ziyang Lou, Nanwen Zhu, Lili Feng. The identification and health risk assessment of odor emissions from waste landfilling and composting. J. of The Science of the Total Environment. 2019. V. 649. P. 1038—1044. https://pubmed.ncbi.nlm.nih.gov/30184519.

12. Ziyang Lou, Mingchao Wang, Youcai Zhao, Renhua Huang. The contribution of biowaste disposal to odor emission from landfills. J. of the Air & Waste Management Association. 2015. V. 65. Iss. 4. P. 479—484. https://pubmed.ncbi.nlm.nih.gov/30184519.

13. Yan Zhaoa, Wenjing Lub, Hongtao Wang. Volatile trace compounds released from municipal solid waste at the transfer stage: Evaluation of environmental impacts and odour pollution. J. of Hazardous Materials. 2015. Vol. 300. P. 695—701 https://pubmed.ncbi.nlm.nih.gov/26292056.

14. Chemical composition of fish. [Electronic resource]. URL: https://znaytovar.ru/new2869.html (accessed 21 December 2023).

15. Trout - amino acid content. [Electronic resource]. URL: https://fitaudit.ru/food/132891/amino#:~:text (accessed 21 December 2023).

DOI 10.34660/INF.2023.72.39.243

60 号药物的致敏特性调查（Pletnev 滴 60 号）

INVESTIGATION OF THE ALLERGENIC PROPERTIES OF DRUG NO. 60 (PLETNEV DROPS NO. 60)

Pletnev Vladimir Vladimirovich
Ph.D in Medicine, doctoral student for the degree of Dr.Habil,
Senior Researcher
National medical research center of cardiology named after
Academician E.I. Chazov,
Moscow, Russian Federation

抽象的。 研究结果表明，60号药物不具有致敏性。 剂量为 0.427 和 0.854 mg/kg（人类估计最高每日治疗剂量的 10 和 20 倍）的 60 号药物，用盐水溶液按 1:10 稀释，在致敏第 14 和 21 天肌肉注射给豚鼠时，不会出现过敏反应。引起过敏性休克（p < 0.05）。 60号药物剂量为0.043和0.214 mg/kg（估计的人类每日最高治疗剂量的1倍和5倍）用盐水溶液按1:10稀释，单次皮下注射给豚鼠不会引起 动物迟发型超敏反应的形成（p < 0.05）。 60号药物以0.427mg/kg的剂量（人类估计最高每日治疗剂量的10倍）以盐水溶液1:10稀释，注射到小鼠对侧爪垫中时，不影响质量和 动物腘淋巴结的细胞结构（p < 0.05）。

关键词：过敏性，Pletnev滴60号，Pletnev医生。

Abstract. *As a result of the conducted research, it was found that the drug No. 60 does not exhibit allergenic properties. Drug No. 60 in doses of 0.427 and 0.854 mg / kg (10 and 20 times the estimated highest daily therapeutic dose for humans) in dilution 1:10 with saline solution when administered intramuscularly to guinea pigs on days 14 and 21 of sensitization does not cause anaphylactic shock (p < 0.05). Drug No. 60 in doses of 0.043 and 0.214 mg / kg (1- and 5-fold the estimated highest daily therapeutic dose for humans) in dilution of 1:10 with saline solution with a single subcutaneous injection to guinea pigs does not cause the formation of delayed hypersensitivity reactions in animals (p < 0.05). Drug No. 60 at a dose of 0.427 mg / kg (10 times the estimated highest daily therapeutic dose for humans) in a 1:10 dilution with saline solution when injected into the pad of the contralateral paw of mice does not affect the mass and cellularity of the popliteal lymph node in animals (p < 0.05).*

Keywords: *allergenicity, Pletnev drops No. 60, doctor Pletnev.*

Introduction

In clinical practice, there are often cases when some of the prescribed factory-made drugs are ineffective, have side effects, cause addiction to them, have a large number of contraindications and high cost. There is a large group of diseases for which there is no medical treatment.

In this regard, the urgent task of modern medicine is to create new highly effective medicines with pronounced pharmacological properties that do not cause undesirable side effects, addiction to them and are used both independently and in conjunction with other drugs.

As a result of the conducted studies, it was found that drug No. 60 exhibits high immunostimulating activity in in vitro and in vivo experiments.

Drug No. 60 is a complex herbal preparation.

The aim of the study was a preclinical toxicological study of Pletnev No. 60 drops with pronounced immunostimulating properties.

Materials and methods of research

The study of the allergenic properties of drug No. 60 was conducted using 3 tests.

Anaphylactogenic activity was studied on 15 variegated guinea pigs, which were divided into 3 groups of 5 animals each: group 1 – control (saline solution), group 2 – drug No. 60 0.427 mg/kg, which was 10 times the estimated highest daily dose for humans, group 3 – drug No. 60 0.854 mg/kg, which was 20 times the estimated highest daily dose for humans. The animals were sensitized 5 times with an interval of 1 day by intramuscular administration of drug No. 60 diluted with 1:10 sterile saline solution. Control animals received appropriate amounts of sterile saline solution used to prepare solutions of drug No. 60. Test administration of drug No. 60 (0.854 mg / kg) was administered intraperitoneally to guinea pigs on days 14 and 21 after the last sensitization.

A study of the delayed-type hypersensitivity reaction was carried out on 15 male guinea pigs with large white areas of skin.

Preparation No. 60 was dissolved 1:10 in sterile saline solution, mixed with a full Freund adjuvant in a ratio of 1:1 and administered to animals. Guinea pigs of groups 2 and 3 were sensitized with a single injection of a drug with a full Freund adjuvant into the pads of 4 paws. The control animals were injected with a complete Freund adjuvant with the addition of sterile saline solution.

20 days after sensitization, the guinea pigs of the experimental groups were given permissive doses of the drug (0.05 ml of the drug solutions used for animal sensitization) on the trimmed area of the back skin. To control the reactivity of the skin, 0.05 ml of sterile saline solution was applied to another trimmed area of the skin of the animals' backs. The skin reaction was assessed visually on the scale of skin tests by Suvorov S.V. 1, 24 and 48 hours after applying the permissive dose.

The study of the effect of drug No. 60 on the mass and cellularity of the popliteal lymph node was carried out on 10 F1 hybrid mice (CBAxC57Bl6), in which 0.05 ml of sterile saline solution was injected into the pad of the right hind paw (control). Drug No. 60 was injected into the pad of the contralateral paw at a dose of 0.427 mg / kg, which was 10 times the estimated highest daily dose for humans. Before use, drug No. 60 was dissolved 1:10 in sterile saline solution.

After 7 days, the mass and cellularity of the right and left popliteal lymph nodes were determined in mice, and the relative index was calculated by dividing the indicators of the left lymph node by similar indicators of the right lymph node.

Results and discussion

The study of the anaphylactogenic activity of drug No. 60 was performed on 15 variegated guinea pigs: group 1 – control, sterile saline solution; group 2 – drug No. 60, 0.427 mg / kg; group 3 – drug No. 60, 0.854 mg / kg. Preparation No. 60 was diluted with 1:10 sterile saline solution.

It was shown that drug No. 60 in doses of 0.427 mg / kg and 0.854 mg / kg when administered intramuscularly to guinea pigs on days 14 and 21 of sensitization did not cause anaphylactic shock.

The delayed hypersensitivity reaction was studied on 15 guinea pigs: group 1 – control, sterile saline solution; group 2 – drug No. 60, 0.043 mg/kg; group 3 – drug No. 60, 0.214 mg/kg. Preparation No. 60 was diluted with 1:10 sterile saline solution. The results are presented in Table 1.

Table 1

Effect of drug No. 60 on delayed type hypersensitivity reaction

Groups of animals	Taking into account the reaction after		
	1 hour	24 hours	48 hours
1 – control	0	0	0
2 – preparation No. 60, 0.043 mg/kg	0	0	0
3 preparation No. 60, 0.214 mg/kg	0	1	0

Note: 0 – There is no visible reaction;
1 – pale pink erythema throughout the skin area or along its periphery;
2 – erythema, infiltration, edema.

The results of the conducted studies showed that the delayed hypersensitivity reaction in tested doses of drug No. 60 in guinea pigs was negative.

Evaluation of the effect of drug No. 60 on the mass and cellularity of the popliteal lymph node was performed on 10 F1 mice (CBAxC57Bl6), in which 0.05 ml of sterile saline solution was injected into the pad of the right hind paw (control), and drug No. 60 was injected into the pad of the contralateral paw at a dose of 0.427 mg / kg. The results of the study are presented in Table 2.

Table 2

Effect of drug No. 60 on the mass and cellularity of popliteal lymph nodes in mice

Groups of animals	The mass of popliteal lymph nodes (mg)	Cellular capacity of popliteal lymph nodes (million / ml)
1 – control	1,8±0,1	15,1±0,48
2 – preparation No. 60, 0.427 mg / kg	1,7±0,1	14,8±0,51

When evaluating the effect of drug No. 60 on the mass and cellularity of popliteal lymph nodes in mice, it was found that the drug does not have an allergenic effect.

When studying the effect of drug No. 60 on the immune system, it was found that the drug does not have immunotoxicity.

Conclusions

As a result of the conducted research, it was found that the drug No. 60 does not exhibit allergenic properties. Drug No. 60 in doses of 0.427 and 0.854 mg / kg (10 and 20 times the estimated highest daily therapeutic dose for humans) in dilution 1:10 with saline solution when administered intramuscularly to guinea pigs on days 14 and 21 of sensitization does not cause anaphylactic shock ($p < 0.05$). Drug No. 60 in doses of 0.043 and 0.214 mg / kg (1- and 5-fold the estimated highest daily therapeutic dose for humans) in dilution of 1:10 with saline solution with a single subcutaneous injection to guinea pigs does not cause the formation of delayed hypersensitivity reactions in animals ($p < 0.05$). Drug No. 60 at a dose of 0.427 mg / kg (10 times the estimated highest daily therapeutic dose for humans) in a 1:10 dilution with saline solution when injected into the pad of the contralateral paw of mice does not affect the mass and cellularity of the popliteal lymph node in animals ($p < 0.05$).

List of literature

1. Mironov, A.N., Bunatyan, N.D., etc. Guidelines for conducting preclinical studies of medicines. – M.: Grif and K. – 2012. – 944 p.

DOI 10.34660/INF.2023.80.58.244

1号药物（Pletnev滴剂1号）对兔子身体、外壳和眼睛附属器官功能状态的影响评估

ASSESSMENT OF THE EFFECT OF DRUG NO. 1 (PLETNEV DROPS NO. 1) ON THE BODY OF RABBITS, THE FUNCTIONAL STATE OF THE SHELL AND THE ACCESSORY APPARATUS OF THE EYE

Pletnev Vladimir Vladimirovich
Ph.D in Medicine, doctoral student for the degree of Dr.Habil, Senior Researcher
National medical research center of cardiology named after Academician E.I. Chazov,
Moscow, Russian Federation

抽象的。 研究结果发现，木贼草1号药物剂量为0.05毫升/公斤时，不会对眼睛的主要结构造成损害，不会改变眼压和平均眼压。 瞳孔测量值，不违反眼睛角膜的敏感性，在急性和亚慢性实验中不影响眼球组织，不会引起角膜上皮、基质、内皮、虹膜、晶状体、玻璃体和视网膜的变化 在兔子中。

关键词：眼睛烧伤、Pletnev 滴剂 1 号、Pletnev 医生。

Abstract. *As a result of the conducted studies, it was found that the drug No. 1 from horsetail grass in a dose of 0.05 ml / kg does not have a damaging effect on the main structures of the eye, does not change intraocular pressure and the average value of pupillometry, does not violate the sensitivity of the cornea of the eye, does not affect the tissues of the eyeball in acute and subchronic experiments, does not causes changes in the corneal epithelium, stroma, endothelium, iris, lens, vitreous and retina in rabbits.*

Keywords: *eye burn, Pletnev drops No. 1, doctor Pletnev.*

Introduction

Diagnosis and treatment of eye burns is a complex and urgent problem of ophthalmic traumatology. Among all injuries to the organ of vision, burn injury remains an important, including medico-social, task, due to common complications and disability of patients with partial or complete loss of vision.

Burns of the organ of vision, according to various authors, account for 4 to 15% of all eye injuries. In peacetime, chemical damage prevails, accounting for about 60-70% of all burns to the organ of vision.

In this regard, it is relevant to study the effect of drug No. 1 on the body of rabbits, the functional state of the shell and appendage of the eye, which has a pronounced anti-inflammatory, wound healing and angioprotective effect.

Drops of Pletnev No. 1 are a complex herbal preparation.

The aim of the study was to study the effect of drug No. 1 on the body of rabbits, the functional state of the shell and accessory apparatus of the eye.

Materials and methods of research

The study of the effectiveness of the drug No. 1 on the model of alkaline corneal burn in rabbits was conducted on 30 chinchilla rabbits.

Pupillometry was performed in daylight using a ruler with millimeter divisions in the vertical and horizontal meridians, since the pupil of the rabbit is elongated vertically.

Quantitative measurement of corneal sensitivity was determined by V.I. Samoilov using a hair with a pressure of 10.0 g / mm2 at 13 points of the cornea. The pressure of this hair is felt at any point of the normal cornea. The state of corneal sensitivity was expressed by the number of felt touches.

Intraocular pressure was measured with a Maklakov tonometer, a weight of 10.0 g. The calculation of intraocular pressure was carried out using a Polyakov ruler and the results were expressed in millimeters of mercury. Intraocular pressure was measured under local anesthesia with 0.5% aqueous solution of dicaine after 2 multiple instillations of anesthetic with an interval between instillations of 1.0-1.5 min.

Results and discussion

The studies were conducted on 3 groups of chinchilla rabbits (27 animals (54 eyes), 9 animals (18 eyes) each: group 1 - control, sterile saline solution; group 2 – comparison drug 95% medical ethyl alcohol; group 3 – drug No. 1. Drug No. 1 at a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution was instilled into both eyes of animals 2 times a day for 30 days. 95% ethyl alcohol in a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution was installed in both eyes of animals 2 times a day for 30 days. Saline solution was installed in both eyes of control animals 2 times a day for 30 days.

Laboratory animals were kept for 1 month in the same room, under the same conditions, on the same diet.

During the entire period of the experiment, there were no changes in the behavior of laboratory animals and eating and drinking disorders. The rabbits gained weight and maintained their normal motor activity. When instilling drugs subconjunctively, the animals behaved calmly, did not show passivity or aggressiveness.

During the study, it was found that the coat of rabbits of groups 1, 2 and 3 remained smooth, even in the area of the eyelids of the outer and inner corners of the eye.

The body weight of rabbits in the group with drug No. 1 for 30 days moderately exceeded the corresponding indicator in animals of groups 1 and 2 (Table 1).

Table 1

Body weight indicators of rabbits when administered drug No. 1 for 30 days

Groups of animals	Body weight, g, M±m
	Male rabbits
1 – control, saline solution	2124,1±13,9
2 – ethyl alcohol	2130,5±14,6
3 – Drug No. 1	2240,2±12,7
	Female rabbits
1 – control, saline solution	2115,8±13,2
2 – ethyl alcohol	2189,7±16,4
3 – Drug No. 1	2202,6±12,9

Thus, drug No. 1 at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution when instilled into both eyes of rabbits 2 times a day for 30 days does not affect general behavior (lack of aggressiveness, lethargy), general condition (appearance, coat condition, appetite) and weight dynamics bodies.

95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution during instillation in rabbits in both eyes 2 times a day for 30 days causes changes in general behavior – local irritation of the eyelids and damage to their forelimbs of rabbits, irritation of the mucous membrane after instillation for 20-30 minutes, as well as a decrease in orientation in space within 3 days from the beginning of the experiment.

Studies of the effect of drug No. 1 on the condition of the accessory apparatus of the eye, mucous membrane, cornea of the eyeball of the eye were conducted on 3 groups of chinchilla rabbits (18 animals (36 eyes), males and females, body weight 2.0-2.5 kg) of 6 animals (12 eyes) each: 1 group - control, sterile saline solution; group 2 – 95% medical ethyl alcohol comparison drug; group 3 – drug No. 1. Drug No. 1 at a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution was instilled into both eyes of animals 2 times a day for 30 days. 95% ethyl alcohol in a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution was installed in both eyes of animals 2 times a day for 30 days. Saline solution was also installed in both eyes of the control animals, but 2 times a day for 30 days.

In the group with drug No. 1, light-optical analysis of 100% of the eyes of laboratory animals on the first day of the experiment from the mucous membrane of the eyeball and eyelids, 30-90 minutes after the start of instillation of the drug, an increase in conjunctival injection near the limb was visualized, which took place after 1-3 hours. Starting from the 2nd day of the experiment, a slight increase

in conjunctival injection near the limb was noted from the mucous membrane of the eyeball and eyelids, which passed after 1-3 hours.

When examining the eyelids and the appendage of the eye, no changes were found in rabbits.

Under the influence of drug No. 1, a film repelling liquid is created on the surface of the cornea. The cornea was not stained with fluorescein.

Changes in the structure of the iris were not detected. No changes were found in the vitreous body. The fundus is unchanged from the disc of the optic nerve, retina and its vessels.

In the group with ethanol, hyperemia was detected from the mucous membrane within 5-20 minutes from the beginning of instillation of the substance. The cornea was stained with 0.5% fluorescein solution in blue, most intensively during the first 2-5 days, while the mydriatic reaction of the pupils was determined on the 20-30 day of the experiment with an increase in the vertical and horizontal meridian to 2-4 mm.

The iris tissue remained calm, and no changes in its structure and color were detected.

No pathological changes were found in the vitreous body using biomicroscopy.

The fundus is unchanged from the disc of the optic nerve, retina and its vessels.

In the group with saline solution, the light-optical analysis of 100% of the eyes of laboratory animals revealed no pathological changes in the external and visible structures of the eye, as well as the local irritant effect of the drug.

When examining the appendage of the eye, the mucous membrane of the eyeball and eyelids, no changes were found in rabbits.

Changes in the structure of the iris were not detected. No changes were found in the vitreous body. The fundus is unchanged from the disc of the optic nerve, retina and its vessels.

Thus, drug No. 1 at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution for short-term (3 days) and long-term (30 days) instillation into both eyes of animals 2 times a day does not have a locally irritating effect on the surrounding tissues of the eye, eyelids, mucous membrane and cornea of the eye in rabbits.

The reference drug – 95% ethyl alcohol at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution with short-term (3 days) and long-term (30 days) instillation into both eyes of animals 2 times a day has a local irritating effect on the surrounding tissues of the eye, eyelids, mucous membrane and cornea in rabbits.

Studies of the effect of drug No. 1 on intraocular pressure were conducted on 3 groups of chinchilla rabbits (18 animals (36 eyes), males and females, body weight 2.0-2.5 kg) of 6 animals (12 eyes) each: group 1 – control, sterile saline solution; group 2 – comparison drug 95% medical ethyl alcohol; group 3 – drug No. 1. Preparation No. 1 at a dose of 0.05 ml / kg in a dilution of 1:15 SFR and 95%

ethyl alcohol at a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution was instilled into both eyes of animals 2 times a day for 30 days. Saline solution was installed in both eyes of control animals 2 times a day for 30 days.

