# 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: June 24**

**Beijing, China 2020**

# 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 3 - Participants’ reports in English

2020年6月24日。中国北京
June 24, 2020. Beijing, PRC

Proceedings of the International Conference
**“Scientific research of the SCO countries: synergy and integration”.** Part 3 - Reports in English

(June 24, 2020. Beijing, PRC)

ISBN 978-5-905695-60-5

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

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ISBN 978-5-905695-60-5

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**TECHNICAL SCIENCES**

## Foreword

*We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 71 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).*

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

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

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

# 前言

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

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

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

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

# 模拟建模作为管理分析的方向
# SIMULATION MODELING AS A DIRECTION OF MANAGEMENT ANALYSIS

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抽象。 本文揭示了管理分析的实质，并考虑了其在会计和经济学科体系中的地位。 分析了管理分析的信息库。 给出了作为管理分析方向的仿真模型开发的原理。

关键词：管理分析，管理会计，经济分析，财务会计，模拟。

***Abstract.*** *The article reveals the essence of managerial analysis, considers its place in the system of accounting and economic disciplines. The information base of management analysis is analyzed. The rationale for the development of simulation modeling, as a direction of managerial analysis, is given.*

***Keywords:*** *management analysis, management accounting, economic analysis, financial accounting, simulation.*

The issues of organizing management analysis occupy both the minds of scientists and commercial management. At the same time, both methodology and conceptual approaches are of concern.

First of all, you need to understand what is meant by management analysis. This concept takes its roots from economic analysis and management accounting.

Management accounting itself was recently isolated by scientists from accounting. This event refers to the moment when the market economy presented accounting requirements for the collection, accumulation and systematization of information for tax purposes.

The legislation began to allocate financial accounting, which secured the functions of collecting, accumulating and systematizing information for the preparation of financial statements; tax accounting, the purpose of which is to obtain

information on the timeliness, accuracy of tax calculation and payment, and management accounting, which is organized at enterprises in order to inform management for making management decisions. This includes: collection and analysis of operational information, planning, allocation of resources, characterization of costs and revenues, their ratio, distribution of overhead costs, determination of the direction of expenses (labor-intensive, material-intensive, energy-intensive production), forecasting of financial results, CVP-analysis, determination of the critical point of production, bankruptcy forecasting etc.

In the framework of financial accounting, an economic analysis is conducted to understand the situation. Its purpose - is to identify causal relationships between phenomena. It includes horizontal and vertical analysis, factorial and empirical and other types. A rather thin line between economic analysis and analysis of economic activity should also be noted. Rather, there is a difference in the object of study.

Economic analysis belongs to the traditional classical analysis, with well-established methods, prescribed coefficients, and their recommended values. The economic analysis clearly spells out indicators that are recommended to be used to characterize labor resources, production, material and technical base, financial condition, liquidity and solvency, business activity, profitability, profit, etc.

With the advent of management accounting as a type of accounting, scientists began to distinguish management analysis. Types of accounting and analysis are given in Fig. 1. As for economic analysis, its classification with respect to management objects and research methods is presented quite widely, and scientists have not come to a consensus in terms of an unambiguous classification. Some scientists (V.E. Gubin, O.V. Gubina, and others) distinguish the following types of analysis under the classification of management objects: technical, economic, financial and economic, managerial, socio-economic, economic and statistical, economic and environmental, marketing. According to the research methodology, they distinguished: comparative, diagnostic, factorial, marginal, economic-mathematical, deterministic, stochastic, functional-value. Other scientists (N.B. Akulenko, V.Yu. Garnova) distinguish managerial analysis when classifying economic analysis from the subjects of the conduct: internal (managerial) and external. At the same time, they distinguish: internal production analysis and internal financial analysis.

Thus, scientists did not come to a single point of view regarding the classification of economic analysis according to all classification criteria, and the place of managerial analysis is not completely determined. Having analyzed different positions on the classification and the place of management accounting in it, we developed the following classification in conjunction with accounting (Fig. 1). From our point of view, it is reasonable to consider it a subspecies with respect to the classification characteristic of the object of analysis.

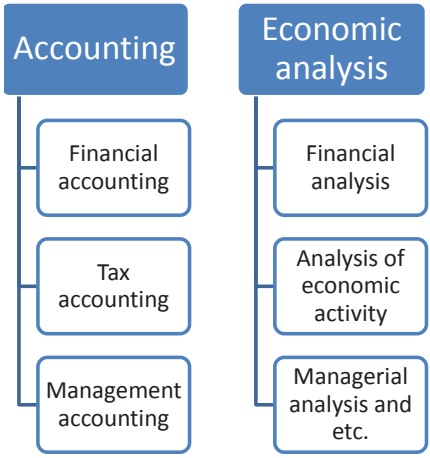


***Figure 1.*** *The relationship of accounting and analysis*

In our opinion, management analysis includes elements of economic analysis, the same indicators and coefficients are used here, their relevant values. The essence of its origin, separation in a separate direction, boils down to the fact that it differs, first of all, in the order of its organization. Moreover, not so much in terms of the subjects of its organizing, but in the set of elements for analysis, choice of directions, choice of indicators, i.e., methodology, therefore we associate it more with the object of analysis than with the subject.

It should be noted that the sources of information for management accounting are the same as in general for economic analysis:

- primary documents of the enterprise and forms of operational accounting;
- accounting registers;
- reporting forms, plans, forecasts, models and other documents of the enterprise, counterparties, tax authorities, credit institutions, insurance companies, investors, creditors, shareholders, consumers, suppliers, competitors, as well as any other information about the economic, political, legal aspects of the environment development of the subject of analysis.

The system of organization of management analysis should be such as to satisfy the needs of management in the necessary information for making management decisions.

These may be issues of resource allocation, increasing or decreasing production volumes by products, pricing policy, development strategy of the enterprise as a whole.

So, for example, in management analysis the following issues can be resolved:

- it is necessary to increase productivity or the number of employees,

- investments should be directed to the development of product A or B;
- overhead distribution base;
- reduce costs or raise prices;
- expand the market or explore new areas for investment;
- investment performance analysis;
- modeling of production processes, etc.

Many managerial tasks in the conditions of technological progress development are successfully solved with the help of simulation models.

Here, of great importance is the possibility of not just choosing a good solution, but the possibility of analytical evaluation in order to choose the best development option for strategic planning. When constructing such models under conditions of uncertainty of all factors, correlation and regression analysis, probability theory, and statistics are actively used.

Using simulation, it is possible to take into account information about a constantly changing external environment (competitors, contractors, market changes, etc.).

There is an opportunity to calculate various options for the ratio of profit, costs, volumes, income and expenses, etc. At the same time, much attention is paid to the direct costing system, which allows you to plan marginal income by product type, development direction, individual orders and the enterprise as a whole.

Modeling allows you to evaluate the behavior of the system in various conditions and calculate the most optimal scenario.

Thus, the organization of management analysis depends on the answer to the questions: who organizes the management analysis, regarding which object, what methodology will be used, what result is expected to be received. Moreover, management accounting is closely related and is interdependent with management analysis. Determining the methods and place of management analysis in the analysis system will make it possible in practice to build a faster and easier analysis system that can give answers and ready-made management decisions.

Further research will be aimed at a more complete disclosure of such management analysis techniques.

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# 分析开发商的破产趋势和原因
# ANALYSIS OF TRENDS AND CAUSES OF INSOLVENCY OF DEVELOPERS

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抽象。 住房领域法人实体破产的数量增加，是由于以下事实：在建筑领域投资项目的实施存在许多风险，而且项目的结果不仅取决于贷款的水平。在管理上，还具有快速吸引和分配财务资源的能力。 本文分析了俄罗斯住房领域的社会经济政策状况，确定了住房领域现代政治工具和机制的发展。