It was found that when prescribing drug No. 1, ethanol and saline solution, intraocular pressure in rabbits is within the normal range (Table 2).

Table 2

Indicators of intraocular pressure in rabbits during instillation of drug No. 1 for 30 days

Observation period, in days	**Intraocular pressure, in mm of mercury**		
	1 – control	2 – ethanol	3 – Drug No. 1
0	19,1±0,2	19,1±0,2	19,2±0,3
31	19,2±0,3	17,2±0,3	19,5±0,9

As a result of the experiment, it was found that drug No. 1 at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution when instilled into both eyes of rabbits 2 times a day for 30 days does not change intraocular pressure in rabbits.

95% ethyl alcohol at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution during instillation in rabbits in both eyes 2 times a day for 30 days reduces intraocular pressure in laboratory animals.

Studies of the effect of drug No. 1 on the reaction of the pupil of the eye were conducted on 3 groups of chinchilla rabbits (18 animals (36 eyes), males and females, body weight 2.0-2.5 kg) of 6 animals (12 eyes) each: 1 group – control, sterile saline solution; 2 group – comparison drug 95% medical ethyl alcohol; group 3 – drug No. 1. Preparation No. 1 at a dose of 0.05 ml / kg diluted with 1:15 saline solution and 95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution was instilled into both eyes of animals 2 times a day for 30 days. Saline solution was installed in both eyes of control animals 2 times a day for 30 days.

The results are presented in table 3.

Table 3

Study of the pupil reaction in rabbits during instillation of drug No. 1 for 30 days

Observation period in days	**Pupil size, mm**					
	1 – control		**2 – ethanol**		**3 – Drug No. 1**	
	vertical	horizontal	vertical	horizontal	vertical	horizontal
0	7,7±0,1	7,9±0,1	7,7±0,1	6,8±0,1	7,8±0,1	6,8±0,2
10	7,6±0,3	7,3±0,2	8,3±0,3	7,9±0,1	7,9±0,1	6,8±0,2
20	7,9±0,2	7,7±0,1	8,9±0,2	8,3±0,2	7,8±0,1	7,0±0,2
31	7,6±0,2	7,6±0,1	8,6±0,2	8,9±0,1	7,7±0,2	7,2±0,1

Thus, when prescribing drug No. 1 at a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution during instillation in rabbits in both eyes 2 times a day for 30 days, the average value of pupillometry does not differ from the norm compared with the control.

95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution when instilled into both eyes of rabbits 2 times a day for 30 days causes mydriasis (pupil dilation), which has a relative resistance for 10-40 minutes.

Studies of the effect of drug No. 1 on the sensitivity of the cornea of the eye were conducted on 3 groups of chinchilla rabbits (18 animals (36 eyes), males and females, body weight 2.0-2.5 kg) of 6 animals (12 eyes) each: 1 group - control, sterile saline solution; 2 group – comparison drug 95% medical ethyl alcohol; group 3 – drug No. 1. Preparation No. 1 at a dose of 0.05 ml / kg diluted with 1:15 saline solution and 95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution was instilled into both eyes of animals 2 times a day for 30 days. Saline solution was installed in both eyes of control animals 2 times a day for 30 days.

The results obtained are presented in Table 4. Ethyl alcohol changes the sensitivity of the cornea in 4 out of 10 cases, which indicates its toxic effect on the cornea tissue and its sensitive innervation.

Table 4

Study of the sensitivity of the cornea of the eyes in rabbits during instillation of drug No. 1 for 30 days

Observation period, in days	**Number of eyes Sensitivity change / no sensitivity change**		
	1 – control	2 – ethanol	3 – Drug No. 1
0	0/10	0/10	0/10
31	0/10	4/10	0/10

As a result of the experiment, it was found that drug No. 1 at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution when instilled into both eyes of rabbits 2 times a day for 30 days does not violate the sensitivity of the cornea of the eyes in rabbits.

95% ethyl alcohol in a dose of 0.05 ml / kg in a dilution of 1:15 with saline solution when instilled into both eyes of rabbits 2 times a day for 30 days violates the sensitivity of the cornea of the eyes in rabbits.

Studies of the effect of drug No. 1 on corneal reepithelization were conducted on 3 groups of chinchilla rabbits (27 animals (54 eyes), males and females, body weight 2.0-2.5 kg) of 9 animals (18 eyes) each: group 1 - control, sterile saline solution; group 2 – comparison drug 95% medical ethyl alcohol; group 3 – drug

No. 1. Preparation No. 1 at a dose of 0.05 ml / kg diluted with 1:15 saline solution and 95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution was instilled into the animal's right eye 2 times a day for 30 days. Saline solution was instilled into the right eye 2 times a day for 30 days.

The results are presented in Table 5.

Table 5

Study of corneal reepithelization in rabbits during instillation of drug No. 1 before complete corneal epithelization in animals

Groups of animals	Average epithelialization time, in days.	
	experiment	control
1 – saline solution	4,8±0,5	5,4±0,6
2 – ethanol	5,3±0,9	5,6±0,5
3 – Drug No. 1	4,0±0,1	5,2±0,3

Thus, drug No. 1 at a dose of 0.05 ml / kg in a 1:15 dilution with saline solution when instilled into rabbits in the right eye 2 times a day accelerates the reepithelization of the cornea of the eyes in rabbits compared with the control.

95% ethyl alcohol at a dose of 0.05 ml / kg diluted with 1:15 saline solution when instilled into rabbits in the right eye 2 times a day does not affect the reepithelization of the cornea of the eyes in rabbits compared with the control eye.

Conclusions

Preparation No. 1 from horsetail grass does not have a damaging effect on the main structures of the eye, does not change intraocular pressure and the average value of pupillometry, does not violate the sensitivity of the cornea of the eye.

List of literature

1. Mironov, A.N., Bunatyan, N.D., et etc. Guidelines for conducting preclinical studies of medicines. – M.: Grif and K. – 2012. – 944 p.

DOI 10.34660/INF.2023.65.68.245

医疗机构竞争力评估（以铁米尔套市初级卫生保健为例）

ASSESSMENT OF COMPETITIVENESS OF MEDICAL ORGANIZATIONS (ON THE EXAMPLE OF PRIMARY HEALTH CARE IN TEMIRTAU CITY)

Kozhakhmetov Timur
Doctoral student
Maqsut Narikbayev University

Omarkulov Bauyrzhan
Professor
Karaganda Medical University

抽象的。 竞争性医疗形成中问题的相关性和发展不够充分，以及研究的现实意义决定了研究的选题、目标和目的。 本研究的目的是研究企业的竞争力作为可持续发展的一个因素，并以铁米尔套市的城市综合诊所为例制定提高医疗保健机构竞争力的措施。

关键词：医学、初级医疗和社会保健、竞争力、组织。

Abstract. *The relevance and insufficient development of the problem in the formation of competitive health care, as well as the practical significance of the study led to the choice of the topic, objectives and purpose of the study. The purpose of the research is to study the competitiveness of enterprises as a factor of sustainable development and to develop measures to improve the competitiveness of health care institutions on the example of urban polyclinics of Temirtau city.*

Keywords: *medicine, primary medical and social care, competitiveness, organization.*

In its report «Global Competitiveness» an authoritative organization such as the World Economic Forum stated: «competitiveness is a set of institutions, strategies and factors that determine the level of productivity of an economy, which, in turn, determines the level of prosperity that a country's economy can achieve» [1,2,3,4,5].

The Organization for Economic Cooperation and Development also gives its view on the concept of competitiveness. «Competitiveness is the ability of firms, industries, regions and countries to create relatively high levels of income and wages while remaining open to international competition» [2,4,5,6,7,8].

Some authors note that the concept of competitiveness should also take into account the hierarchical structure: competitiveness of a product (service), economic entity, industry, region, state [3,5,7,8,9,10].

The competitiveness of the industry implies the presence of competitive advantages over similar industries in the country and abroad. This can be determined by the presence of a more rational industry structure, developed infrastructure, effective work of R&D, material and technical equipment, etc.

Consequently, based on the literature analysis, we conclude that the competitiveness of the industry is comparable and determined in comparison with other competing industries.

In addition, this process is dynamic and competitiveness can emerge or disappear, increase or decrease, so this characteristic is manageable. In other words, competition ensures that the best products and services are provided to meet the needs of the population.

Health care is an important sector of the economy, and increasing the competitiveness of health care according to the multiplier effect leads to an increase in the competitiveness of the national economy. To determine how health care competitiveness is shaped, it is necessary to examine the set of measures that preserve and support the health of the population.

According to the World Health Organization (WHO), health care consists of organizations, institutions, resources and people whose main goal is to improve health.

In our opinion, health care cannot be considered only as a medical component. It is a whole set of measures aimed at preserving and supporting the health of the population. Therefore, it is necessary to take into account the parameters that in one way or another affect the state of health of the population: it is staffing, material and technical equipment, health policy, the level of financing and others.

When assessing the competitiveness of health care, such a factor as the provision of qualified personnel is necessarily taken into account. The effectiveness of health care directly depends on the quantitative and qualitative characteristics of human resources in health care. Currently, the number of medical personnel in Temirtau city is more than 1669 specialists, of which more than 850 are middle medical workers (hereinafter - MSW), and this is 50% of the number of personnel. Within the framework of the implementation of the state program of health care development of the RK «Densaulyk» for 2016-2019, one of the main problems in the field of health care is one of the priority areas of the Ministry of Health of the RK. It is associated with inefficient distribution of labor resources between the levels of medical care. For this reason, it is necessary to develop effective measures of human resources management in terms of their stimulation.

In addition, the main criteria for assessing the effectiveness of health care according to WHO are:

- The health status of the population: life expectancy, mortality, disability, etc..;

- lifestyle of the population: prevalence of smoking, alcoholism, obesity, etc.; and

- meet the reasonable needs of the population: human rights, independence in decision-making, right to confidentiality, patient orientation (attentiveness of medical personnel, cleanliness and proper nutrition in medical organizations, social support, opportunity to choose);

- in terms of fairness in payment for medical services and equality in access to medical care (payment based on income rather than risk).

In recent years, Kazakhstan's health care system has undergone significant changes, affecting the management structure and the amount of funding, affecting the quality of medical and pharmaceutical care. It is advisable to analyze development strategies by studying the current state of development of the industry, as well as analyzing the impact of external factors on it. This procedure is commonly known as SWOT analysis, which does not include economic categories, and can be applied to any organization, industry, individual and country to develop strategies in various fields of activity, including health care.

The SWOT analysis we conducted identifies the strengths and weaknesses of healthcare and the risks that may hinder the industry's prospects and strategic plans for healthcare.

SWOT-analysis allowed us to identify the main health problems. One of the most important problems remains low wages of health workers. A comparative analysis of the domestic primary health care system and OECD countries in terms of staff motivation revealed a number of major problems and issues that need to be addressed. PHC followed the principles of distribution of finances primarily for network maintenance, budget control, fixed salaries and administrative management methods, which forces doctors to hide the true state of affairs and manipulate statistics.

Thus, the analysis of competitiveness indicators showed insufficient financing of the sector in the health care system, constant shortage of personnel and, as a consequence, low availability and quality of medical care.Also remains a relatively high level of morbidity of the population with socially significant diseases and non-communicable diseases, which requires further work.

Along with the SWOT-analysis, the author conducted a sociological survey of the population, since such indicators as the quality and efficiency of medical services can be purely subjective. Therefore, gathering information and conducting population surveys is an important component of this study. Survey subjects-can be considered as one of the most common ways to obtain information about survey respondents. A survey involves asking people specific questions, the answers to

which allow the researcher to obtain the necessary information depending on the objectives of the study.In order to assess the level of competitiveness of the health care industry, the author conducted an online survey of citizens of the Republic of Kazakhstan in the city of Temirtau. A questionnaire was developed to conduct a sociological survey.

The questions in the survey are designed to assess the competitive advantages of health care. To calculate the number of respondents in a representative sample, the author used an online calculator that calculated that the total population of 1 million people should be 384 (online sampling calculator https://blog.anketolog.ru / 2015/12 /sample/).

The total population is 1 million people.The probability of certainty is-95%.

The confidence interval is + / -5%.

Thus, 384 people participated in the survey.Of these, 23% were men, 77% were women.64.8% of the respondents are between 19 to 40 years of age.They constitute the bulk of the sample. The smallest proportion of respondents was respondents under 18 years of age (2.3%). It is observed that by social status, 25% of the respondents work in the civil service and 37.9% categorize themselves as «others». It can be assumed that they are employees of private firms, joint-stock companies, republican state enterprises, etc.On the issue of applying to medical organizations, 68.8% of respondents choose state medical organizations, the remaining 31.2% use the services of private medical organizations.Waiting time for a specialist is an important indicator in health care, which speaks about the availability of medical care, i.e. how quickly a patient can receive medical care. Thus, 38.7% of respondents wait a week to see a specialist, 23% - more than a week to see the necessary specialist.A number of respondents (23%) stated that they would receive the service on the same day, and 15.2% of respondents stated that they would get an appointment with a specialist the next day.

In addition, 32.8% of respondents are dissatisfied with the quality of medical care provided, while 24% of respondents are satisfied with the quality of medical services provided. Almost 43% have difficulties with the answer. It can be assumed that such doubt is due to high asymmetry of information in a certain sector.Patients are not fully aware of their diseases and therefore cannot assess the quality of prescribed treatment and, accordingly, the quality of medical services.

Despite the fact that almost 69% of the population is registered in state medical organizations, 89.5% of them simultaneously turn to private specialists.

Seeking private medical services may be due to dissatisfaction with the quality of medical services provided in public medical institutions.In addition, frequent visits to private medical organizations may affect the waiting time for a specialist. It is not always possible to get an appointment with a doctor at the earliest possible time in public health care facilities. In these cases, private health care facilities are

a great way out of the situation where you don't wait too long to see a doctor and you can get an appointment the same day.That said, here are the most common reasons for going to private medical organizations.

List of references used

1. Growth, Competitiveness, Employment: The Challenges and Ways Forward into the 21st Century: Supplement 6/93 to the Bulletin of the European Communities / Council on European Competitiveness; Commission of the European Communities. – Brussels, 1993. – 57 p.

2. The Global Competitiveness Report 2017–2018 / World Economic Forum. – Geneva, 2017. – 393 p.

3. Regulation and industrial competitiveness: a perspective for regulatory reform / OECD. – Paris, 1997. – 55 p.

4. Filosofova T.G., Bykov V.A. Competition. Innovation. Competitiveness: textbook. allowance. – M.: UNITY-DANA, 2007. – 296 p.

5. Structural elements of healthcare systems / World Health Organization // http://www.who.int/healthsystems/topics/ru/.

6. Zwanziger J., Melnick G. Can managed care plans control health care costs // Health Affairs. – 1996. – Vol. 15(2). – P. 185-199.

7. Robinson J.C., Luft H.S. Competition, regulation, and hospital costs, 1982 to

8. 1986 // JAMA. – 1988. – Vol. 260(18). – P. 2676-2681.

9. Miller R. Competition in the health system: good news and bad news // Health Affairs. – 1996. – Vol. 15(2). – P. 107-200.

10. Rivers P.A., Glover S.H. Health care competition, strategic mission, and patient satisfaction: research model and propositions // J Health Organ Manag. – 2008. – Vol. 22(6). – P. 627–641.

DOI 10.34660/INF.2023.68.84.246

药物治疗听管功能障碍的有效性
THE EFFECTIVENESS OF DRUG THERAPY FOR AUDITORY TUBE DYSFUNCTION

Usmanova Nilufar Abdusaid qizi
Doctoral student
Tashkent State Dental Institute,
Tashkent, Uzbekistan

Makhkamova Nigora Ergashevna
Professor, Doctor of Medical Sciences
Tashkent State Dental Institute,
Tashkent, Uzbekistan

注解。 据世界卫生组织统计，当今5%的人口，即4.3亿人，其中3400万儿童需要帮助恢复听力。 尽管现代研究方法众多，但儿童耳部病变往往仍未得到及时诊断。 这是考虑用于治疗渗出性中耳炎和听管功能障碍的药物的基础，目的是确定保守治疗的有效性。 研究方法。 该研究是在多学科诊所TMA和Prof Med Service LLC的基础上于2020年9月至2023年10月期间进行的。该研究总共包括32名患者，其中17名男性和15名女性，年龄从3岁到16岁。 听管功能障碍的诊断是根据主诉、病史、检查数据、内镜检查方法、B型和C型鼓室导抗测试和听力测定，以及PPN的CT/MRI或3D X射线成像数据做出的。 结果。 根据现有数据，我们可以说，在 3 岁患者中，大多数情况下 66.7% 的管状脊与腺样体赘生物的重叠程度是确定的，这是非常合乎逻辑的，因为它发生在高峰期。 他们的运作。 在8-11岁的患者中，更常见1-2级腺样体，但经鼓室导抗测试和听力测试证实，治疗后充血和听力损失持续很长时间； 12 名患者中，有 10 名患者的耳朵充血持续了 3 个月。 32例患者中，根据L.Skoloudik和D.Kalfert分级，A级15例（46.87%），B级10例（32.25%），C级7例（21.87%）。

Annotation. *According to WHO statistics, today 5% of the population or 430 million people, of which 34 million children need help in restoring their hearing. Despite modern numerous research methods, ear pathologies in children often remain undiagnosed in a timely manner. This served as the basis for considering the drugs used in the treatment of exudative otitis media and dysfunction of the auditory tube with* ***purpose*** *determining the effectiveness of conservative therapy.* ***Research methods.*** *The study was conducted on the basis of the multidisciplinary clinic TMA and Prof Med Service LLC during the period from September 2020 to October 2023. In total, the study included 32 patients, 17 male and 15 female,*

from 3 to 16 years old. The diagnosis of auditory tube dysfunction was made on the basis of complaints, medical history, examination data, endoscopic examination methods, type B and C tympanometry and audiometry, as well as CT/MRI or 3D X-ray imaging data of the PPN. ***Results****. Based on the available data, we can say that in 3-year-old patients, in most cases 66.7%, the degree of overlap of the tubular ridges with adenoid vegetations was determined, which is quite logical, since it occurs at the peak of their functioning. In patients aged 8-11 years, adenoids of grade 1-2 were more often observed, however, after treatment, congestion and hearing loss persisted for a long time, confirmed by tympanometry and audiometry; in 10 patients out of 12, congestion in the ears persisted for 3 months. Of 32 patients, according to the classification L.Skoloudik and D.Kalfert determined grade A in 15 patients (46.87%), grade B in 10 patients (32.25%) and grade C in 7 patients (21.87%).*

Introduction

According to WHO statistics, today 5% of the population or 430 million people, of which 34 million children need help in restoring their hearing. Most of these people come from developing countries and low- and middle-income countries. 50% of cases of exudative otitis media occur in infants under one year of age, 60% of cases in children under 2 years of age. The largest number of cases occurs in children with changes in the facial skeleton (congenital cleft palate, cleft palate and genetic abnormalities trisomy 21, etc.)[1, 2, 3]

The main pathophysiological factor in the development of almost all middle ear pathologies is dysfunction of the auditory tube. Children are more vulnerable to middle ear abnormalities, primarily due to the immature development of their Eustachian tubes. Compared to adults, the position of the Eustachian tube of an infant is at an angle of 10° relative to the horizontal plane. This angle differs in adults, in whom the Eustachian tube is located at an angle of 45° [1,3]. It is the difference in position angles in children, as opposed to adults, that is associated with an increased incidence of middle ear pathology – otitis media. However, some investigators have found that active muscle function, rather than passive clearance and impedance of the Eustachian tube, is responsible for ventilation and drainage from the middle ear. A smaller or partially blocked Eustachian tube does not necessarily correlate with disease risk or even active disease. Exudative otitis media, in addition to being a burden on hearing, has direct consequences for speech development. Correct sequential drug therapy can be effective in the treatment of otitis media and persistent Eustachian tube dysfunction [2,3,4].