关键词：破产，房屋，建造者，开发商破产，破产动态，破产统计，破产原因。

***Abstract.*** *The increase in the number of bankruptcies of legal entities in the field of housing is due to the fact that the implementation of investment projects in the field of construction is associated with many risks, and the results of the project depend not only on the level of management, but also on the ability to quickly attract and distribute financial resources. The article analyzes the state of socio-economic policy in the field of housing in Russia, identifies the development of tools and mechanisms of modern politics in the field of housing.*

***Keywords:*** *bankruptcy, housing, builder, bankruptcy of developers, dynamics of bankruptcy, bankruptcy statistics, causes of bankruptcy.*

During the period of the central planning system, the issue of insolvency of economic entities was not relevant, since there was no need for legal regulation of the activities of insolvent organizations and citizens. Shishmareva T. P., “to some extent this was explained by the fact that the property of most business entities was state-owned and the appearance of insolvent entities did not infringe on the rights of other owners, therefore there was no need for such a legal institution” [1].

The situation changed with the development in Russia of the institution of private property and a market economy, the hallmark of which is the inefficiency of subjects of economic relations. With the departure from the planned economy, when the state sector of the economy ceded part of the market to private owners, the need arose for the legal regulation of relations arising between the insolvent debtor and his creditors.

Over the past 28 years, three laws have been passed that regulate relations in the field of bankruptcy - the Law of the Russian Federation of November 19, 1992 № 3929-1 "On the insolvency (bankruptcy) of enterprises", the Federal Law of January 8, 1998 № 6-FL "On insolvency ( bankruptcy) and the Federal Law dated October 26, 2002 N 127-FL "On Insolvency (Bankruptcy)" (hereinafter referred to as the Bankruptcy Law). In turn, in the last of these laws in recent years, many changes and additions have been made - a total of more than 50 versions of the Bankruptcy Law.

At the moment, the possibility of declaring a debtor bankrupt is enshrined in Art. 25 of the Civil Code of the Russian Federation, as well as the Bankruptcy Law, while bankruptcy is understood as the lack of ability of a person recognized by the arbitration court to fully fulfill obligations to creditors.

In order to resolve the problem of bankruptcy in housing, in 2011, paragraph 7 of Chapter IX of the Bankruptcy Law came into force, which regulates the bankruptcy of developers (According to the Bankruptcy Law, a developer is a person who attracts funds and (or) property of construction participants - legal a person, regardless of its legal form, including a housing construction cooperative, or an individual entrepreneur, for whom there are requirements for the transfer of residential premises or monetary requirements), changes to which continue to be made annually.

The methodological basis of the work was constituted by regulatory legal acts devoted to the regulation of bankruptcy and housing construction [7]; analytical data and reviews on the dynamics of company bankruptcies in Russia [1, 2, 4, 6]; publications in the media regarding the bankruptcy of GC "SU-155" [18].

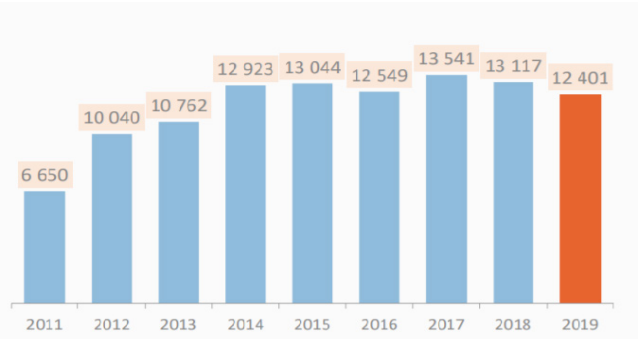


***Figure 1 -*** *Dynamics of company bankruptcies (bankrot.fedresurs.ru) [19]*

At the beginning of 2020, the Unified Federal Bankruptcy Information Resource (UFBIR) published the summary results of bankruptcy procedures for 2019 (data as of December 31, 2019 was obtained based on the processing of messages and reports of arbitration managers disclosed in the Fedresurs (Uni-

fied Federal Bankruptcy Information Register, bankrot.fedresurs.ru). According to the statistical bulletin, despite the insignificant reduction in the last year of the total number of Russian companies declared bankrupt, a tendency toward an increase in the number of bankrupt legal entities has been evident over the past 7 years [19].