Po Dennis and his co-authors in their study demonstrated the relevance and great capabilities of endoscopy compared to classical research methods such as MSCT, MRI, ultrasound, etc. Also, using videoendoscopy, he divided the movement of the auditory tube into stages, thus first the soft palate rises, the lateral wall

of the pharynx and the medial cartilaginous plate move medially; then the lateral wall of the pharynx moves laterally; the expansion of the orifice begins from the side wall and then spreads to the isthmus; the opening of the cartilaginous part of the mouth is the final stage. [6]

L. Skoloudik and D. Kalfert offered classification describing the relationship of the size and distribution of the adenoids to the mouth of the auditory tube [8]:

• grade A: adenoid tissue, not in contact or in contact with the tubar ridges (torus tubarius);

• grade B: adenoid tissue, in contact with tubar ridges without complete coverage;

• grade C: adenoid tissue completely covers and compresses the torus tubarius.

Children are more vulnerable to middle ear pathology than adults. This is mainly due to the fact that ET dysfunction is a common condition in children. ET in children has several differences compared to adults [1, 2, 5]. In children, the tube is generally shorter, but with the bony part is relatively longer compared to adults. In addition, ET in children is more horizontal. The inclination of the tube relative to the horizontal level in a newborn is approximately 10°. Moreover, in children, the osteochondral junction appears linear. Finally, the submucosa of the tubes in children is characterized by more developed accumulations of lymphoid tissue, which form tubular ridges. The same applies to more pronounced adenoids in children than in adults [1, 4, 5].

Ars Bernard in his study identified other functions of the fibrocartilaginous part of the eustachian tube, which provide protection of the sterile environment of the middle ear cavity from potentially pathogenic flora; it should provide 3 additional specific functions [9], namely:

1. Mechanical protection against nasopharyngeal secretions and reflux of pathogenic microorganisms, as well as against retrograde propagation of vocal sounds
2. Local immune protection
3. Mucociliary clearance into the nasopharynx of secretions formed in the middle ear cavity.

Previously, it was believed that exudate in the middle ear cavity was sterile, but after studies in 2004 by N. Fergie and 2006 by L.Hall-Stoodly determined the presence of living bacteria - Streptococcus pneumoniae, Haemophilus influenza and Moraxella catarrhalis, in connection with thistreatment of acute exudative otitis with antibiotics was proposed. Many antibiotic drugs have been tested, but none have proven long-term effectiveness for otitis media.[7,8].

The function of the auditory tubes is an integral and important component of the pressure regulation system in the middle ear cavity.

Purpose The study was to determine the effectiveness of conservative therapy in patients with auditory tube dysfunction.

Research methods.

The study was conducted on the basis of the multidisciplinary clinic TMA and Prof Med Service LLC during the period from September 2020 to October 2023. A daily objective clinical assessment of the condition was carried out, laboratory and instrumental examination methods were determined, and conservative treatment and prevention of complications were subsequently developed in the corresponding groups of patients with auditory tube dysfunction.

In total, the study included 32 patients, 17 male and 15 female, from 3 to 16 years old. The diagnosis of auditory tube dysfunction was made on the basis of complaints, medical history, examination data, endoscopic examination methods, type B and C tympanometry and audiometry, as well as CT/MRI or 3D X-ray imaging data of the PPN.

The study included patients with a duration of symptoms of at least 3 months and all previous attempts at conservative treatment had failed.

The examination of patients consisted of a detailed medical history, endoscopic examination of the nose, endoscopic otoscopy, and tympanometry. Clinical evaluation of the ears, i.e. congestion, hearing loss, the presence of exudate, the nature of the exudate, bulging eardrum were conventionally designated from 0 to 5 (each feature was awarded 1 point). To assess the size of the adenoids using endoscopy of the nasopharynx, a rigid 0-degree endoscope of 2.7 and 4 mm was used. According to the classification, the adenoid vegetations were also divided into 1st, 2nd, and 3rd degree. The patients also underwent tympanometry and types B and C were identified. Thirty-two patients with adenoid hypertrophy were diagnosed with bilateral otitis media (type B or C) by otoscopy and tympanometry and were included in the study. Based on the available data, we have proposed our own tactics for the management of patients with persistent dysfunction of the auditory tube, manifested by frequent relapses of exudative otitis media and hearing loss.

The children included in this study were divided into 2 groups: Group A (study) and Group B (control). Group A received the following treatment: vasoconstrictor drops based on oxymetazoline 0.025%, one injection into each nostril, strictly 2 times a day for 5 days, then washed the nose with saline solution 0.9% Sodium Chloride, i.e. carrying out irrigation-elimination therapy, which has proven to be the most relevant among the pediatric population. Then, one spray per nostril (1st dose) of a topical glucocorticoid spray containing mometasone furoate (50 mcg per dose) should be applied twice a day for a total of 200 mcg per day in each nostril for the first 4 weeks. Intranasal corticosteroids have also been used to reduce local inflammation causing eustachian tube dysfunction in otitis media. These drugs can inhibit the synthesis of arachidonic acid and inflammatory mediators in the Eustachian tube and middle ear. They can also shrink the lymphoid tissue around the eustachian tube, improve surfactant secretion, and reduce the viscosity of

middle ear effusion. However, the use of systemic corticosteroids is associated with a number of adverse reactions, such as diarrhea, nausea, hyperactivity and epistaxis. Systemically, the study group received a drug containing carbocisteine (Caslirol syrup 250 mg/5 ml) 250 mg 2 times a day, the daily dose was 500 mg. Carbocisteine is the only currently recommended mucokinetic agent. It is used to reduce mucus production, promote mucus elimination, and reduce inflammation. Mucokinetic agents can relieve the symptoms of otitis media, but have not yet been proven effective. A review of the literature showed that 1-3 months of treatment with mucokinetic agents can avoid the need for shunts in 20% of children with otitis media. However, this treatment is not recommended in international guidelines.

Of particular importance was the massage of the auditory tubes by chewing gum or making chewing movements throughout the day.

The second stage of conservative treatment was followed by a maintenance dose of 1 dose of mometasone furoate nasal spray in each nostril once a day at bedtime for 8 weeks. Group B received initial treatment of nasal irrigation with isotonic sodium chloride solution 0.9% in each nostril 2 times a day for 4 weeks, then nasal irrigation with isotonic sodium chloride solution 0.9% was carried out once before bedtime for 8 weeks.

Observation was carried out 2 weeks after treatment, then after another 2 weeks during the first 4 weeks, and then after 1 month, i.e. at 12 weeks of treatment.

At each visit, patients were checked and recorded for any changes present, as well as local side effects.

Table 1.

Clinical assessment of the size of adenoid vegetations and otoscopic picture before and after treatment

Patient no.	Floor	Age, year, years	Size of adenoid vegetations according to L.Skoloudik and D.Kalfert	Right ear		Left ear	
				Before treatment	After	Before treatment	After
1	M	2020 (3)	C degree	5	3	5	3
2	AND	2019 (4)	To the degree	5	2	5	3
3	AND	2019 (4)	A degree	3	2	4	2
4	M	2017 (6)	A degree	3	1	2	1
5	AND	2015 (8)	To the degree	2	1	2	0
6	AND	2018 (5)	A degree	2	0	1	0
7	AND	2020 (3)	C degree	5	4	5	3
8	AND	2020 (3)	C degree	5	3	5	2
9	M	2019 (4)	C degree	4	1	4	2
10	M	2019 (4)	To the degree	2	1	3	1

eleven	M	2011 (12)	A degree	1	0	1	0
12	AND	2015 (8)	A degree	2	1	1	0
13	AND	2018 (5)	To the degree	3	2	3	3
14	AND	2014 (7)	A degree	2	1	1	1
15	AND	2020 (3)	C degree	4	4	5	3
16	M	2019 (4)	To the degree	4	2	4	2
17	M	2019 (4)	A degree	3	1	4	2
18	M	2019 (4)	A degree	3	2	4	3
19	M	2017 (6)	A degree	2	1	3	1
20	M	2015 (8)	To the degree	2	1	2	1
21	M	2009 (14)	A degree	1	0	1	0
22	M	2020 (3)	C degree	4	3	5	3
23	AND	2020 (3)	To the degree	5	2	4	3
24	M	2015 (8)	A degree	3	1	1	0
25	M	2014 (7)	A degree	2	1	3	1
26	AND	2015 (8)	A degree	2	0	1	0
27	AND	2019 (4)	To the degree	4	2	4	2
28	AND	2018 (5)	To the degree	4	3	4	2
29	M	2019 (4)	C degree	5	4	4	3
thirty	AND	2019 (4)	To the degree	2	1	3	1
31	M	2011 (12)	A degree	2	1	2	0
32	M	2007 (16)	A degree	1	0	1	0

Results and conclusions

Based on the available data, we can say that in 3-year-old patients, in most cases 66.7%, the degree of overlap of the tubular ridges with adenoid vegetations was determined, which is quite logical, since it occurs at the peak of their functioning. In patients aged 8-11 years, adenoids of grade 1-2 were more often observed, however, after treatment, congestion and hearing loss persisted for a long time, confirmed by tympanometry and audiometry; in 10 patients out of 12, congestion in the ears persisted for 3 months. Of 32 patients, according to the classification L.Skoloudik and D.Kalfert determined grade A in 15 patients (46.87%), grade B in 10 patients (32.25%) and grade C in 7 patients (21.87%).Despite the numerous diagnostic methods available, the problem of late diagnosis and untimely treatment, leading to permanent hearing loss, remains relevant to this day. This eventually leads to a significant deterioration in the quality of life. Our statistical studies have shown the effectiveness of conservative treatment for exudative otitis media with grade 2-3 adenoids, without concomitant severe allergies of the nasal mucosa. In patients with severe allergies, severe swelling of the mucous membrane, it was poorly corrected with topical steroids and the presence of a high degree of

adenoid vegetations. There are many studies to date, but the usefulness of topical steroid spray in patients with otitis media is still controversial.

We chose mometasone furoate nasal spray because of its favorable benefit-risk profile. Our study included children of both sexes aged 2 to 12 years, since adenoid involution occurs with age. The average age of patients in the study was 4.5 years. We used mometasone nasal spray for three months and noted that after 3 months of using mometasone nasal spray; there was a statistically significant improvement in Eustachian tube dysfunction compared to the isotonic saline 0.9% irrigation group.

References

1. Asmanov Alan Ismailovich, Pivneva Natalya Dmitrievna Dysfunction of the auditory tube in children after surgical interventions in the nasopharynx // Ros Vestn Perinatol and Pediat. 2016. No. 5. URL: https://cyberleninka.ru/article/n/disfunktsiya-sluhovoy-truby-u-detey-posle-operativnyh-vmeshatelstv-v-oblasti

2. Garashchenko T.I., Tarasova G.D., Karneeva O.V., Garashchenko M.V., Tulina A.S. Directions for the use of irrigation-elimination therapy // MS. 2018. No. 17. URL: https://cyberleninka.ru/article/n/napravleniya-ispolzovaniya-irrigatsionno-eliminatsionnoy-terapii

3. Isaev V.M., Sambulov V.I., Zenger V.G., Ashurov Z.M., Nasedkin A.N., Prokofieva E.I. Treatment of auditory tube dysfunction in children // Almanac of Clinical Medicine. 2002. No. 5. URL: https://cyberleninka.ru/article/n/lechenie-disfunktsiy-sluhovoy-

4. Ahmed, MR, Eldeeb, WE Effectiveness of mometasone furoate nasal spray on tympanometric results and hearing loss in children with otitis media with effusion. Egypt J Otolaryngol 38, 32 (2022). doi.org/10.1186/s43163-022-00225-x.

5. Bluestone C, Klein J. Otitis media and eustachian tube dysfunction. Pediatric Otolaryngology, Fourth Edition. Philadelphia, PA: Elsevier Saunders; 2005.

6. Dennis SP, Abou-Halawa A, Abdel-Razek O. Analysis of the dysfunctional eustachian tube by video endoscopy. Otol Neurotol. 2001 Sep;22(5):590-5. doi: 10.1097/00129492-200109000-00005. PMID: 11568663.

7. Fergie N, Bayston R, Pearson JP, Birchall JP. Is otitis media with effusion a biofilm infection. Clin Otolaryngol Allied Sci. 2004 Feb;29(1):38-46. doi: 10.1111/j.1365-2273.2004.00767.x. PMID: 14961850.

8. Hall-Stoodley L, Hu FZ, Gieseke A, Nistico L. Direct detection of bacterial biofilms on the middle-ear mucosa of children with chronic otitis media. JAMA. 2006 Jul 12;296(2):202-11. doi: 10.1001/jama.296.2.202. PMID: 16835426; PMCID: PMC1885379.

9. Ars B.: Eustachian tube. Physiology. Eustachian Tube Dysfunction. Edited by Holger Sudhoff, Uni-Med Verlag, Bremen, Germany, 2013, pp.19-29.

DOI 10.34660/INF.2023.45.45.247

先天性腭裂儿童鼻腔及鼻旁窦状况评估
ASSESSMENT OF THE CONDITION OF THE NASAL CAVITY AND PARANASAL SINUSES IN CHILDREN WITH CONGENITAL CLEFT PALATE

Makhkamova Nigora Ergashevna
Doctor of Medical Sciences, Professor
Tashkent State Dental Institute,
Tashkent, Uzbekistan

Nabieva Djamila Malikovna
Tashkent State Dental Institute,
Tashkent, Uzbekistan

注解。 通过研究这个问题，我们发现患有先天性唇腭裂（CCLP）的儿童经常会出现鼻腔和鼻旁窦的病变。 鼻腔的病理改变是CCLP儿童比健康儿童更容易诊断出急慢性鼻炎和下鼻甲肥大的原因，而手术较晚的儿童则更容易出现慢性化。

关键词：先天性唇腭裂，儿童，鼻子，鼻旁窦。

Annotation. *Studying this problem, we found that in children with congenital cleft lip and palate (CCLP) quite often there is pathology from the nasal cavity and paranasal sinuses. Pathological changes in the nasal cavity are the reason that acute and chronic rhinitis and hypertrophy of the inferior turbinates are diagnosed in children with CCLP more often than in healthy children, and chronicity occurs earlier in children operated on for this anomaly at a later date.*

Keywords: *congenital cleft lip and palate, children, nose, paranasal sinuses.*

Relevance

Cleft lip and palate are the most common malformations of the maxillofacial region. The incidence of the defect varies from 1:600 to 1:1100 viable newborns. The significance of this problem is due to the persisting high level of frequency, as well as not always satisfactory results of the operation (N.G. Negametzyanov, 2002; M.E. Makhkamov, 2002; R.A. Amanullaev, 2005; Dusmukhamedov M.Z 2006). Regardless of the age of the sick child with VPH, the main task of the surgeon in traditional treatment is to restore the anatomical form and adequate function.

Rehabilitation of patients with cleft lip and palate is a process that occurs from birth to adulthood and involves a team of many specialists. ENT pathology ranks second in children with CGN after maxillofacial disorders. This developmental defect is accompanied by anatomical and functional disorders, the severity of which depends on the degree of clefting and the age of the child. BRN is a fundamental factor in the development of mixed breathing, and also causes the reflux of food into the nasal cavity during feeding. This congenital defect creates favorable conditions for secondary infection of the ENT organs. ENT pathology ranks second in children with VRN after maxillofacial disorders.There is a small number of studies stating more frequent cases of diagnosing acute sinusitis, rhinitis, tonsillitis, hearing loss and other ENT diseases in children with VPH compared to healthy children. A few foreign publications are devoted mainly to the condition of the ear, nose and paranasal sinuses in children with VRN. In these works, the authors compared the structure of the ear and hearing, the volume of the sinuses on the healthy side and on the side of the cleft, and the timing of their pneumatization in comparison with similar sinuses of healthy children. Taking into account the above, it should be noted that the problem of ENT pathologies with congenital cleft lip and palate remains relevant. Congenital and acquired defects and deformations of the jaws lead to secondary deformations of the middle zone, grossly disrupt the function of various vital organs and systems and facial aesthetics, negatively affecting the formation of the psycho-emotional status of children.

The purpose of the work is to evaluate the condition of the nose and paranasal sinuses in children with congenital cleft palate based on clinical, laboratory and instrumental studies. Improving the quality of diagnosis and treatment of pathologies of the ENT organs in children with varicose veins.

Material and methods: 34 children aged from 3 to 18 years were examined, of which 17 had a congenital unilateral through cleft of the upper lip and palate, 12 had a congenital bilateral through cleft of the upper lip and palate, and 5 children had a congenital isolated cleft palate. A comprehensive examination revealed impaired nasal breathing in patients with congenital unilateral through cleft of the upper lip and palate in more than 98% of cases.Endoscopy of the nasopharynx and microotoscopy revealed hyperplasia of the mouths of the Eustachian tubes (64.3%), turbidity and unclearness (55.2%) of the anatomical signs of the eardrums. Rhinoscopic examination - 98% of cases have a deviated nasal septum, 78% have hypertrophy of the inferior turbinates. CT scan of the bones of the face and skull determined the asymmetry of the skull bones in 100%.

The research methods were clinical and anamnestic examination, medical and social questionnaires, instrumental, photometric, functional, radiological, biometric, laboratory and statistical research methods at the stages of interdisciplinary rehabilitation of children with cleft lip and palate at different age periods.

Conclusions: The identified risk factors for the development of diseases of the ENT organs in children with this anomaly justify the need to develop comprehensive examination and treatment regimens. The developed scheme of local complex treatment will allow for targeted treatment of diseases of the nose and paranasal sinuses in children with varicose veins, which will help reduce complications leading to chronicity of the process, and will increase the level of rehabilitation of children with varicose veins with these diseases.

Bibliography

1. Abdurakhmonov, I. R., & Shamsiev, D. F. (2023). Bosh miya falazi fonidagi paranasal sinusitlarni davolashda uzig hos yondashish. MedUnion, 2(1), 14-26.

2. Abdurakhmonov I. R., Shamsiev D. F. (2021). The effectiveness of local antibiotic therapy in the treatment of paranasal sinusitis in children with cerebral palsy. In Science and education: preserving the past, creating the future (pp. 336-338). 3. Abdusamatova, I. I., Shamsiev, D. F., & Tastanova, G. E. (2023).

Burunning nafas ўkazuvchanligi buzilishida mechanoreceptorlarning clinics ahamiyati (adabiyot sharhi). MedUnion, 2(1), 26-34.

4. Baltabaev, O. K., & Makhkamova, N. E. The condition of the auditory tubes in children with congenital cleft palate in the oral region. Uzbekistonda ilmiy tadqikotlar: Davriy anzhumanlar: 18-KISM, 23.

5. Boboev, R., Zainutdinov, M., & Makhkamova, N. (2015). Clinical features and treatment of exudative otitis media in children with congenital cleft palate. Stomatologiya, 1(3 (61)), 52-55.

6. Vokhidov U, Vokhidov N, Shamsiev D, Nuriddinov H, Kakhkhorov A. (2021) Surunkali polyposis rhinosinusitising endoscopic diagnostics davolash natizhalarini tagil kilish // Stomatologiya, (No. 1 (82)), 95-99.

7. Vokhidov U., Vokhidov N., Shamsiev D., Nuriddinov Kh., Kakhkhorov A. (2021). Endoscopic diagnosis of chronic polypous rhinosinusitis and analysis of treatment results. Stomatologiya, (1 (82)), 95-99. 8. Jabbarov K.D., Shamsiev D.F., Ismoilov I.I., Shernazarov O.N., Soatov S.M. (2020) Foreign body in the nasal cavity: clinical aspects // Avicenna Magazine No. 56, pp. 24-27

9. Jabbarov K.D., Shamsiev D.F., Vokhidov U.N. (2018) History of the development of the Department of Otorhinolaryngology of the Tashkent State Medical Institute // Stomatologiya, (No. 1 (70)), 6-8.

10.Ibragimova M.Kh., Ubaydullaeva N.I., Shamsiev D.F., Bakhramova F. (2021) Protective system of the oral mucosa in chronic recurrent aphthous stomatitis against the background of chronic cholecystitis // Journal "Medicine and Innovation" No. 3, pp. 265-271

11. Ismoilov I. I., Karimov O. M., Shamsiev D. F. (2021). Results of a study of mucociliary transport of the nasal cavity in patients with chronic rhinosinusitis. In VOLGAMEDSCIENCE (pp. 359-360). 12. Makhkamov, M. E., Makhkamova, N. E., Nabieva, Zh. M., Baltabaev, O. K., Yakubdzhanov, D. D., & Normuradov, N. A. (2022). Condition of the nasopharynx in children with congenital cleft palate in the Aral region. Integrative Dentistry and Oral Surgery, 1(1), 27-31.

13. Makhkamova, N. E., Nabieva, Zh. M., Yakubdzhanov, D. D., & Nasretdinova, M. T. (2022). Condition of ENT organs in children with congenital cleft lip and palate. Integrative Dentistry and Oral Surgery, 1(1), 14-18.

14. Makhkamova, N., & Yakubjanov, D. (2018). Features of the structure of the nasal cavity in children with congenital cleft lip and palate. Stomatologiya, 1(4 (73)), 79-81.

15. Makhkamova, D., Yakubdzhanov, D. D., & Khalmirzaev, A. D. Founders: Limited Liability Company with Foreign Capital Participation" E-LINE PRESS. STOMATOLOGIYA Founders: Limited Liability Company with Foreign Capital Participation" ELINE PRESS", (3), 87-91.

16. Makhkamova, N., Yakubdzhanov, D., Khalmirzaev, A., & Nasretdinova, M. (2021). Diagnostic examination of the nasal cavity in children with congenital cleft palate. Journal of Dentistry and Craniofacial Research, 2(1), 31-33.17. Makhkamova, N. E., Yakubdzhanov, D. D., & Khalmirzaev, A. D. (2021, February). Results of endoscopic examination of the nasal cavity in children with congenital cleft palate. In The 6th International scientific and practical conference "World science: problems, prospects and innovations" (February 23-25, 2021) Perfect Publishing, Toronto, Canada. 2021. 792 p. (p. 496).

18. Makhkamova, D. E., Khadzhaeva, D. Kh., Makhkamova, N. E., Khadzhaeva, U. A., Atazhanov, Sh. D., & Kurbanova, Sh. A. (2016). Study of changes in the spectrum of microorganisms in the oral cavity in pathology of the auditory analyzer in children with congenital cleft palate. Approbation, (12), 104-107. 19. Makhkamova, N. E. (2014). Clinical features and treatment of exudative otitis media in children with congenital cleft palate. Bulletin of the Kazakh National Medical University, (23), 71-72.

20. Makhkamova, N., & Zainutdinov, M. (2015). Ultrastructural features of the muscles of the soft palate in children with congenital cleft palate. Stomatologiya, 1(3 (61)), 35-39.

21. Makhkamov, M. E., Mamurkhanov, Kh. N., Makhkamova, N. E., Mamedov, A. A., & Amanullaev, R. A. (2001). Bronchopulmonary function in children with congenital cleft lip and palate. Dentistry, (5), 34-36.

22. Mirazizova, D. R., Khodzhimetov, A. A., A. A., & Makhkamova, N. E. (2022). The mechanism of development of endothelial cell dysfunction in patients with coronavirus infection. MedUnion, (1), 73-81.

23. Mirazizov K. D., Shamsiev D. F. (2007). Choosing a method for correcting a deviated nasal septum during repeated septoplasty. Russian rhinology, (No. 1), 31-32.

24. Rakhimova G.Sh., Shamsiev D.F. (2023) Modern principles of prevention and treatment of pregnant women with allergic rhinitis // MedUnion Vol. 2 No. 1, 2023, pp. 191-201

25. Nasretdinova, M., Nabiev, O., Makhkamova, N., & Normuradov, N. (2021). Diagnostic value of the glycerol test for Meniere's disease. Journal of Dentistry and Craniofacial Research, 2(1), 34-37.

26. Usmanova, N. A., & Makhkamova, N. E. (2023). Review of anatomical and morphological data on the auditory tube, possible causes of its dysfunction. MedUnion, 2(1), 254-260.

DOI 10.34660/INF.2023.94.37.248

老年慢性心力衰竭合并膝骨关节炎患者全身炎症指标与瘦素的相关性

ASSOCIATION OF INDICATORS OF SYSTEMIC INFLAMMATION AND LEPTIN IN ELDERLY PATIENTS WITH COMORBIDITY OF CHRONIC HEART FAILURE WITH OSTEOARTHRITIS OF THE KNEE JOINT

Kolyagin Alexey Anatolyevich
Resident
Voronezh State Medical University N.N. Burdenko, Voronezh, Russia

Kryshka Anastasia Alexandrovna
Postgraduate student
Belgorod State National Research University, Belgorod, Russia

Savelyeva Galina Olegovna
Postgraduate student
Belgorod State National Research University, Belgorod, Russia

该研究包括 58 名被诊断患有慢性心力衰竭 (HF) 和右膝关节骨关节炎 (OA) 的患者（平均年龄 70±2 岁）。 进行了一项一般血液测试的研究，测定了白细胞配方、瘦素、白细胞介素-1β和MCP-1（Vector-Best，俄罗斯）的血清含量。

结果发现，合并心力衰竭和骨关节炎的老年患者血清中 IL-1ß 含量比第 1 组高 28.6%（p<0.01），MCP-1 含量高 33.7%（p<0.01）。 与第 1 组相比，第 2 组的 NLR 降低了 37.8% (p<0.01)，MLR 降低了 34.6% (p<0.01)，瘦素降低了 27.1% (p<0.01)。 在研究组患者中，存在骨关节炎合并症，全身炎症发生率较高，并且全身炎症标志物与瘦素水平之间存在密切关系。

关键词：慢性心力衰竭，膝关节骨关节炎，老年人。

Resume. *The study included 58 patients (average age 70±2 years) diagnosed with chronic heart failure (HF) and osteoarthritis (OA) of the right knee joint. A study of the general blood test with the determination of the leukocyte formula, the serum content of leptin, interleukin-1β and MCP-1 (Vector-Best, Russia) was conducted.*

It was found that elderly patients with comorbidity of HF and OA have a higher serum content of IL-1β by 28.6% (p<0.01) and MCP-1 by 33.7% (p<0.01) than in group 1. There is an increase in NLR by 37.8% (p<0.01), MLR by 34.6% (p<0.01), leptin by 27.1% (p<0.01) in group 2 compared to group 1. The study demonstrated that in elderly patients with HF, in the presence of comorbidity with

osteoarthritis, higher rates of systemic inflammation occur and a close relationship was established between markers of systemic inflammation and leptin levels in the studied group of patients.

Keywords: *Chronic heart failure, osteoarthritis of the knee joint, elderly age.*

The mortality rate of patients with chronic heart failure (CHF) is still high [1]. One of the most vulnerable groups are elderly patients who have comorbid pathology due to diagnostic difficulties, low patient compliance and the likelihood of polypharmacy, which leads to a high risk of unfavorable outcome [2]. In patients over 60 years of age, one of the most common concomitant conditions is osteoarthritis (OA), as the most common form of arthritis [3]. At the same time, the question is how chronic heart failure and osteoarthritis of the knee joints are interconnected and influence the course and progression of each other.

In recent years, research findings have indicated the important role of systemic inflammation in the pathogenesis of both heart failure and osteoarthritis. It is known that cytokines are secreted by immune-competent cells (lymphocytes, macrophages, and monocytes), as well as cardiomyocytes and endothelial cells. The activation of cytokines in heart failure (regardless of etiology) is closely associated with autoimmune mechanisms and oxidative stress, and the degree of increase in the concentration of interleukin-1β (IL-1β) in the blood is directly related to the stages of heart failure [4]. Additionally, persistent immune activation is reflected in the elevation of chemokine levels (monocyte chemoattractant protein-1). In patients with osteoarthritis, the level of IL-1β can be used as an indicator of cartilage degradation, as it blocks collagen synthesis. The ratio of neutrophils to lymphocytes (NLR) and monocytes to lymphocytes (MLR) in the blood is a simple non-invasive marker of inflammation in various systemic diseases [5], but its role in elderly patients with comorbid heart failure and osteoarthritis has not been fully studied.

Leptin plays an important role in the development and progression of HF, reducing the sensitivity of peripheral tissues to insulin, which is accompanied by impaired carbohydrate and lipid metabolism. Leptin is involved in modulating the activity of the immune system by activating phagocytic function and stimulating the production of pro-inflammatory cytokines. Already in the early stages of OA, leptin has a negative effect on articular cartilage, promoting the synthesis of nitric oxide in chondrocytes. Given that the mechanisms by which leptin acts as a modulator of the inflammatory immune response are quite complex and many aspects regarding the interaction of leptin with inflammation and the immune system remain unclear, this issue requires further study.

Purpose of the study– study associations of systemic inflammation markers (IL-1β,MCP-1, NLR and MLR indices) and leptin in elderly patients with comorbidity of HF and osteoarthritis of the knee joint.

Material and research methods. The study was conducted on the basis of two clinics No. 3 and No. 18 in Voronezh from 2020 to 2023, included 58 patients (average age 70±2 years) with CHF with preserved left ventricular ejection fraction (EF>50%) I-IIFC according to NYHA, and an x-ray proven diagnosis of stage 2 knee OA according to Kellgren-Lawrence [6] (group 1). The diagnosis of OA was made in accordance with clinical guidelines for the diagnosis and treatment of primary osteoarthritis (2022) [3]. Diagnosis of HF was made in accordance with recommendations [7]. The comparison group consisted of 35 elderly patients with CHF with preserved ejection fraction without osteoarthritis (group 2). All patients signed informed consent to participate in the study.

All patients underwent a general blood test with determination of the leukocyte formula using standard methods. The level of IL-1β, MCP-1 and leptin in the blood was determined using the enzyme immunoassay method using a set of reagents for enzyme immunoassay determination by Vector-Best JSC (Russia).

Statistical processing was carried out using the STATISTICA 10.0 program. Quantitative variables are presented as Me (Q25%, Q75%), continuous - as M±SD, where M is the mean value, SD is the standard deviation. Qualitative variables are presented as frequencies (%). The results of statistical analysis were considered significant at $p<05$.

Results.

When assessing clinical and demographic data, it was found that in group 2, compared to group 1, women predominated (by 32.4%, $p<0.01$), patients had a higher BMI (by 26.3%, $p<0.01$), heart rate (by 10%, $p<0.05$). Patients in group 2 were significantly more likely to have arterial hypertension (by 21.6%, $p<0.01$), type 2 diabetes mellitus (by 12.4%, $p<0.05$), chronic kidney disease (by 14.5%, $p<0.05$).

Table 1 presents indicators of systemic inflammation in the studied groups of patients.

Table 1

Indicators of systemic inflammation and leptin levels in blood serum in the studied groups of elderly patients

Indicator, units of measurement	Group 1 (n=35)	Group 2 (n=58)
IL-1β, pg/ml	76.3 (61.5; 93.7)	106.8** (88.2; 179.1) 28.6
MCP-1, pg/ml	45.3 (34.7; 54.2)	68.3** (41.7; 86.4) 33.7
NLR, rel. units	2.3 (1.7, 2.6)	3.7** (2.9, 4.5) 37.8
MLR, rel. units	0.34 (0.23;0.44)	0.52**(0.41; 0.60) 34.6%
Leptin,ng/ml	18.6 (8.9; 28.3)	25.5** (19.0; 33.9) 27.1

Note: **p<0.01 – difference between groups 1 and 2;NLP – neutrophil/lymphocyte ratio; MLR - monocyte/lymphocyte

It has been established that the group has level 2IL-1β is higher by 28.6% ($p<0.01$), MCP-1 by 33.7% ($p<0.01$) than in group 1. A recent study showed that systemic inflammation conditions influence not only on the number of blood cells, but also on the ratio between different forms of leukocytes, such as the ratio of monocytes and lymphocytes, neutrophils and lymphocytes, etc. [8]. Our study also noted an increase in NLR by 37.8% ($p<0.01$), MLR by 34.6% ($p<0.01$) in group 2 compared to group 1. Leptin levels in group 2 were higher by 27.1% ($p<0.01$) compared to group 1.The correlation analysis showed a positive relationship between IL-1β and the level of NLR ($r=0.25$, $p=0.018$), MLR ($r=0.23$, $p=0.021$), MCP-1 level with NLR ($r=0.32$, $p=0.012$), MLR ($r=0.22$, $p=0.02$). In addition, a positive correlation between leptin levels and the NLR ($r=0.199$, $p=0.033$) and MLR ($r=0.190$, $p=0.042$) indices was revealed.

Univariate analysis of the odds ratio showed a significant association with OA indices MLR ($p = 0.018$) and NLR ($p = 0.024$), leptin levels with the MLR index ($p = 0.042$) and NLR ($p = 0.039$).

Thus, our study demonstrated that elderly patients with CHF in the presence of comorbidity with osteoarthritis have higher rates of systemic inflammation and a close relationship was established between markers of systemic inflammation and leptin levels in the studied group of patients.

References

1. *Vinogradova N.G., Polyakov D.S., Fomin I.V. Analysis of mortality in patients with CHF after decompensation during long-term observation in specialized medical care and in real clinical practice. Cardiology. 2020;60(4):91-100.https://doi.org/10.18087/cardio.2020.4.n1014*
2. *Rebrov A.P. Osteoarthritis and cardiovascular disease: a complex relationship. South Russian Journal of Therapeutic Practice. 2023;4(2):18-24. https://doi.org/10.21886/2712-8156-2023-4-2-18-24*
3. *Clinical guidelines for the diagnosis and treatment of primary osteoarthritis. 2022*
4. *Roitman A.P., Fedorova T.A., Ivanova E.A., Bugrov A.V., Dolgov V.V. The role of metabolic disorders, inflammation, myocardial damage in the development of chronic heart failure in patients with metabolic syndrome. Laboratory service. 2018;7(4):5-10 https://doi.org/10.17116/labs201870415*
5. *Osipova O.A., Gosteva E.V., Zhernakova N.I., Shepel R.N., Ponomarenko T.N., Inshakova K.Yu., Drapkina O.M. Features of the daily profile of blood pressure and systemic inflammation in patients with stable coronary heart disease with obstructive sleep apnea. Cardiovascular therapy and prevention. 2023;22(9):3705.https://doi.org/10.15829/1728-8800-2023-3705*

6. Kellgren JH, Lawrence JS. Radiological assessment of osteoarthrosis. Ann Rheum Dis. 1957;16(4):494-502

7. Chronic heart failure. Clinical guidelines 2020. Russian Journal of Cardiology. 2020;25(11):4083. doi:10.15829/1560-4071-2020-4083

8. Luo H, He L, Zhang G, Yu J, Chen Y, Yin H, Goyal H, Zhang GM, Xiao Y, Gu C, Yin M, Jiang X, Song X, Zhang L. Normal Reference Intervals of Neutrophil-To- Lymphocyte Ratio, Platelet-To-Lymphocyte Ratio, Lymphocyte-To-Monocyte Ratio, and Systemic Immune Inflammation Index in Healthy Adults: a Large Multi-Center Study from Western China. Clin Lab. 2019;65(3). doi: 10.7754/Clin. Lab.2018.180715

DOI 10.34660/INF.2023.67.43.249

高分子材料在口腔正畸活动义齿基托中的应用分析
ANALYSIS OF THE APPLICATION OF POLYMER MATERIALS USED IN ORTHOPEDIC DENTISTRY FOR THE BASES OF REMOVABLE PLATE DENTURES

Chirkova Ksenia Evgenievna
Dentist Therapist
Research Institute of Dentistry and Maxillofacial Surgery
Pavlov First Saint Petersburg State Medical University

Lesheva Evgenia Olegovna
Graduate Student
Voronezh State Medical University named after N.N. Burdenko

Derevnina Natalia Gennadievna
Teacher
Voronezh State Medical University named after N.N. Burdenko

Levchenko David Mikhailovich
Teacher
Voronezh State Medical University named after N.N. Burdenko

注解。 用于活动义齿的任何设计方案和材料都不可能完全具有生物惰性。患者身体的个体特征在口腔修复体设计中的牙槽系统器官反应中发挥着重要作用。 使用活动假牙的过程对假牙床组织有不同程度的反应，具体取决于患者内脏器官病理和心理情绪障碍的存在、制造材料的特性、固定义齿的方法。 假肢。咀嚼压力传递的性质和基底的大小起着重要作用。 有必要考虑活动义齿的作用强度和持续时间以及患者身体的反应性等刺激因素。 为活动假牙选择牙科材料是一项复杂而负责任的任务，因为目前牙科材料市场提供了大量的聚合物材料，这些材料不仅成本不同，而且质量也各不相同。 治疗的成功取决于他们的正确选择。 已经确定，义齿床组织炎症反应的发展和颌骨牙槽嵴萎缩过程的加速是由可摘义齿对组织的创伤作用和聚合物的毒性作用引起的 可摘义齿的基托就是用它制成的。 口腔致病菌和机会菌群的废物发挥着重要作用，它们共同为适应活动假牙创造了不令人满意的条件。

关键词：活动义齿，聚合物基材。

Annotation. *Any design options and materials used for removable dentures cannot be completely biologically inert. Individual characteristics of the patient's body play a role in organ responses dentoalveolar system placed in oral cavity*

design of the prosthesis. The process of using removable dentures has varying degrees of response from the tissues of the prosthetic bed, depending on the presence of pathology of internal organs and psycho-emotional disorders in the patient, properties of the materials used for their manufacture, methods of fixing the prosthesis. The nature of the transmission of chewing pressure and the size of the base play an important role. It is necessary to take into account such irritating factors as the intensity and duration of action of the removable denture, as well as the reactivity of the patient's body. Choosing a dental material for removable dentures is a complex and responsible task, since currently the dental materials market offers a huge number of polymer materials that differ from each other not only in cost, but also in quality. The success of treatment depends on their correct choice. It has been established that the development of inflammatory reactions in the tissues of the prosthetic bed and the acceleration of atrophic processes in the alveolar ridges of the jaws are caused by the traumatic effect of the removable denture on the tissue and the toxic effect of the polymer from which the base of the removable denture is made. An important role is played by waste products of pathogenic and opportunistic flora of the oral cavity, which together create unsatisfactory conditions for adaptation to removable dentures.