At the same time, despite the increase in the number of bankruptcies, the efficiency of bankruptcy procedures remains low. The average duration of bankruptcy proceedings continues to grow, while the percentage of satisfied creditors' claims decreases. Thus, the share of satisfied claims of creditors in completed cases at the end of 2017 amounted to only 5.2% of the total amount of claims against the debtors in the amount of 1,992.4 billion rubles. Moreover, in 65% of cases, the claims of creditors following the results of bankruptcy proceedings are not satisfied at all [19].


***Figure 2 -*** *Average duration of company bankruptcy proceedings (bankrot.fedresurs.ru)*

According to the appendix to the above statistical bulletin, among the companies declared insolvent, for the second year in a row with a significant margin from other debtors, construction and trading companies dominate [19]. Moreover, among all construction companies, a special increase in the number of bankruptcies is observed among developers - companies that attract citizens' money for the construction of residential buildings (a full definition of a developer company is contained in Section 201.1 of the Bankruptcy Law. Bankruptcy Law distinguishes developers as a special category of debtors and provides for the preferential position of citizens (construction participants) over other bankruptcy creditors).

In 2018, the number of such bankrupts and the volume of construction in progress were doubled. So, according to the Analytical Review “Bankrupt Developers in the Russian Federation” of the Unified Register of Developers for 2018, the number of construction companies under bankruptcy increased by 67% (from 250 to 418), and the volume of construction in progress increased by 51% [ 1].

To date, the growth rate of the number of insolvent construction companies significantly exceeds the dynamics of an increase in the total volume of housing being built. Financial problems faced not only large, but also small players in the housing construction market, as evidenced by a decrease in the average construction volume of a bankrupt developer. So, if in 2018 the average volume of construction of an insolvent developer was not less than 30 thousand sq. m., then last year this figure dropped to 22.6 thousand sq. m. [2].

As of the end of 2019, more than 600 construction companies have been identified that have at least one residential building in construction in progress. At the same time, the total volume of construction in progress of developers, for which there are entries in the UFBIR, is 12,479,050 sq. m., which is 2.6% more than in September 2019 (12,164,288 sq. m.) [2].

In this regard, the researchers note that the implementation of investment projects in the field of construction is associated with many risks, and the results of the project depend not only on the level of management, but also on the ability to quickly attract and distribute financial resources.

In particular, the following risks to which developers are exposed can be identified [12]:

- legal risks (for example, the identification of previously undetected obligations);
- urban risks associated with the process of construction itself;
- technological risks (for example, errors in choosing a construction site);
- project risks associated with errors in project management;
- administrative risks (changes in the regulatory framework);
- economic risks (errors in macroeconomic forecasting, crisis);
- financial risks (for example, a shortage of financial resources).

The implementation of each of these risks individually may cost the developer significant loses and ultimately lead to financial insolvency. In this regard, when managing risks, companies must take into account many factors determined by the economic situation in the country and the situation in the construction industry. So the 2014 currency crisis, during which the Russian ruble lost 70% of its value, turned out to be a deterioration in credit conditions for developers and a decrease in the volume of solvent demand, which affected the ability of construction companies to raise interest-bearing funds and maintain the necessary level of revenue.

Thus, a decrease in the profitability of developers under the influence of deteriorating lending conditions and a decrease in demand was one of the key reasons for the growth of bankruptcies among construction companies in 2014.

Meanwhile, with a high degree of probability, the number of insolvent developers in the coming years will continue to grow. An increase in the tax burden on business and housing reform, which is now being carried out with the aim of

providing additional guarantees to citizens in case of bankruptcy of the developer, will entail a redistribution of the housing market. Small companies, which now make up more than half of all registered developers, will be forced to leave the market, transferring their share to stronger market participants.

Besides, in addition to external reasons, partly due to the unpredictability of the Russian economy, it is necessary to highlight the internal reasons for the financial insolvency of real estate developers.

Firstly, an important role is played by the quality of management in the company, whose competence directly affects the ability of the developer to pursue an anti-crisis policy.