Keywords: *removable dentures, polymer base materials.*

At the present stage of development of orthopedic dentistry, the requirements for basic materials, the quality of which, to a large extent, determine the functional value of removable dentures, have increased significantly. Currently, when the market is saturated with a large number of different materials of varying quality and technological characteristics, this problem, in our opinion, becomes especially relevant. At the moment, 98% of plate prostheses used in orthopedic treatment of patients are made of acrylic polymers. These polymer-monomer compositions have good technological properties. They are very easily molded in the form of a plastic dough, which makes it possible to individually produce dentures in plaster molds, in a water bath without significant pressing pressures and temperatures above 100°C, are easily painted in colors that imitate the soft tissues of the oral cavity, and are firmly connected to artificial teeth.

Of the domestic materials for the manufacture of rigid denture bases, hard plastics are most often used: "Ethacryl", "Ftorax", "Bakril", "Acronil", "Stomakril", colorless base plastic. Imported analogues of base plastics supplied to Russia correspond to domestic ones in terms of basic physical and mechanical indicators. Rigid base polymers of imported origin include hot-curing plastics: "Paladon-65", "Impact-2000", "Palavit-55", "Cronsin", "Mega-L", "Futura". Analogues of acrylic base plastics are: "Selecta-plus", "Trevalon", "Trevalon-S", "Akron-MSi". One of the disadvantages of acrylic plastics is that fractures of the base of the plate

prosthesis are very common in clinical practice. The cause of breakdowns may be insufficient strength of the base material itself, even if the manufacturing technology of the removable denture is followed. As a result of clinical observations of patients and analysis of the causes of failure of plate prostheses, a number of specific requirements for base materials were developed: sufficient strength with minimal thickness; elasticity, ensuring the integrity of the prosthesis and the absence of its excessive deformation under the influence of chewing forces; sufficient bending strength, high impact resistance; low specific gravity, sufficient hardness, low abrasion; biocompatibility, characterized by harmlessness to the tissues of the oral cavity and the body as a whole, as well as indifference to the effects of saliva and various foods; color fastness when exposed to light, air and other environmental factors; low hydrophilicity or complete hydrophobicity; manufacturability and low cost of processing; easy repair of dentures; easy coloring and good imitation of the natural color of the gums; absence of unpleasant taste or smell.

In the process of development of various base materials, the problem of their improvement has remained and remains relevant, which manifests itself in the search for the most durable and biocompatible material.

It is known that these studies were carried out in the following areas: improving the technology of laboratory production of removable lamellar dentures from acrylic polymers, improving the quality of acrylic base materials by copolymerization and creating materials of a non-acrylic nature.

Significant changes in the properties of polymer base materials can be achieved by introducing fillers of various natures and shapes into their composition. They influence the hardness, thermal conductivity, and shrinkage of materials. As is known, fillers are divided into mineral and organic based on their origin, and into powdery and fibrous based on their structure. The greatest effect is achieved when a chemical bond or significant adhesive forces occur between the filler and the polymer. These are active fillers that have advantages over inert fillers, but have no connection with the polymer. One of the most common are fiber fillers. The method of reinforcing the prosthesis base helps to improve physical and mechanical properties, thereby increasing the service life of the prosthesis. The newest trend is the use of ultra-strong fibers, which are several times stronger than polyethylene fiber.

Scientists studied various acrylic polymers reinforced and filled with polyamide aramid fiber, such as Kevlar, and showed improved properties of the modified materials compared to the original materials. The development of chemical science has improved the quality of fiber filler. Ultra-strong fibers, the so-called “third generation fibers,” have found wide application in many areas of science and production. Recently, work has appeared on the use of titanium bases for the manufacture of plate prostheses, which are made by superplastic molding. The

bases obtained in this way correspond extremely accurately to the tissues of the prosthetic bed. They are durable, fairly light, and have good thermal conductivity. However, unfortunately, the method is very expensive and has not yet found wide application in practice.

The development of new polyurethane-based materials for the manufacture of removable denture bases was carried out as a result of the joint work of the Department of Faculty Orthopedic Dentistry of the Moscow State Medical University and the Liquid Molding Laboratory of the Research Institute of Rubber and Latex Products. Materials based on polyurethane Dentalur and Dentalur-P are absolutely free from monomer and are characterized by increased physical and mechanical characteristics and low shrinkage.

By the 1980s, excellent results had been obtained in the use of biologically neutral thermoplastics, which proved to be lighter, more monolithic, and more elastic than acrylic plastics. In terms of strength, thermoplastic polymers outperform acrylics by 8-20 times. However, the cost of removable prostheses made of thermoplastic polymers significantly increases compared to acrylic bases. Among the most well-known thermoplastic polymer materials for removable prosthesis bases and injection system technology, we can mention “Dental-D”, “Valplast”, “Acetal”, “Flexiplast”, “Bredent”, “Polyan”, and “Flexy-Nylon”.

Thus, based on the analysis of literature data, we can conclude that hot-curing acrylic base materials require further improvement to improve physical and mechanical properties, sanitary-chemical and toxic-hygienic properties.

References

1. Ganisik, A. V.Level of awareness of orthopedic dentists about ways to optimize the process of patient adaptation to removable dental orthopedic structures/ A. V. Ganisik, O. V. Oreshaka, O. I. Zavodov //Bulletin of Medical Science. – 2019. – No. 2 (14). – P. 74-75.

2. Hygienic condition of the oral cavity in patients using removable orthopedic structures / N.V. Chirkova, A.N. Morozov, Zh.V. Vecherkina [etc.]. – Voronezh: VSMU, 2017. – 72 p.

3. Dmitriev, S. A. OFeatures of the dental orthopedic status of elderly and senile patients with somatic diseases/ S. A. Dmitriev, D. N. Maslennikov, V. N. Salnikov // Modern methods of diagnosis, treatment, and prevention of dental diseases: materials of the 54th All-Russian Dental Scientific and Practical Conference dedicated to the 25th anniversary of the public organization “Dental Association of Stavropol region”, April 05 - 06, 2018 - Stavropol, 2018. - pp. 30-32.

4. Study of the process of adaptation of the oral mucosa in patients with removable dentures/ M. V. Dikanova, A. T. Egorova, O. P. Goncharova, A. A. Minashkina //Dental Forum. – 2016. –No. 4. – P. 23.

5. Therapeutic and preventive measures aimed at improving the adaptation of prosthetic bed tissues to removable dentures / N. A. Polushkina, N. V. Chirkova, Zh. V. Vecherkina [et al.] // System analysis and management in biomedical systems. – 2020. – Volume 19, No. 2. – P. 12-16.

6. Optimizing patient adaptation to removable dentures/ A. K. Iordanishvili, A. K. Kuvshinova, A. I. Volodin [etc.] //Military medical journal. – 2018. – Volume 339,No. 10. – pp. 63-65.

7. Evaluation of removable dentures and denture bed tissues within the warranty period/ A. K. Iordanishvili, A. I. Volodin, A. A. Serikov, A. A. Petrov //Institute of Dentistry. – 2018.–No. 4 (81). – pp. 64-66.

8. Improving preventive care during orthopedic treatment with removable dentures/ Zh. V. Vecherkina, N. V. Chirkova, E. A. Andreeva [etc.] //System analysis and control in biomedical systems. – 2022. – Volume 21,No. 1. – P. 16-20.

DOI 10.34660/INF.2023.30.39.250

块状木材废料的回收利用
INVOLVEMENT OF LUMP WOOD WASTE IN RECYCLING

Galaktionov Oleg Nikolaevich
Doctor of Technical Sciences, Full Professor
Petrozavodsk State University

Sukhanov Yuriy Vladimirovich
Candidate of Technical Sciences, Associate Professor
Petrozavodsk State University

Vasilev Aleksey Sergeevich
Candidate of Technical Sciences, Associate Professor
Petrozavodsk State University

抽象的。 该论文探讨了利用木材加工废料来制造游戏产品的可能性。 描述了准备原材料和图像、制作成品样品的工艺流程。 图像和配色方案由用户选择并由软件处理，直到外观令用户满意为止。 然后根据预期的覆盖区域选择材料的尺寸，并应用染料。 成品将使您能够从天然材料中获得个性化的产品。

关键词：合理利用木材、块状木材废料、马赛克拼图、室内产品。

Abstract. *The paper examines the possibilities of using waste from wood processing to create gaming products. The technological process of preparing raw materials and images, manufacturing finished samples is described. The image and color scheme are selected by the user and processed by software until the appearance is satisfactory to the user. Then the size of the materials is selected, depending on the intended coverage area, and dyes are applied. The finished product will allow you to obtain an individualized product from natural materials.*

Keywords: *rational use of wood, lump wood waste, mosaic puzzle, interior products.*

Currently, people all over the world are increasingly paying attention to the safety and environmental friendliness of products and materials that surround them in everyday life, and are also interested in environmental issues [1-3]. Traditionally, wood is used to make not only houses and construction materials, but also furniture, toys, souvenirs and decorations, as well as other household and household products. The demand for some wooden products, for example, wooden toys and puzzles, has only been growing recently [4]. Wood is a natural, safe

and environmentally friendly material. Wood products are attractive to the user, and the expressiveness and variety of natural texture gives each item individuality, in addition, the surface of natural wood is pleasant to the touch and warm. The problems of recycling wood products are also solved much easier and cheaper than products made from other materials.

In wood processing industries, during the manufacture of main products, a lot of wood waste is generated, including lump waste. When manufacturing lumber products, up to 20% of lump waste is generated from the volume of processed raw materials [5]. Traditionally, large lump waste is used to make small lumber products or containers, and is also processed into industrial chips. There are technologies for producing wood-fiber boards from lump waste [6]. The possibility of processing large lumpy waste into products for cultural, household, household purposes and consumer goods has long been known [7]. However, in many woodworking enterprises, lump waste, even quite large ones, often does not find further use and is simply burned to produce energy, which is used for drying wood raw materials and heating production premises. Moreover, such lumpy waste from workpieces may already have carpentry or room-dry moisture, and some of the surfaces may already be planed.

Today, modern technologies are widely used in the production of consumer goods from wood. Thus, in Japan, to preserve traditional forms of products, 3D scanners are used to digitalize standard products and create a library of digital models of wooden products for public use [8]. In China [9], to improve the quality and reduce the cost of producing custom wood furniture fronts, hierarchical clustering is used to group individual wood products based on style and type, material, design, cost, etc. The use of modern computer technology can help create new wood products.

Puzzles captivate not only children, but also adults. For children, puzzles often solve an educational problem, and for adults, solving puzzles is a hobby and a relaxing pastime. One of the most popular puzzles is the “Jigsaw puzzle”, which is a mosaic of specially shaped cardboard (less often plywood) tiles. The solution to the Jigsaw puzzle is to find the correct order of tiles that contain part of the overall image, and thereby assemble the overall image [10]. Children’s puzzles usually consist of several dozen to several hundred piece tiles, while adults can contain up to several thousand piece tiles and require several evenings to assemble. The assembled puzzle can be disassembled again or can be carefully glued to a dense base (plywood or cardboard) and used as interior decoration. However, the puzzle initially contains a specific image; the user can only choose what will appear in the picture, but cannot assemble his own individual image. The Mozabrick project [11] offers an original solution - a mosaic with plastic six-color tiles, which allows the user to assemble his picture from the proposed tiles up to 76x76 cm in size, for

which the user, using a special application and special tools, converts his picture into instructions for assembling a mosaic with his picture .

As one of the options for using piece waste from enterprises producing planed lumber or profile parts for construction, it is proposed to produce individual wooden colored mosaics, which can be used both as a puzzle and as a unique decoration for the interior of residential premises, safe for children and adults.

When producing planed timber with a cross-section of 20x20 and 30x30 mm, either solid or spliced along the length, trims remain - small pieces of waste, often containing knots and other wood defects. This waste can be considered as the most suitable raw material for the production of customized wooden colored mosaics. If the waste in the cross-section is of inappropriate dimensions, then it is pre-dissolved on a compact band saw. From waste of the required cross-section, parallelepiped-shaped workpieces are made on a tabletop miter saw, after which the workpieces are processed on a grinding machine and workpieces with defects and damage are rejected. Parallelepipeds 20x20x20 can be used as pieces of mosaic puzzles for older children and adults, and parallelepipeds measuring 30x30x20 can be used for children's mosaic puzzles, since the size of the part meets the safety requirements for children in terms of the size of the parts [12], as well as for mosaic puzzles with large areas. The finished blanks of the mosaic-puzzle parts are subjected to painting - covered with matte water-based interior paint using color for children's sets, taking into account the materials permitted for children's toys [13].

Currently, the PixelArt art style has gained significant popularity. This style appeared as a reaction to nostalgia for old computer games, when the hardware of the first game consoles and vintage computers did not allow them to display a sufficiently realistic high-resolution image on the screen with a wide color palette and anti-aliasing, and later artists and computer game developers simply began to imitate the images with technical limitations [14]. For example, the online digital software distribution service Steam [15] today widely presents commercial computer games of various genres in the PixelArt style and programs for creating pictures in the PixelArt style. Traditionally, pictures using the PixelArt technique have a so-called 8-bit color palette, which allows you to display 256 colors [16], but the authors believe that it is extremely difficult to implement a mosaic with 256 colors of wooden tiles, so they suggest using 16 colors from the color palette of the W3C HTML 3.2 standard [17] or 16 colors VGA (EGA) 4-Bit [18] (Figure 1).

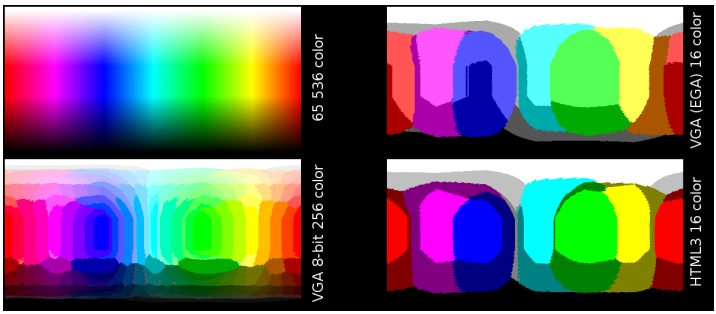


Figure 1. *Indexing colors using different color palettes*

Each tile of a certain color in a wooden color mosaic puzzle acts as one pixel. The final dimensions of the assembled mosaic will be a multiple of the dimensions of the wooden tiles - 20x20 or 30x30 mm. For example, the initial image for a mosaic with a width of 3600 mm and a height of 2400 mm from a 30x30 mm tile should be an image of 120x80 pixels.

In this case, the user, to obtain an individual wooden colored mosaic, selects the size of the tile and, based on this, the desired size of the future product. The user must select a picture that will serve as the initial image to form a mosaic pattern. Using special software, the user's picture is processed: first, the picture is cropped based on the aspect ratio of the future mosaic, then the size of the picture is reduced so that the number of pixels in the picture corresponds to the number of tiles of the future mosaic, and the colors of the picture are indexed to 16 colors. The user must evaluate the resulting picture, which will represent the prototype of the future mosaic. If the user is not satisfied with the resulting picture, then the original picture can be changed, for example, its tone, illumination, saturation or color balance can be changed, which will ultimately change the resulting picture (Figure 2). After the resulting picture suits the user, he receives a set of tiles of the required colors in the required quantity, as well as a pattern for assembling the mosaic. The mosaic tiles can be assembled by the user and glued to the wall using adhesives based on polyvinyl acetate dispersion or vinyl acetate copolymers.

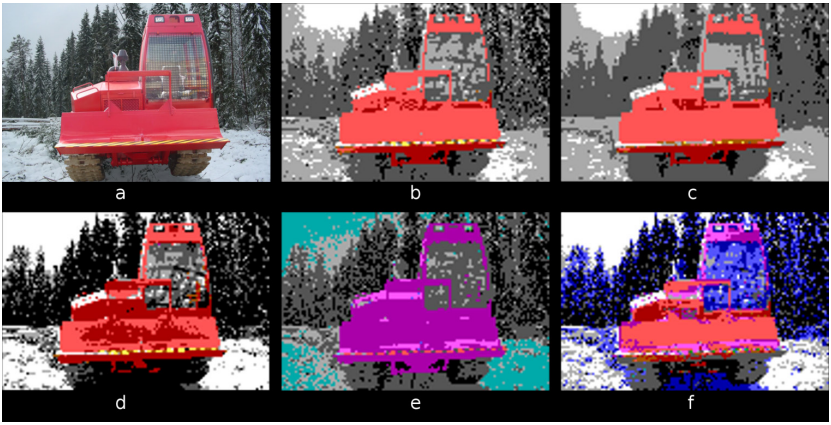


Figure 2. *Image conversion with resizing up to 120x80 pixels and 16 VGA color palette: a – original image; b – the size is changed, and then indexing; c – indexing, and then changing the image; d – preliminary increase in contrast; e – preliminary change in hue and saturation; f – preliminary change of color balance*

The production of such kits for self-assembly of mosaic puzzles by the user can be considered as a new way of using unclaimed small pieces of waste, more fully using valuable wood raw materials, and does not require complex machines and equipment, large production areas and large energy capacities. At the same time, the resulting safe and environmentally friendly product can be considered both as a puzzle game for relaxing time and family leisure, teak and as an option for interior products for original home decoration. Modern computer technology allows you to transform any image and use it as an idea for a mosaic. A program for converting an image and generating instructions for assembly can be a web service that works through a regular browser or a separate application that runs on a personal computer and smartphone.

This work was supported by the Russian Federation Ministry of Science and Higher Education (state research target, theme no. 075-03-2023-128).

References

1. Harju, Charlotta & Lähtinen, Katja. (2021). Perceptions of wooden interior product quality – insights on sustainability views among Finnish consumers. Silva Fennica. 55. 10.14214/sf.10605.

2. Zhou, C. & Wang, Qiyu & Kaner, Jake & Lv, Yixin. (2023). Wooden Door Preferences Based on Lifestyle Theory and Consumer Behaviour Theory. BioResources. 18. 1616-1636. 10.15376/biores.18.1.1616-1636.

3. Toivonen, Ritva. (2012). Product quality and value from consumer perspective-An application to wooden products. Journal of Forest Economics. 18. 10.1016/j.jfe.2011.12.004.

4. Petrović, Slavica. (2023). The european market of wooden toys. Conference: Current trends and challenges for forest-based sectorAt: Prague, Czech Republic. June 2023. p. 6.

5. Kozhukhov N. I., Sazanova E. V. Issues of resource conservation and the use of lump waste in sawmilling // News of higher educational institutions. Forest magazine. 2001. No. 1. pp. 125-130.

6. Yaroshenko K. O., Petrusheva N. A. Effective conditions for processing lumpy waste in the production of fiberboard // Science and modernity. 2011. No. 13-2. pp. 258-261.

7. Veselov A. A. Use of wood waste from plywood and match production M.: Lesnaya promyshlennost, 1987. – 160 p.: ill.

8. Minoshima, Yukito & Matsumoto, Mitsutaka & Ura, Sharifu. (2023). Digitizing Manufacturing Processes of Wooden Products for Sustainability. Conference: 13th International Symposium on Environmentally Conscious Design and Inverse Manufacturing (EcoDesign2023) At: Nara, Japan. December 2023.

9. Zhang, Na & Xu, Wei & Tan, Yong. (2023). Multi-attribute hierarchical clustering for product family division of customized wooden doors. BioResources. 18. 7889-7904. 10.15376/biores.18.4.7889-7904.

10. Kong, Lingyi. (2022). Puzzle-Mopsi: A location-puzzle game. Applied Computing and Intelligence. 3. 1-12. 10.3934/aci.2023001.

11. About Mozabrick // Mozabrick Puzzle. Made by HSH Digital. URL: https://mozabrick-puzzle.com/pages/about-us (Дата обращения: 2023.12.20).

12. GOST EN 71-1 – 2014. Toys. Safety requirements. Part 1. Mechanical and physical properties. 113 p.

13. GOST EN 71-7-2014. Toys. Safety requirements. Part 7. Paints for finger painting. Technical requirements and test methods. 28 p.

14. Tarasconi, Diogo & Santos, Marco. (2021). Padrões de Produção de Ícones e Símbolos em Jogos com Estilo Pixelart. 297-300. 10.5753/sbgames_estendido.2021.19655.

15. Pixel Graphics // 2023 Valve Corporation. URL: https://store.steampowered.com/tags/en/Pixel+Graphics (Дата обращения: 2023.12.20).

16. Mary Winkler. What is Pixel Art? // Envato Pty Ltd. 13 Jan 2016. URL: https://design.tutsplus.com/articles/what-is-pixel-art--cms-21759 (Дата обращения: 2023.12.20).

17. HTML 3.2 Reference Specification. W3C Recommendation. 14-Jan-1997 URL: https://www.w3.org/TR/2018/SPSD-html32-20180315/ (Дата обращения: 2023.12.20).

18. VGA Color Palettes // EXPL-32 Development System URL: https://www.fountainware.com/EXPL/vga_color_palettes.htm (Дата обращения: 2023.12.20).

DOI 10.34660/INF.2023.86.28.251

重力排水管网水力计算的推荐依赖关系
RECOMMENDED DEPENDENCE FOR HYDRAULIC CALCULATION OF GRAVITY DRAINAGE NETWORKS

Prodous Oleg Alexandrovich
Doctor of Technical Sciences, Professor, General Director
INKO-expert LLC,
Saint-Petersburg, Russia

Shlychkov Dmitry Ivanovich
Candidate of Technical Sciences, Associate Professor
National Research Moscow State University of Civil Engineering,
Moscow, Russia
ORCID: 0000-0003-0210-2695

Chelonenko Andrey Gennadievich
Master
National Research Moscow State University of Civil Engineering,
Moscow, Russia

注解。 目的。 研究目的是对重力污水管网水力计算的计算依赖性进行比较分析。 方法。 对两种计算依赖关系进行了比较——Shezy 公式和 N.F. Fedorov 公式，用于重力污水管网的水力计算。 对于一个具体的例子，确定了一个依赖关系 - Shezy 公式，它在计算重力管道的水力坡度时提供了最高的精度。 通过引入所提供的内管直径的概念，对 Shezy 公式的外部形式进行了细化。 构建了依赖图i=f(dpr)，表明Shezy计算公式的细化形式更加准确。 结果及其讨论。 重力污水管网的水力计算建议采用改进的Shezy公式。 建议制定具有内部沉积物的污水管网水力计算的计算表。 结论。 本文介绍的对具有内部沉积物的重力污水管网水力计算的计算依赖关系的分析允许推荐实际使用的改进的 Shezy 公式，根据作者的说法，随后编写了一本手册“重力污水管网水力计算表” 应该发展“内部存款”。

关键词：内部沉积物、计算依赖性、排水网络、水力计算、沉积物层、水力坡度。

Annotation. Purpose. *The purpose of the study is to conduct a comparative analysis of the calculation dependencies for the hydraulic calculation of gravity sewage networks.* ***Methods****. A comparison of two calculation dependencies was carried out – the Shezy formula and the N.F. Fedorov formula, used for*

the hydraulic calculation of gravity sewage networks. For a specific example, a dependency was identified – the Shezy formula, which provides the highest accuracy in calculating the hydraulic slope of a gravity pipeline. The external form of the Shezy formula was refined by introducing the concept of the provided internal pipe diameter. A dependency graph i=f(dpr), was constructed, indicating that the refined form of the Shezy calculation formula is more accurate. ***Results and their discussion.*** *It is recommended to use the refined Shezy formula for the hydraulic calculation of gravity sewage networks. It is proposed to develop calculation tables for the hydraulic calculation of sewage networks with internal deposits.* ***Conclusion.*** *The analysis of calculation dependencies for the hydraulic calculation of gravity sewage networks with internal deposits presented in the article allows recommending the refined Shezy formula for practical use, following which, according to the authors, a Handbook "Tables for the hydraulic calculation of gravity sewage networks with internal deposits" should be developed.*

Keywords: *internal sediments, calculated dependence, drainage networks, hydraulic calculation, sediment layer, hydraulic slope.*

Introduction

The mode of movement of wastewater in existing gravity drainage networks is uneven. The uneven movement of wastewater is due to the following reasons:

• changes in network diameters, local resistance to flow movement (turns, tees, etc.);

• lateral connections and differences in network elevations;

• subsidence of the route and the presence of large mechanical particles (gravel, crushed stone, tree branches, etc.)

• deposits on the inner walls of pipes

Local resistances and deposits on the inner walls of pipes have the main and most significant influence on the unevenness of the self-flowing flow of wastewater. Therefore, when calculating the hydraulic characteristics of self-flowing wastewater networks, these factors must be taken into account in the first place.

Methods

Since the flow rate q, moved by gravity through the drainage networks, does not change, q=const, the hydraulic calculation of the drainage networks is carried out according to the formulas for the uniform movement of wastewater operating in a quadratic resistance zone.

There are three main calculation formulas for hydraulic calculation of pipes:

1. Flow continuity equation:

$$q = \omega \cdot V, \text{ m}^3/\text{s}$$

$$V = \frac{q}{\omega} = \frac{4 \cdot q}{\pi \cdot d_{in}^2}, \text{ m/s} \quad (1)$$

where:

ω – open section area, m^2; $\omega = \frac{\pi \cdot d_{in}^2}{4}$

V – average fluid flow speed, m/s;

D_{in} – internal diameter of pipes, m.

2. Formula A. Shezy:

$$V = C\sqrt{R \cdot i}, \text{ m/s} \quad (2)$$

where:

C is a coefficient that takes into account the influence of the roughness of the pipe walls, as well as the properties and composition of the waste liquid (viscosity, presence of suspended particles, etc.);

R– hydraulic radius, m, $R = \frac{d_{in}}{4}$;

i– hydraulic slope, mm/m (m/m).

3. Formula of Professor N.F. Fedorova:

$$\frac{1}{\sqrt{\lambda}} = -2\,Lg\left(\frac{\Delta_э}{13{,}68R} + \frac{\alpha_2}{Re}\right), \quad (3)$$

where:

λ– resistance coefficient;

Δ_e – equivalent absolute roughness of pipe walls, m: $0{,}6 \le \Delta_e \le 2$ mm [4];

R– hydraulic radius, $R = \frac{d_{вн}}{4}$;

α_2– coefficient that takes into account the nature of the pipe wall roughness and the structure of the liquid flow with suspension; $70 \le \alpha_2 \le 100$ [4];

Re – Reynolds number, $Re = \frac{V \cdot d_{in}}{\nu}$;

ν – coefficient of kinematic viscosity, depending on the temperature of the waste liquid, m^2/s.

The coefficient C for the quadratic zone $\lambda=f(Re)$ in formula (2) is called the A. Shezy coefficient and is determined by the formula:

$$C = \frac{1}{n} \cdot R^y, \quad (4)$$

where: y – is a variable value depending on the value of the hydraulic radius R and roughness coefficient values n.

According to the recommendations of academician N.N. Pavlovsky, the value of the exponent y is calculated using the formula [9]:

$$y = 2{,}5\sqrt{n} - 0{,}13 - 0{,}75\sqrt{R}(n - 0{,}10), \quad (5)$$

For practical calculations take

$$y \cong 1{,}5\sqrt{n}, \quad (6)$$

Then formula (4) takes the form (R. Manning's formula):

$$C = \frac{R^{(1{,}5\sqrt{n})}}{n} = \frac{R^{1/6}}{n}, \quad (7)$$

where:

n – roughness coefficient. For practical calculations take values in the range $n = 0.012 \div 0.014$.

During the operation of drainage networks in pipes made of different materials, depending on the flow rate *V* and the composition of the wastewater, deposits appear in the tray part of the pipes, as shown in Fig. 1.

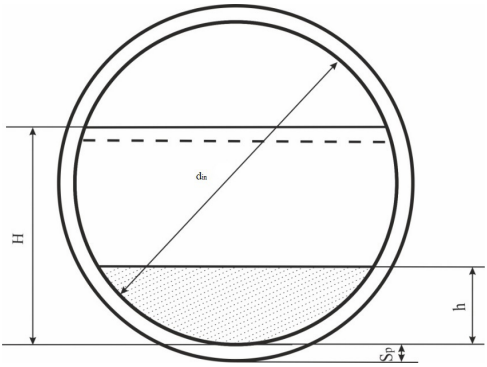


Figure 1. *Fragment of sediments in the chute part of concrete pipes*

Formulas (1), (2) and (3) do not take into account the influence of the thickness of the sediment layer h on the value of the actual characteristics of the hydraulic potential of the pipes, d_{in}^{f} V_f, i_f [5], therefore it is necessary to choose from three formulas - one that gives the most accurate result in hydraulic calculations.

Let's perform a hydraulic calculation of a gravity drainage network using a specific example.

Results of their discussion

Conditions of the problem

A gravity drainage network made of concrete pipes (GOST 20054-2016) with a diameter d_{in} = 400 mm (0.4 m) and a wall thickness S_p = 0.055 m (Fig. 1) transports the flow of household wastewater q = 0.15 m^3/s (150 l/s) with the amount of suspended substances explosive = 400 mg/l.

Wastewater temperature t°= 10° C. The thickness of the sediment layer in the flume part of the pipe is h=0.1 m.

Calculate the values of the actual characteristics of the hydraulic potential of the pipes d_{in}^{f} , V_f, i_f using three calculation formulas (1), (2) and (3) and show the percentage of discrepancy in the values of these parameters.

Solution

The method for determining the values of the three characteristics of the hydraulic potential of pipes is as follows:

1. Let's determine the value din for a new concrete pipe (Fig. 1):

$$d_{in} = d_o - 2S_p = 0.511 - (2\ 0.055) = 0.4 \text{ m}$$

and for a pipe with a deposit layer thickness h = 0.1 m:

$$d_{in}^{f} = (d_o - 2Sp) - h = 0.4 - 0.1 = 0.3 \text{ m}$$

where:

d_{in} – internal diameter of the pipe according to GOST;

d_o – outer diameter of the pipe according to GOST, m;

S_p – wall thickness of the concrete pipe according to GOST, m;

h – thickness of the sediment layer according to the conditions of the problem, h = 0.1 m.

2. The average velocity of the gravity flow V in the new pipe and in the pipe with deposits Vf is determined using formula (1):

$$V = \frac{4 \cdot q}{\pi \cdot d_{in}^2} = \frac{4 \cdot 0{,}15}{3{,}14 \cdot 0{,}4^2} = \frac{0{,}6}{0{,}5024} = 1{,}19 \text{ m/s};$$

$$V_f = \frac{4 \cdot q}{\pi \cdot \left(d_{in}^{f}\right)^2} = \frac{4 \cdot 0{,}15}{3{,}14 \cdot 0{,}3^2} = \frac{0{,}6}{0{,}2826} = 2{,}12 \text{ m/s}.$$

3. Using formula (8), the value of the hydraulic resistance coefficients is calculated λ for a new pipe and a pipe with a layer of buildup h=0.1 m and determine the value of the hydraulic slope i for a new concrete pipe and a pipe with a layer of sediment h=0.1 m using the Darcy-Weisbach formula:

$$i = \lambda \frac{V^2}{2g \cdot d_{in}^{f}}, \text{ mm/m (m/m)}$$

$$i_f = \lambda_b \frac{V_f}{2g \cdot d_{in}^{f}}, \text{ mm/m (m/m)} \qquad (8)$$

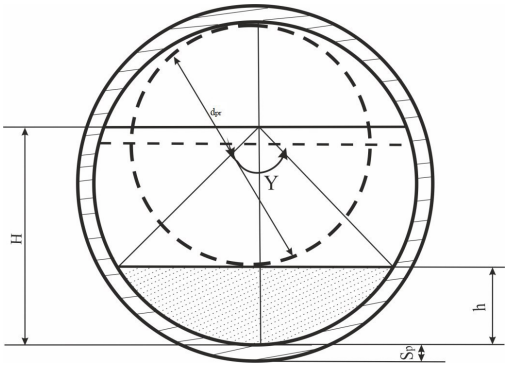


Figure 2. *Geometric parameters of the flow in gravity drainage networks*

When calculating the hydraulic radius R in formula (4) and the open section area ω, trigonometric functions are used, depending on the degree of fillin g $\frac{o}{d_{in}}$.

The calculation is made according to the formula [7]:

$$R = 0{,}25\, d_{in}\left(1 - \frac{sin\varphi}{\varphi}\right) \quad (9)$$

where: d_{in} – internal diameter of pipes, m;

$$d_{in} = d_o - 2S_p \quad (10)$$

d_o – outer diameter of pipes according to GOST, m;

S_p – pipe wall thickness according to GOST, m;

φ – the angle between two chords from the center of the pipe to the surface of the deposits

$$\omega = 0{,}125\, d_{in}^2(y - sin\varphi), \text{ m}^2. \quad (11)$$

Currently, there are two methods for hydraulic calculation of gravity drainage networks.

First technique– is valid for the region of a completely rough regime of turbulent fluid flow.

The calculation is made according to the formula of A. Shezy(2):

$$V = C\sqrt{R \cdot i}, \text{ m/s}$$

where:

C – coefficient A. Shezy, determined by the formula N.N. Pavlovsky [7].

R– hydraulic radius, $R = \frac{d_{in}}{4}$, m;

i– hydraulic slope of the pipe tray, m/m (mm/m).

Second technique– manufacturer's calculation using N.F. formula Fedorov, which is valid for all three modes of turbulent flow:

$$\frac{1}{\sqrt{\lambda}} = -2\, Lg\left(\frac{\Delta_э}{13{,}68R} + \frac{\alpha_2}{Re}\right),$$

where: λ – coefficient of hydraulic resistance;

Δ_e– coefficient depending on the roughness of the inner surface of the pipes [7, 9];

α_2 – coefficient depending on the nature of the pipe roughness, that is, on the type of material (concrete, fiberglass, etc.) [9];

$Re_f = \frac{V \cdot d_{in}}{\upsilon}$ – Reynolds number;

ν – coefficient of kinematic viscosity of the liquid, depending on its temperature, m^2/s.

Both methods of hydraulic calculation of pipes are related by the relationship:

$$C = \left(\frac{8 \cdot g}{\lambda}\right)^{0,5}, \text{ or }, C^2 = \frac{8 \cdot g}{\lambda}, \lambda = \frac{8 \cdot g}{C^2}$$

$$C = \sqrt{\frac{8 \cdot g}{\lambda}}. \quad (12)$$

According to the conditions for the given example, let us compare the hydraulic calculation of pipes using formula (2) - A. Shezy and formula (3) - N.F. Fedorov. The calculation results are summarized in Table 1.

Table 1.

Calculation results

Type of calculation dependencies	Design characteristics of pipes		
	WITH	λ	i, m/m
Formula A. Shezy	65.15	0.01849	0.00286
Formula N.F. Fedorov	----	0.04759	000859

Analysis of *i* values in table. 1 shows the greater accuracy of the formula of A. Shezy, in comparison with the calculation using the formula of N.F. Fedorov. The percentage of discrepancy between *i* values is 66.71% or 3.0 times.

Therefore, the main calculation relationship for the hydraulic calculation of pipes without internal deposits is the formula:

$$\lambda = \frac{8 \cdot g}{C^2}.$$

Likewise for pipes with deposits. For the example given in table. Figure 2 presents the results of calculations of pipe characteristics with a sediment layer thickness *h*=0.1 m.

Table 2.

The results of calculating the values of pipe characteristics with a layer thickness of deposits h = 0.1 m.

Type of calculation dependencies	Pipe design characteristics values		
	WITH	λ	i, m/m
Refined formula of A. Shezy (14)	99.60	0.00791	0.01126
Formula N.F. Fedorova (3)	----	0.03191	0.04541

From the table 2 also follows that A. Shezy's formula (2) is more accurate than N.F.'s formula. Fedorov (3), since the value *i* = 0.01126 m/m is less than the value *i* = 0.04541 m/m by 75.20% or 4.03 times.

Therefore, when making hydraulic calculations of gravity drainage networks, you should always use a more accurate dependence that takes into account the value of the provided diameter of pipes with sediment d_{pr}, determined by formula (7):

$$d_{pr} = \sqrt{d_{in}^2 - \left[\left(d_o - 2S_p\right) - h\right]^2} = \sqrt{d_{in}^2 - (d_{in} - h)^2}\ , \text{m} \qquad (13)$$

Formula (14) refined by the authors, due to the introduction of the concept d_{pr}, formula (13) takes the form (7):

$$i_{pr} = \frac{4 \cdot (V_{pr})^2}{C^2 \cdot d_{pr}}, \text{ m/m} \qquad (14)$$

Dependence (14) characterizes the free area of the wetted perimeter of the pipe ωpr between its roof and the surface of the pipe with deposits and increases the

accuracy of calculating the characteristics of gravity flow in pipes with deposits in the trough part.

In Figure 3 shows a graph of the dependences $i=f(d, d_{pr})$. From the graph in Fig. 3 it follows that for the conditions of the given example, the values of the hydraulic slope i for new pipes differ significantly from the values i_{pr} for pipes with deposits h = 0.1 m. In Figure 3 shows the values of the characteristics based on which the graphs in Fig. 3 for new pipes: d = 0.15, 0.20, 0.25, 0.30 and 0.40 m.