Secondly, the presence of "long-term construction" and construction in progress can cause a stable deterioration in the financial condition of the construction company.

Thirdly, it is the low efficiency of the company's marketing system. The inefficiency of marketing of a construction company may be due to the following problems:

- the absence of a marketing strategy that takes into account the elasticity of demand and the market level of prices, relied on effective marketing channels;
- errors in the formation of pricing policy.

As a specific example of bankruptcy in the construction industry, we consider the bankruptcy of the Investment and Construction Group of Companies “SU-155” (hereinafter - the SC “SU-155”). Before the bankruptcy in 2016, "SU-155" GC was one of the largest Russian developers and occupied one third of the entire Moscow housing construction market. The developer was a group of companies with a closed production cycle, the activity of which was concentrated immediately in several areas, including construction, industry and engineering. In 2016, the developer, being unable to fully satisfy the requirements of creditors, left about 30 thousand people who invested in the construction of houses without housing.

One of the main reasons for the bankruptcy of the company was the preservation of previous production volumes with a decrease in demand. So, in the 2000s, the Ministry of Defense acted as the main “customer” of GC “SU-155”, in connection with which the developer’s production facilities were designed for large-scale housing construction for military personnel on government orders. The group of companies included more than 80 enterprises that produced everything necessary for construction [19]. After the Ministry of Defense refused the housing construction program for the military, the developer did not slow down production volumes. The main goal of GC remained significant volumes of construction, which allowed to use all the assets of the company, with the loss of the main "customer".

In this regard, in order to continue current activities in the previous volumes in the absence of a state order, GC “SU-155” had to attract borrowed financing and sell construction projects below market prices. Moreover, after the crisis of 2014, taking into account the fall in consumer demand for housing, the company could no longer continue to operate even under such conditions.

The rigid hierarchical organizational structure of the GC “SU-155”, which was not able to adapt to the sharp deterioration of the financial situation in the economy, also played its role. In this regard, the developer was unable to adapt to changes in the external environment and chose the wrong strategy to preserve the assets included in the group of companies and production volumes in the absence of consumer demand in the highly unstable housing market.

Another important factor in bankruptcy was the attitude of GC “SU-155” to contractors and the general style of doing business, in which the developer did not pay the bills on time, delayed the deadlines for objects and started attracting citizens' money for housing construction within the framework of housing- construction cooperatives ( hereinafter - HCC) until obtaining a building permit and other design documentation.

The previously acceptable approach in the 2010s began to cause dissatisfaction with the authorities, who repeatedly publicly criticized the GC "SU-155" for their business practices and the developer’s commitment to the use of housing cooperatives. All this contributed to the formation of a negative image of the developer in the eyes of potential customers (buyers), which also reflected in the drop in consumer demand for housing from GC "SU-155".

Thus, the reasons for the financial insolvency of GC “SU-155” were not only macroeconomic, but also intraorganizational factors, which include the low efficiency of the company's management, and an inefficient marketing system.

As already noted, one of the most sensitive sectors to the crisis is the housing construction industry. At the same time, with the growth in the number of insolvent construction companies, the number of citizens who have invested money in housing construction and have not received apartments is also growing. The main reason for citizens to purchase housing from a developer is more favorable prices than in the secondary market, and the opportunity to purchase modern housing. Meanwhile, the acquisition of housing by citizens in a new house under construction is fraught with high risk.

So, since when buying an apartment in a new house under construction before it is commissioned and put into operation, the construction company does not have documents of title for the project planned for construction, and therefore it is impossible to conclude a sales contract, until recently the most common scheme for attracting a company the builder of financing from citizens for the purpose of their subsequent acquisition of housing was an equity agreement.

The main risk of such a mechanism for raising funds was that if the developer company could not fulfill its obligations, for example, due to bankruptcy or due to dishonesty of the management, then the citizen could neither receive housing nor return the invested funds.

In order to solve the above problem in the field of housing construction, in 2018 amendments were adopted to the Federal Law dated 30.12.2004 N 214-FL "On participation in shared construction of multi-apartment buildings and other real estate objects and on amendments to some legislative acts of the Russian Federation" ( hereinafter referred to as the Law on shared construction), which tighten the requirements for developers, as well as strengthen the protection of the rights of construction participants.

The amendments provide for the transition from a simple form of shared construction to project financing for developers, namely, the transition from July 1, 2019 to the project financing scheme for housing using escrow accounts, while attracting citizens' funds under equity agreements and other previously legal financing schemes are prohibited. Now, when buying an apartment in a new building under construction, a person who wants to purchase a house does not pay money directly to the developer, but deposits money into an escrow account with an authorized bank.

The developer company will be able to withdraw this money after the completion of construction work, when the person who wants to purchase a home will become the owner of the property. Thus, under the new rules, by the start of construction, the developer company must have its own capital sufficient for construction, and favorable lending conditions at banks, in case its own funds are insufficient. The lack of preparedness and non-transparency of the proposed project financing mechanism may affect the volume of housing construction.

The analysis allows us to state that the growth rate of the number of insolvent construction companies significantly exceeds the dynamics of an increase in the total volume of housing being built. Financial problems faced not only large, but also small players in the housing construction market, as evidenced by a decrease in the average construction volume of a bankrupt developer.

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# 开发用于识别和评估商业银行风险的综合方法
# DEVELOPMENT OF A COMPREHENSIVE METHODOLOGY FOR IDENTIFYING AND ASSESSING THE RISKS OF A COMMERCIAL BANK

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抽象。 作者提出了解释金融稳定性的问题，并提出了一种评估方法，其中要考虑到不同梯队的俄罗斯商业银行活动的特殊性。

关键字：商业银行的风险，金融稳定性，银行组织的稳定性标准，银行体系，巴塞尔协议III标准。

***Abstract.*** *The authors raise the issue of interpreting financial stability and propose a method for assessing it, taking into account the particularities of the activities of Russian commercial banks of different echelons.*

***Keywords:*** *risks of a commercial bank, financial stability, standards of stability of a banking organization, banking system, Basel III standards.*

A credit institution is considered stable in the case of a long-term ability to maintain a stable position with “non-shock” changes in the market [1, 2, 3,]. The main difference between the concepts of “financial stability” and “financial reliability” lies not only in the presence of a sufficient sign of compliance with the accepted requirements for borrowers and investors, but also in the need to comply with the norms regulated by the governing body (CB) of the banking system of the Russian Federation [4, 5, 6, 7, 8, 9].

Thus, the financial stability of a banking organization implies a state of its financial resources in which the bank, leveling financial risks, is able to quickly perform the functions of managing a loan and deposit portfolio and maintain the stability of key indicators of capital and profit in a volatile external environment [1,2, 7,9,10].

**Relevance** of the work consists in the need to develop a comprehensive methodology for identifying and assessing risks - indicators of the financial stability of a commercial bank.

**Subject of the study** - quantitative and qualitative approaches to the determination and assessment of the financial stability of a commercial bank.

When assessing the financial risks selected by credit institutions, the authors took as the basis an analysis of the annual balance sheets and the structure of the money loan market.

In the work, the authors take into account the following financial risks: capital adequacy; credit; liquidity; market; profitability; operating.

The capital adequacy ratio characterizes not only the scale of the bank's activity (amount of equity), but also its ability to withstand credit, market, and operational risks. Regulatory capital (the minimum requirement for capital composition) should be at least 8% of all assets weighted by the amount of risks [5]. Additional requirements of Basel III for capital adequacy, such as accounting for all risks, the quality and quantity of capital, are aimed at assessing the bank's ability to function in conditions of financial shocks and economic crises.