Table 3.

Values of pipe parameters according to the formulas of A. Shezy

Type of calculation dependencies	Average values of calculated pipe characteristics		
	WITH	λ	i, m/m
Refined formula of A. Shezy (14)	59.35	0.02228	0.01926
Formula N.F. Fedorova (3)	57.64	0.02362	0.02042

Analysis of the values of i presented in table 3 shows:

- the calculation of the values of i using the formula (14) refined by the authors differs from the values of i using the classical formula (3) by 5.68% or 1.1 times.

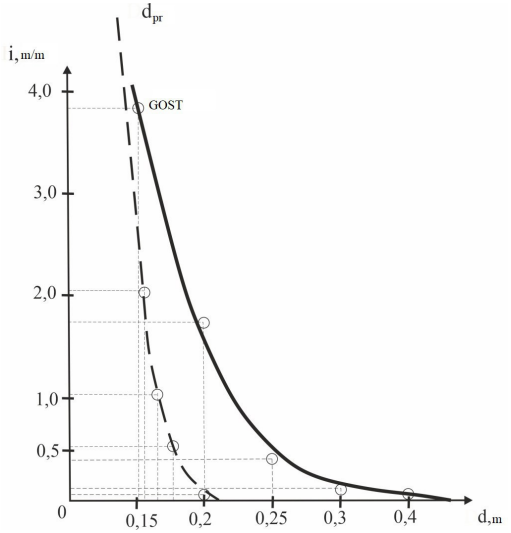


Figure 3. *Dependency graph $i= f (d, d_{pr})$*

In Figure 3 shows graphs of the dependence $i= f (d, d_{pr})$, demonstrating the discrepancy between the values of i, calculated using formulas (14) and (12).

Conclusion

Thus, the analysis of the calculated dependencies presented in the article for the hydraulic calculation of gravity drainage networks with internal sediments allows us to recommend for practical application the formula of A. Shezy (14), refined by the authors.

Contribution of the authors

The authors contributed equally to this article.

Conflict interests

The authors declare no conflict of interests regarding the publication of this article. The final manuscript has been read and approved by all the co-authors. The article was submitted; approved after reviewing; accepted for publication.

References

1. Blyashko Ya. I. Use of sewerage wastewater from pressure-gravity water pipelines and discharges from thermal power plants for the generation of electrical energy // Chief Power Engineer. 2020. No. 6. P. 35-44.

2. Vointseva II, Novikov MG, Prodous OA Extension of the period of operation of pipelines of water supply systems made of steel and cast iron pipes. // NT magazine "Engineering systems" AVOK - North-West", No. 1, 2019. - pp. 44-47.

3. Vointseva II, Nizhnik T.Yu., Strikalenko TV, Baranova AI Anticorrosive properties of disinfecting agents based on polyhexamethylene guanidine hydrochloride // Water: chemistry and ecology. 2018. No. 10-12 (117). P. 99-108

4. Prodous OA, Novikov MG, Samburskiy GA, Shipilov AA, Terekhovt LD .., Yakubchik PP, Chesnokov VA Recommendations for the reconstruction of new metal water supply pipelines made of steel and gray cast iron. //Ed. LLC "Own Publishing House", St. Petersburg - Moscow. 2021 .-- 40 p.

5. Prodous OA Dependence of the duration of the study of metal water supply pipelines on the thickness of the sediment layer on the inner surface of the pipes. // Collection of reports of the XV International Scientific and Technical Conference "Yakovlev's Readings". March 19, 2020. Moscow: Publishing house. IISS - MGSU. 2020. - P. 113-117.

6. Prodous OA Methodology for assessing the duration of the use of metal pipelines of water supply and wastewater systems // Vodoochistka. Water treatment. Water supply. 2021. No. 1 (157). P. 4-10.

7. Prodous OA, Shlychkov DI On the change in the values of the hydraulic characteristics of pressure sewer collectors made of steel and cast-iron pipes with internal deposits // Izvestiya vuzov. BUILDING. 2020. No. 12 (744). P. 70-77

8. Orlov VA Energy saving as a result of reconstruction of water supply networks by trenchless methods. // In the collection: Actual problems of the construction industry and education. Collection of reports of the First National Conference. 2020.P 866-870.

9. Chupin RV Optimization of developing drainage systems. Monograph. Irkutsk: publishing house ISTU. 2015 .-- 418 p.

10. Shevelev FA, Shevelev AF Tables for hydraulic calculation of water pipes. Reference manual. // Publishing House "Bastet". M., 2014.-- 382 p.

11. Shlychkov DI Problems of the technical condition of operating pipeline systems // Innovations and investments. 2020. No. 4. P. 207-210.

12. Shlychkov D.Energy-saving as an integral part of technical and economic efficiency// Option. 2019. Vol. 35. No. SpecialEdition24. pp. 1626-1636.

13.Carsten UlrichSchwermera,WolfgangUhlabcCalculating expected effects of treatment effectiveness and river flow rates on the contribution of WWTP effluent to the ARG load of a receiving river//Journal of Environmental Management. 2021 No. 288 P. 2-14

DOI 10.34660/INF.2023.45.37.252
UDC 002.6:004.415.048.65

情绪智能人工系统中本体的参数优化
PARAMETRIC OPTIMIZATION OF ONTOLOGIES IN ARTIFICIAL SYSTEMS OF EMOTIONAL INTELLIGENCE

Bondarchuk Victoria Valeryevna
Candidate of Technical Sciences, Head of Department
Kravchenko Natalia Mikhailovna
Candidate of Technical Sciences, Senior Researcher, Senior Researcher
Institute of Artificial Intelligence Problems, Donetsk

抽象的。 该工作致力于情感智能人工系统中本体参数优化的方法论，通过调节系统参数优化的方法提高神经网络的鲁棒性。 提出了基于Python编程语言Keras库的解决方案技术，该库提供与人工神经网络（TensorFlow平台的高级接口）OpenCV的交互。 为了训练神经网络，使用了 Effectnet 数据集（Kaggle 平台），包含 8 个类别的 28175 张图像。 卷积神经网络模型

关键词：神经网络架构、模型训练、类、缩放、TensorFlow、OpenCV、AffectNet、Kaggle。

Abstract. *The work is devoted to the methodology of parametric optimization of ontologies in artificial systems of emotional intelligence, increasing the robustness of neural networks by the method of parametric optimization of the regulatory system. The solution technologies based on theKeras library of the Python programming language, a library that provides interaction with artificial neural networks (high–level interface of the TensorFlow platform), OpenCV, are presented. To train the neural network, the Effectnet dataset (Kaggle platform) was used, containing 28175 images in 8 categories. Convolutional neural network model*

Keywords: *neural network architecture, model training, class, scaling, TensorFlow, OpenCV, AffectNet, Kaggle.*

Research in the field of analysis is carried out at the Donetsk Institute of Artificial Intelligence Problems processes of interaction of cognitive dysfunctions with the hardware and software complex, tools, adaptation methods and specialized processing coming from means of collecting information about the state of the object during psycho-emotional diagnostics include several components: collection and analysis of large volumes of data, working with open, dynamically changing

sources; formation of a decision-making protocol for multi-purpose data processing, semi-structured flows data using recurrent neural networks with continuous learning, as well as architectural solutions for software that allows solving these problems. The subsystem for collecting, extracting and analyzing the data flow is the entry point of information for the functioning and decision-making of all subsystems of emotional intelligence. As part of the project implementation, the following tasks are being solved in research work: analysis of methods for collecting and analyzing large volumes of data from open, dynamically changing sources; development of a method for forming an artificial emotional intelligence system in a local and, in the future, WEB-project with automated workstations, systems in conditions of limited resources; development of theoretical foundations of architectural features of data processing software; development of theoretical foundations for solving problems of multi-purpose processing of information flows using recurrent neural networks with continuous learning.

The digital transformation of society is an integral factor of progress. The intensification of all spheres of human activity is associated with an increase in the risks of psycho-emotional dysfunctions against the background of stress, affect, and decompensation. The human factor has been and remains at the forefront of digital transformation. Of particular relevance are studies of unsolved problems of cognitive dysfunctions and brain patterns, such as affects, qualia, possibility implementation of emotional diagnostics and rehabilitation. The lack of research into these problems has encouraged scientific research to address them. The project examined a set of issues related to the organization of achieving goals through the design of an artificial emotional intelligence system.

Given the fundamental concepts of emergent processes of emotions, it is relevant to present the basic architecture of the artificial emotional intelligence system model, including dynamic, recursive emotional processes, instrumental means of information gathering, processing, and data management within the system. Practical solutions of the artificial emotional intelligence system based on neural networks have been implemented. Instrumental means of the artificial emotional intelligence system, monitoring information-analytical system of psych-emotional dysfunctions have been developed: automated user workstation - an intelligent assistant of information diagnostics.

As part of research devoted to the effective use of drug-free methods and means of intellectual-spiritual therapy and the pragmatic features of artificial emotional intelligence for the purposes of self-regulation of psycho-emotional states of the individual, a project is being developed, the conceptual idea of which is to create conditions for the development of an interactive high-tech effective intellectual system of psycho-emotional diagnostics with elements of rehabilitation.

The basis for developments in this direction was the analysis of the emergent fundamental concepts of ontologies that ensure this functioning. Based on the results of this analysis, a structuring of knowledge was carried out, and an ontological model was proposed that integrates this knowledge. Based on the structuring carried out, it is expected to develop a methodology for models for the formation of an emotional intelligence system using a multi-criteria formulation of the problem, machine learning, as well as deep learning algorithms for artificial emotional intelligence systems.

Tools for processing cognitive information and modern brain research technologies are based on the mechanism of processing cognitive information. Emotion recognition is an important research area in various fields. Human emotions have many manifestations; emotion recognition can be realized by analyzing facial expressions, speech, behavior or physiological signals [1-6].

The possibilities of image processing using the OpenCV python library have been explored, the function interface: imread() - reading an image from a file, imwrite() - writing to a file, resize() - resizing, imshow() - displaying in a window, cvtColor() - transformation colors, CascadeClassifier() – creation of a cascade classifier for object detection using the Haar method; capabilities of working with images in the python Pillow library, methods of the Image class: open() – reading from a file, save() – saving an image, show() – display using OS software, crop() – cropping at specified fragment coordinates, resize () and thumbnail() – resizing, transpose() – reflection, rotation, rotate() – rotation by an arbitrary angle.

The following datasets of images of emotional facial expressions were found on the Kaggle platform: Facial Expressions Training Data (affectnet) and FER_2013. Comparative analysis and clustering of data sets was carried out. Pre-processing of images from the affectnet and FER-2013 data sets has been implemented for their use in training neural networks to recognize emotional states.

Options for setting parameters for training artificial neural networks (options for initial approximation of weighting coefficients, learning rates, neuron activation functions, probability values for dropout, and various optimizer algorithms) have been identified. Experiments were conducted on training a neural network on prepared datasets of facial images using various network settings in order to select the optimal solution.

To implement a solution to this problem (describing the network architecture, calculating parameters - training, identifying emotions from photographs), the Keras library of the Python programming language was used - a library that provides interaction with artificial neural networks (high-level interface of the TensorFlow platform). For image processing (reading data from files, searching and highlighting faces in photos, cropping, scaling), the OpenCV library was used.

Calculations were carried out using the following convolutional neural network model (Fig. 1). This diagram was obtained during model calculations. To

develop the scheme, we used the function plot_model of the Keras library [7]. To connect to this database via VPN, you are required to register on this site. To train the neural network, the AffectNet dataset (Kaggle platform) was used, containing 28,175 images in 8 categories (anger, contempt, disgust, fear, joy, sadness, surprise and neutral face). The learning process is displayed in the following Figure 2. It shows the change during successive approximations (epochs) of parameters characterizing the success of learning: loss, accuracy. The graphical representation is provided by the corresponding function of the matplotlib library.

The architecture of a deep learning neural network is presented in Figure 1 (fragment). During training, the Adam optimizer (adaptive torque estimation) and a variable learning rate coefficient were used. On all layers except the output layer, the Selu activation function was used. The network was trained on the Facial Expressions Training Data (affectnet) dataset hosted on the Kaggle.com platform. The dataset contains more than 29 thousand color images of human faces measuring 96x96 pixels. The images are divided into eight categories. Seven photographs of people with different emotions expressed on their faces: joy, sadness, fear,

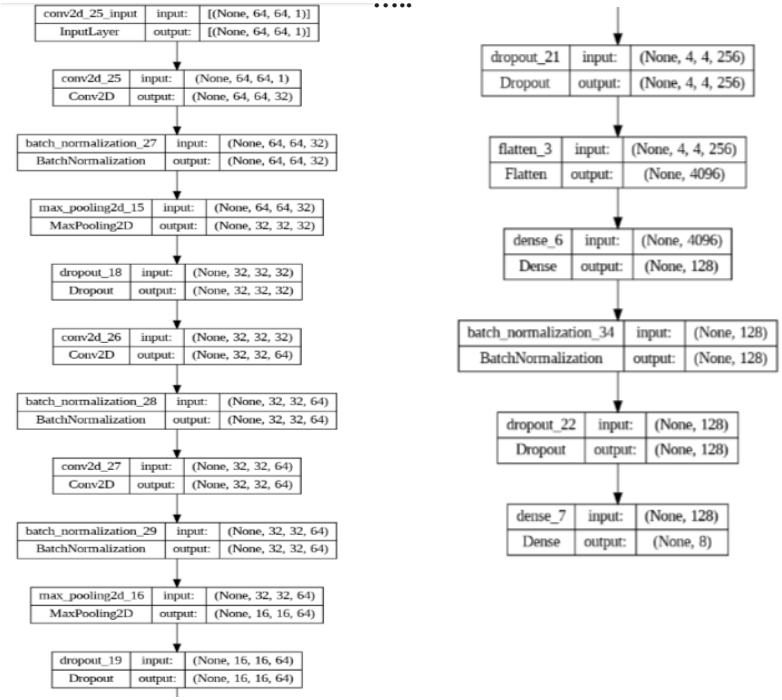


Figure 1. *Convolutional neural network model (fragment)*

surprise, disdain, disgust, anger. And one more category - photographs of people with neutral facial expressions (Fig. 3).

Rice 3. *Characteristic eight categories of images*

Experiments were carried out on training a neural network on the original data set and after some pre-processing of these images (changing color, image size, etc.). To assess the quality of the constructed models, the following data sets were used: fragments of training and test samples from FER-2013 (source - Kaggle. com platform), as well as a self-generated collection of images - stills from films, photographs in the public domain. The table presents the results of testing the calculated models on three samples. Correct answers here mean the results of a calculation that determines the maximum probability of the presence of the emotion expected by the tester, without taking into account cases where this emotion ranks second in probability.

Table 1

Comparative analysis of test results

Model	**Correct answers in the forecast, %**		
	Stills from films (1039 photos)	**FER-2013 (test set fragment, 1989 photographs)**	**FER-2013 (fragment of the training set, 8598 photos)**
Training on the original set affectnet 96x96	40.8	39.6	33.1
The original set data (96x96) is normalized by dividing by 255	47.1	42.8	38.2
Original set data (96x96) transformed using global contrast normalization	33.0	39.7	36.0
The face area is selected in the original images, the photo is converted to size 64x64, shades of gray. Reduced number of convolutional layers	43.7	46.7	47.3
Color photos 64x64 (face area), usual number of layers	47.0	51.8	51.0
Grayscale 64x64 (face area), normal number of layers, increased number of epochs during training	49.1	52.8	52.8

From a comparison of testing results (Table 1), it follows that the best forecast quality is provided by a neural network model trained on a set of 64x64 images after preprocessing (selection of the face area, conversion to grayscale). The quality of determination of individual emotions by this model (depending on the test set): anger: 37.6 - 42.8%; contempt: 25 – 27%; disgust: 59.8 – 72.1%; fear: 43.2 – 56.4%; joy: 65.9 – 72.7%; neutral expression: 31.9 – 52.1%; sadness: 46.4 – 54.0%; surprise: 57.9 – 68.8%.

A prediction was made for modeling correct answers for various databases: frames from films (1039 photographs), FER-2013 (fragment of the test set, 1989 photographs, FER-2013 (fragment of the training set, 8598 photographs; training on the original setaffectnet 96x96; the original data set (96x96) was transformed using global contrast normalization; The face area is selected in the original images, the photo is converted to size 64x64, shades of gray. The number of convolutional layers has been reduced; color photos 64x64 (face area), usual number of layers. Grayscale 64x64 (face area), usual number of layers, increased number of epochs during training.

Results of testing the model on images (Fig. 4) from Izard's book "Human Emotions": 1st depicts excitement-interest, we do not have such a category, it is defined as surprise; 2-4 – detection is correct: happiness, surprise, sadness prevail; 5 – there should be anger, disgust was found, anger is in second place, noticeably inferior. A possible explanation is that a distorted mouth line is usually present in images with the emotion of disgust; 6 – the author believes that disgust, sadness and fear are recognized, disgust is in third place. (perhaps the person is crying, indeed, the author); 7 – there must be contempt, neutrality is determined; 8 – fear (according to Izard "Human Emotions"), according to the model – surprise + fear, reversed. But they are very similar, and the model often confuses them, and so do the compilers of the sets on which the networks are trained; 9 – according to Izard "Human Emotions" – shyness, we don't have such a class, the network is at a loss: anger? Neutrality? Sadness? Modeling a database.

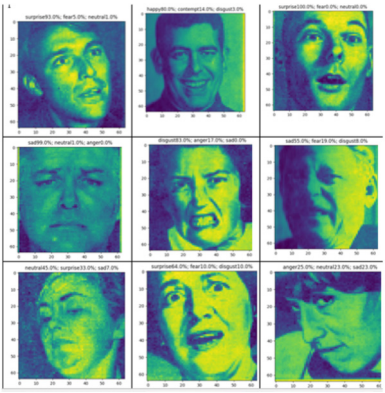
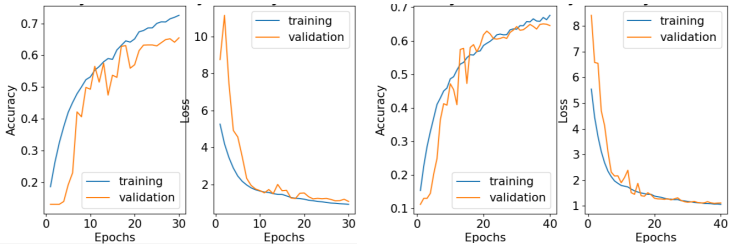


Figure 4. *Results of testing the model on images from Izard's book "Human Emotions"*

Experiments were carried out to train the network on the original set of images (Fig. 5) with different Dropout values (to reduce the effect of overtraining).