The basic capital adequacy ratio of a bank is calculated using the following formula [4]:

$$\text{N 1.1} = \frac{C_1}{SUM\ C_{r_1}(A_i - R_i) + code\ 8656.1 + code\ 8660 + code\ 8733.1 + code\ 8735 + code\ 8735 + code\ 8741 + code\ 8752 + code\ 8754.1 + code\ 8769.1 + code\ 8770 + code\ 8772 + code\ 8782 + code\ 8807 + code\ 8847 + BC + IC_1 + ACR_1 + CRS + RCC + CRF_1 + 12.5 \times OR + MR_1 + CRP_1} \times 100\%$$

where, $C_1$ - the value of the base capital of the bank [5]; $C_{r_1}$ — risk coefficient of the i-th asset of the corresponding group; $A_i$ – i-th asset of the bank (credit requirement and requirements for obtaining accumulated interest on the i-th asset); $R_i$ – the value of the formed reserves for possible losses on loans, loan and equivalent debt of the i-th asset; BC – indicator that provides for the use of increased requirements for capital coverage of a certain level of certain bank assets (the sum of codes 8852, 8879, 8881); $IC_1$ – operations with increased risk ratios (sum of codes 8731, 8809.1, 8814.1, 8816, 8818.1, 8820, 8822, 8824.1, 8826.1, 8828.1, 8830.1, 8834.1, 8836.1, 8838 minus code 8856.1); $ACR_1$ – the amount of credit risk for contingent liabilities of a credit nature (obligations to make payments in the event counterparties fail to fulfill their obligations to other creditors, the bank's obligation to provide funds on a repayable basis) [6]; CRS – value of credit risk for derivative financial instruments (code 8811); RCC – the amount of risk of changes in the value of the credit claim as a result of deterioration (code 8866); OR – amount of operational risk (code 8942); $MR_1$ – value of market risk (code 8812.1); $CRP_1$ – value of credit risk calculated for the purpose of inclusion in the bank's capital adequacy ratios (amount of codes 8757.1, 8758.1, 8759); $CRF_1$ – value of credit risk associated with the bank's investments in stock and (or) shares of joint-stock investment funds, mutual investment funds, private pension funds, and also funds located outside the Russian Federation (code 8761.1).

The method of assessing credit risk is also presented in reporting in the form of 0409115 [11] and characterizes the level of the bank reserve of the loan portfolio. The general reserve is formed in order to cover potential losses on a loan or group of loans. Risk management departments calculate the required number of reserves, taking into account the historical level of losses of the expected level of recovery of planned activities for distressed assets and terms. Thus, the higher the estimated%, the higher the risk of default on loans.

Credit risk is calculated by the formula:

$$PA2 = \frac{R_i}{S},$$

where:$R_i$ – the value of the formed reserves for possible losses on loans, on the loan and equivalent debt of the i-th asset (code 8775); S – balance sheet amount of credit claims to individuals, organizations and enterprises, excluding claims on syndicated loans, letters of credit, mortgage-backed securities (code 8889).

Bank liquidity characterizes the ability to ensure timely fulfillment of obligations. For this reason, it is necessary to assess the amount of potential losses that may arise while maintaining liquidity, and to allocate cash resources correctly. The current liquidity ratio of the bank is calculated by the formula [5, 11]:

$$N_3 = \frac{L_{at}}{L_{dm} - l_{dm*}} \times 100\% \geq 50\%,$$

where: Lat - liquid assets that should be received by the bank, or may be claimed within the next 30 calendar days (the amount of account balances by codes 8722, 8848, 8849, 8908, 8931, 8950, 8984, 8989, 8995, -8702, -8706, -8938, -8987);

Ldm - liabilities on demand accounts, on which a depositor or creditor may be required to immediately repay them, and bank liabilities to depositors or creditors with a maturity of obligations in the next 30 calendar days (the amount of account balances by codes 8723, 8872, 8905, 8907, 8916, 8927, 8928, 8933, 8939, 8940, 8990, 8991, 8993, -8854, -8868, -8906, -8911, -8938, -8965, -8994, -8999);

Ldm* - value of the minimum aggregate balance of funds in the accounts of individuals and legal entities on demand and liabilities with a due date in the next 30 calendar days (code 8930).

To assess the ability to withstand “non-shock” market events, one should consider the share of funds covering risky assets, that is, fixed-term deposit funds excluding deposits of citizens.