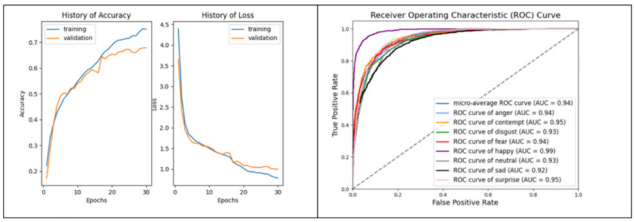
Dropout values used (by layer): 0.3, 0.4, 0.5, 0.6, 0.5:



loss: 1.0846 - accuracy: 0.6547 Increase in Dropout values: 0.4, 0.5, 0.5, 0.6, 0.6: loss: 1.1166 - accuracy: 0.6452

The Adam optimizer with variable learning rate coefficient, initial value lr=0.001, selu activation function, padding='same' (for convolutional layers), 40 epochs. Testing on the test set: loss: 0.9175 - accuracy: 0.6869. Training is conducted on an augmented set of images. For the purpose of improving the balance of the training set, it has been enriched with images of facial emotional expressions obtained from various sources (internet photos, movie stills, book illustrations, etc.). Examples of facial images added to the training set, random samples per specified emotion. Experimental studies conducted by Ph.D. Kravchenko N.M. (Fig. 5) showed that the emotional state of the face in the Mona Lisa painting is most likely neutral (61%), with a 37% probability of a tinge of disdain (probably due to a slight smile with an asymmetric mouth line) and a slight probability of

joy (0.41%) and sadness (0.39%). The probabilities of other emotions are even smaller, around 0.



Error curve

Figure 5. *Convolutional neural network training process*

The following are the results of the experiments. In all paintings, a neutral facial expression is most likely to be detected. This is not surprising, given that these are portraits. The person from whom the artist paints a portrait sits calmly and relaxed. That's why it's such an emotion. For comparison, below: a portrait of a girl (apparently from Raphael's painting "Lady with a Unicorn") and stills from the film "The Master and Margarita." Photos of actors with various emotions on their faces.

As a result of the program algorithm, the set goals were achieved. The following emotions were detected: contempt, happy, fear, disgust, sad, neutral, surprise. Next, to assess the adequacy of the model, a forecast was carried out (evaluation of images using the calculated parameters of the neural network. The percentages next to the category name show the probability of detecting a given emotion (Fig. 3).Parametric optimization of ontologies in an artificial emotional intelligence system completed successfully.

References

1. *Bondarchuk V.V.,Kravchenko N.M. Analytical review of artificial emotional intelligence systems: practical solutions: chapter 9 / Current issues of modern society, science and education: monograph / Ed. ed. G.Yu. Gulyaeva. – Penza: ICNS "Science and Education", 2023 – 336 p. – pp. 134–145. – ISBN 978-5-00236-010-9.*
2. *Bondarchuk VVArtificial Emotional Intelligence management system: diagnostics and rehabilitation / Proceedings of the International University Forum "Practice Oriented Science: UAE – Russia – India". – Dubai, UAE. – 19 September 2023. – 200 rub. – R. 178–180. – DOI 10/34660/TNF.2023.30.67.236. – UDC 002.6:004.415.048.65. – ISBN 978-5-905695-87-95.*
3. *Bondarchuk VV, Kravchenko NM Functional Features of Methods and Tools for Computer-Aided Design of Artificial Emotional Intelligence Systems / The I International Scientific and Practical Conference "Topical Aspects of Modern Scientific Research". – GPN Publishing Group, Tokyo, Japan, Sci-Conf.com.ua. – 28-30 September 2023. – 276 p. – P. 75–85. – ISBN 978-4-9783419-2-1. – UDC 004.8.*
4. *Bondarchuk V.V. Technologies for computer design of artificial emotional intelligence systems / "Higher school: scientific research": materials of the Interuniversity International Congress (Moscow, October 13, 2023). – T. 1. – Moscow: Infinity, 2023. – 170 p. – pp. 130–134. – ISBN 978-5-905695-53-7. – DOI 10.34660/INF.2023.58.92.386*
5. *Bondarchuk V.V., Kravchenko N.M. Mathematical modeling of artificial emotional intelligence systems / Monthly scientific journal "National Association of Scientists (NAU)". – 2023. – T. 2, No. 94. – P. 48–52. – ISSN Print 2412-5291. – DOI: 10.31618/NAS.2413-5291.2023.2.94.*
6. *Bondarchuk V. V.., Kravchenko N.M. Technologies for designing software for intelligent systems of emotional state / Monthly scientific journal "Eurasian Union of Scientists. Series: Technical and physical and mathematical sciences." – St. Petersburg, Russian Federation. – 2023. – T. 1, No. 9. – P. 10–13. – DOI: 10.31618/ESU.2413-9335.2023.1.112. – GRNTI 44.31.03; 13/61/17.*
7. *https://www.kaggle.com/datasets/noamsegal/affectnet-training-data*

DOI 10.34660/INF.2023.50.69.253

铁氧体 – 石榴石薄膜中的螺旋动态域
SPIRAL DYNAMIC DOMAINS IN FILMS FERRITES - GARNETS

Rusinova Elena Anatolyevna
Senior Lecturer
Ural State University of Railway Transport,
Ekaterinburg, Russian Federation

注解。 这项工作研究了铁氧体石榴石薄膜晶体中产生的动态域结构的混沌运动系统的自组织过程。 揭示了这种结构的外观对连续运行的交变磁场的幅度和频率的依赖性。 已经获得了各种各样的DDS，并且实验表明磁畴系统中的自组织类型会根据外部条件而变化。 这些研究重点是螺旋动态域。 考虑了具有不同特征的三个样本。

关键词：磁畴结构、螺旋磁畴、角态、交变磁场、频率。

Annotation. *The work investigated the processes of self-organization in a chaotically moving system of dynamic domain structures arising in films-crystals of ferrite garnets. The dependence of the appearance of such structures on the amplitude and frequency of a continuously operating alternating magnetic field was revealed. A wide variety of DDSs have been obtained, and it has been experimentally shown that the type of self-organization in the system of magnetic domains changes depending on external conditions. These studies focus on helical dynamic domains. Three samples with different characteristics were considered.*

Keywords: *Domain structures, spiral domains, angular state, alternating magnetic field, frequency.*

Experimental technique

In experimental studies, the microvideo filming method was used. The installation on which the research was carried out is shown (Fig. 1)

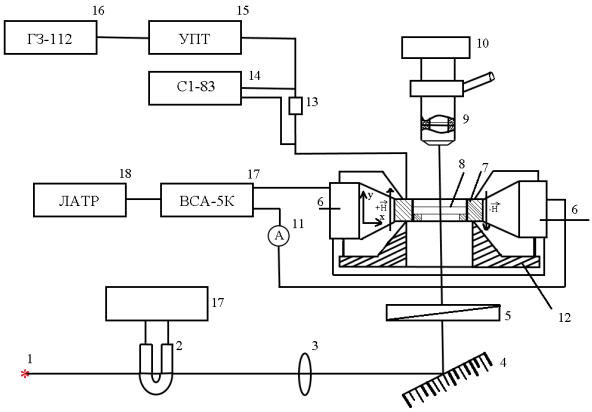


Figure 1. *Experimental setup*

1. monochromatic light point source;
2. flash lamp;
3. focusing lens;
4. rotating mirror;
5. polaroid;
6. wire coil to create a constant magnetic field;
7. wire coil to create an alternating magnetic field;
8. stand for samples of yttrium garnet films;
9. Polaroid for analyzing light in a microscope;
10. video camera
11. ammeter
12. table
13. reference resistance
14. oscilloscope s1-83
15. alternating field amplifier
16. generator g3-112
17. rectifier VSA-5K
18. laboratory autotransformer
19. individual lamp power supply

The phenomenon of dynamic self-organization in films of ferrites – garnets

The discovery of the phenomenon of dynamic self-organization in films of ferrites - garnets with perpendicular anisotropy was reported in the works of Gerta

Semenovna Kandaurova - professor, doctor of physical and mathematical sciences, department of magnetic phenomena of the Ural State University named after Gorky (Ural Federal University). A previously unknown special excited state of a multi-domain magnetic medium, arising in a spatially homogeneous continuously acting magnetic field, called the angular state, was described. This state appears in FG films under low-frequency pumping by an alternating magnetic field (102 – 104).

The characteristic features of the speaker are:

The emergence of ordered dynamic domain structures (DDS) occurs in a limited amplitude-frequency (H0–f) region. In this region (H0 – f), self-organization processes occur in a system of chaotically moving domain boundaries and ordered, stable DDS of various types are formed (spiral, ring domains, "leading centers" of various types). The presence of a number of quasiperiodic processes, the main of which are the emergence and disappearance of ordered systems of dynamic domains (DD), alternating "emission" of DD of alternating polarity, etc., the frequency of these processes is several orders of magnitude lower than the frequency of the exciting field; emerging ordered DDS are characterized by translational and rotational motion, quasi-periodic changes in their size and shape; the presence of the waiting time necessary for the formation of a macroscopic ordered configuration from a chaotic system of domain boundaries. Strong dependence of angular state, parameters and emerging DDS on the frequency and amplitude of the alternating pump field (additional alternating field).

A striking feature of this state is that the emerging ordered DDS (SD) "live" for some time Tg surrounded by a disordered (chaotic) structure, and then disappears. After some time Tw (waiting time), a new (or several new) ordered structure emerges from chaos in this section of the sample, etc. Thus, as long as the pump field is in effect, quasi-periodic processes of the chaos-order transition occur.

Experiment results

Experimental studies were carried out on three samples, with different chemical compositions and different thicknesses. The results obtained are described below.

Sample № 1

Let us consider the processes occurring in the domain system with an increase in the amplitude H0 of the sinusoidal magnetic field in the FG film for sample No. 1 with the composition (TmBi)3(FeGa)5O12, having a thickness of 5 μm, and a static saturation field of 57 Oe. In the initial state, the sample has the usual labyrinthine domain structure (DS) (Fig. 2a). With an increase in the amplitude of the H0 domain boundaries (DWs), they begin to slightly "quiver" and shift from the equilibrium position, then, at a minimum frequency in the harmonic field, stable multi-turn beautiful-looking SDs appear (Fig. 2a, c-d). Then their movements be-

come more intense, they begin to move randomly, and the entire DDS picture "blurs" at a field strength of H0 = 40 – 44 Oe. At H0>50, only chaotic movement of the domains is visible. There are no signs of any ordering; the movement of the DW remains chaotic. However, with a further increase in the amplitude of the alternating field to 46 – 50 Oe, a qualitative change in the state of the multi-domain sample occurs; As experience shows, the formation of SD begins with a certain minimum threshold frequency f and occurs only in a limited range of amplitudes (0.6 – 0.8 from the static saturation field H) and alternating field frequencies (Fig. 2e).

SD observations have shown that stripe domains under the influence of an alternating field can twist both clockwise and counterclockwise, i.e. have different topological charges q+ and q-. The number of both, on average, remains the same (The average size of the SD is 900 μm). The entire observed picture of DDS is mobile and changeable. Individual spirals appear, move along the sample and disappear, and in their place new SDs are formed.

This continues indefinitely as long as pumping by an external variable field is in effect. The emerging SDs interact with each other like elastic systems; the pitch of the spirals in most cases becomes smaller at the points of their contact. The "lifetime" of an individual SD or a whole complex of such domains is seconds and tens of seconds. Therefore, the observed DDS was classified as a stable dynamic domain structure. Various types of helical domains arising in this sample are presented in Fig. 3.

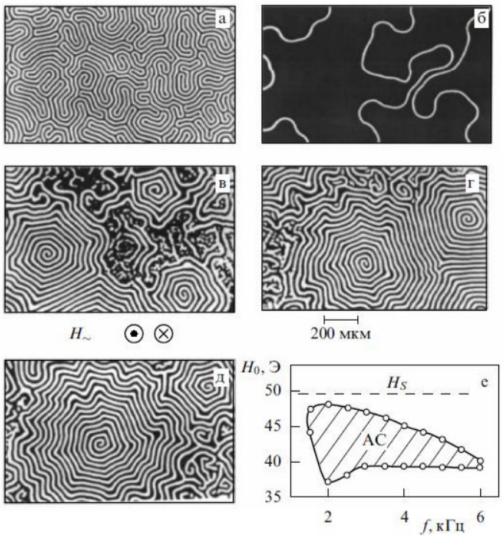


Figure 2. *Domain structure in sample № 1 at different amplitudes of the alternating magnetic field*

Figure 3. *SD formed in sample № 1, under various conditions*

Sample № 2

In the initial state, sample No. 2 with the composition (YSm)3(FeGa)5O12, having a thickness of 4.6 μm and a static saturation field of 96 Oe, has a conventional labyrinthine domain structure. When magnetized in a constant field, the domain structure changes in the usual way. Spirals can twist clockwise or counterclockwise, i.e. have different signs of topological charge (Fig. 3 d-f). These LEDs differ in their geometry from those formed under conditions of pumping with a sinusoidal magnetic field. The lifetime T_g of the LEDs under consideration is quite long. At a frequency of 300 Hz, T_g can reach 10 seconds, and the larger the spiral, i.e. the more turns it has, the longer it lives. Between two successive appearances of LEDs in the observed area of the sample, some waiting time T_w passes, when only a gray background is visible (i.e., the movement of the domains is chaotic). For an area of ~1 mm2 in the center of the sample, the time T_w at f = 300 Hz is on average several seconds.

When two SDs with the same or different signs of q collide, they interact as two elastic systems. The distance between the turns decreases, and a thickening area is formed (Fig. 4 and 5).

Figure 4. *Interaction of helical domains in sample № 2*

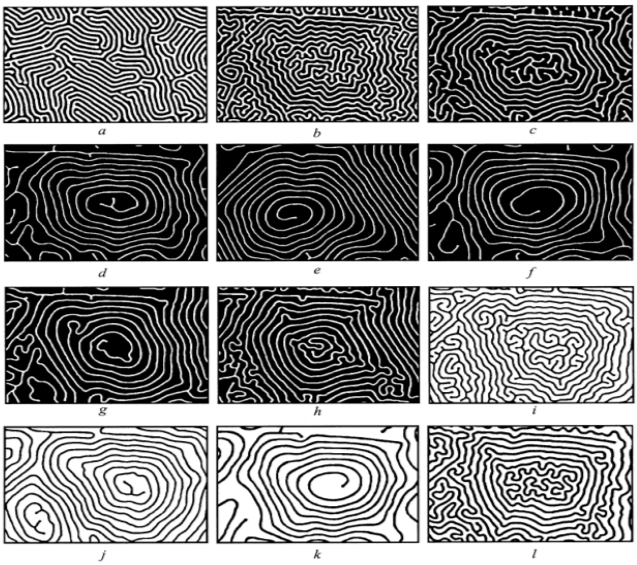


Figure 5. *Behavior of LED in sample № 2 in different amplitude-frequency regions*

Sample № 3

Very interesting and unexpected data are shown on sample No. 3 with the composition (YSm)3(FeGa)5O12; having a thickness of 8 microns, and a static saturation field of 64 Oe. It is necessary to note the special stability of the spirals in this sample. In the frequency range 200 – 400 Hz, the lifetime reaches 2 minutes (Fig. 6). Then it sharply decreases and at frequencies of several kilohertz it has a value of ~ 1 second or less. It turned out that spatially uniform constant magnetizing fields significantly affect the type and quantitative parameters of dynamic SDs. Figure 6 shows photographs showing the change in the DDS in the same section of the sample with increasing displacement field Hb = 0 Oe. As Hb increases, the number of turns in the LED and their size decrease (Figure 6b). With a further increase in the displacement field, the LEDs become two to three turns (Fig. 5c), and their rotation speed slightly increases. With a further increase in the Hb field, the spirals become single-turn (Fig. 5d). Moreover, stable dynamic domains in the form of brackets and commas are observed. Their lifespan, like the others, is much longer than the period of pumping. If we compare Figures 6a and 6b, c, we can also see that instead of interconnected spirals with different topological charges, isolated SDs with the same direction of twist are formed. When the sign of the Hb field changes to the opposite, LEDs of a different twist become preferable. Thus,

the displacement field removes the degeneracy in the direction of twisting of the spirals.

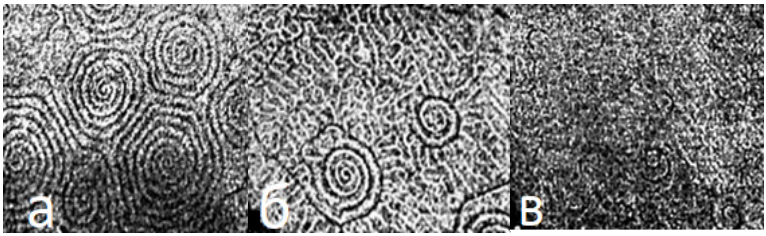


Figure 6. *The influence of the displacement field on the sign of the topological charge of the LED, at a frequency of 300 Hz and fields H_p and H_b equal, respectively, to a) 38 and 6 Oe; b) 38 and 8.8 Oe; c) 40 and 8.7 Oe*

Conclusions:

The processes of self-organization in a chaotically moving system of dynamic domain structures arising in films-crystals of ferrite garnets were studied. Films of various chemical compositions and different thicknesses were considered. Particular attention was paid to the formation, interaction and destruction of spiral dynamic domains. The results of processing several dozen photographs of LEDs taken for different values and signs of H_b showed that the type of LEDs arising in the samples under study depends on many parameters, such as the amplitude, frequency of the alternating magnetic field, direction of the pump field, thickness and chemical composition of the sample. Further research is needed to better understand the mechanism of DM formation.

References

1.Balbashov, A. M., Chervonenkis,A. Ya., 1979. Magnetic materials for microelectronics.Energiya.

2.Kandaurova, G. S., Sviderskу,A. E., 1990. Letters to ZhETF. 97(4). pp. 1218-1229.

3.Kandaurova, G. S., Osadchenko, V. Kh., Rusinov, A. A.,Rusinova,E. A., 1999. Letters to ZhETF. 63(6). pp. 453-456.

4.Rusinov, A. A., Rusinova,E. A., 2014. Bulletin of the Ural State University of Railways. 2(22). pp. 19-27.

5.Rusinov, A. A., Rusinova,E. A., 2015. Bulletin of the Ural State Transport University. 1(25). pp. 18-23.

6.Rusinov, A. A., Rusinova, E. A.,Avksentyeva,E. I., 2018. Bulletin of modern research. 12.1(27). pp. 401-402.

7.Rusinov,A. A., Rusinova,E. A., 2020. International independent scientific journal. 21(2). pp. 61-63.

8.Kandaurova,G. S., Osadchenko, V. Kh.,Pashko,A. G., 2005. Physics of the Solid State.

9.Kryuchkova, D. S., Rusinova,E. A., 2021. «Influence of Magnetic Field on Dynamic Parameters of Domain Structures of the "Leading Center" Type,» in Theory, School and Concepts of Sustainable Development of Science in Modern Conditions. Collection of articles on the results of the International Scientific and Practical Conference. Sterlitamak. pp. 5-12.

10.Rusinov, A. A., Rusinova, E. A., 2021.Evolution and parameters of dynamic domain structures of the "Leading Center" type.AIP Conference Proceedings. "Proceedings of the Scientific Conference on Railway Transport and Engineering, RTE 2021". 090008.

.

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

2023 年 12 月 23 日。中国北京

编辑A.A.Siliverstova
校正A.I.尼古拉耶夫

2023 年 12 月 23 日。中国北京
USL。沸点：98.7。 订单253.流通500份。

在编辑和出版中心印制
无限出版社