Market risk is calculated by the formula [5, 11]:

$$Cmar. = \frac{D_{av.} - D_{in.}}{A_{risk}},$$

where: D av. – D. in. – liabilities of the bank to a third party (the sum of bills under code 8918, excluding obligations to individuals);

A risk. – the balance sheet amount of credit claims and claims for the receipt of accrued interest of the bank to the counterparty for the transaction of IV and V groups of assets (the sum of accounts under codes 8889.T and 8890).

The effective activity of the bank can be determined by the rates of income from assets, which also indicates the correctness of the disposal of financial resources and maintaining the profitability of shareholders when the market situation changes.

Standard N12 also regulates the risk of bank investments in shares of other legal entities (risk of bank profitability) [5, 11]:

$$N_{12} = \frac{SUM\ C_{in_i}}{C_0} \times 100\% \leq 25\%,$$

where: $C_{in_i}$ — the value of the i-th investment of the bank in shares of other legal entities minus the accumulated reserve for possible losses on these investments (the sum of the balances under codes 8729, 8919, 8963, -8920, -8982);

$C_0$ - bank capital [4].

The Basel Committee recommended that operational risk be included in the sustainability assessment of commercial banks [3, 5, 12]. The Central Bank characterizes operational risk as the risk of losses resulting from inconsistencies with the nature and scope of the credit institution and (or) the requirements of the current legislation, their violation by employees of the credit institution, insufficient functionality, and also as a result of external events [13].

Operational risk is usually calculated by the formula (Instruction № 180-I) [5]:

$$Cor. = 0.15 \times \frac{\sum_{i=1}^{n} I_i}{n},$$

where: I – income for the ith year to cover operational risk (net non-interest income, excluding commission expenses and expenses on operations with precious metals and precious stones, net interest income in the form of 0409807). If indicator D is negative or equal to zero, it is not included in the calculation of operational risk;

n - the number of years preceding the date of calculating the size of the operational risk (should not exceed three years).

A change in the approach to assessing operational risk under Basel III is planned for implementation in 2021–2022. [6]. Bank losses due to the implementation of the OR will be used to calculate the Internal Loss Multiplier (ILM) component, which is included in the calculation of capital [10]:

$$Cor. = \alpha * BI * ILM,$$

where: BI – business indicator reflecting averaged industry operational risk;

α- 12%, 15% or 18% depending on the size of the credit institution;

ILM – internal loss multiplier

$$ILM = LN\left(\exp(1) - 1 + \left(\frac{LC}{BIC}\right)^{0,8}\right),$$

where LC - Loss Component, which takes into account the operational risk of a particular bank according to its internal loss statistics for recent years (at least 10 years). Banks with lower losses due to operational risk management will have a reduced regulatory capital requirement to cover this risk.

The bank should create a database of operational risk events, namely [6]: amount of losses; dates of occurrence and reflection of loss on the bank balance sheet; the source of the event (unit, automated system, name of the business process); refunds received; information on the causes and circumstances of the occurrence of events.

We apply the proposed list of financial risks and methods for assessing them to three Russian commercial banks of different echelons: PJSC Bank " FC OTKRITIE", PJSC "URALSIB Bank", "Chelindbank" PJSC [8, 9, 12, 14, 15, 16].

PJSC Bank "FC OTKRITIE" is included in the list of systemically important credit organizations approved by the Bank of Russia. "Otkritie" is a universal bank with a developed structure of the services provided. "Otkritie" was formed through the integration of such large federal organizations as "Petrocommerce" Bank, NOMOS-BANK, and the Khanty-Mansiysk Bank. In March 2020, in terms of assets, "Otkritie" became the 7th in Russia with a result of 2 675 473 579 thousand rubles. [12].

PJSC "URALSIB Bank" is a universal bank with a developed regional network. As of March 1, 2020, the bank has 6 branches, 272 points of sale, 1,547 ATMs, 528 payment terminals. In addition, "Uralsib" supports the operation of the ATLAS ATM network, which is a centralized technological solution for partner banks. In March 2020, "Uralsib"became the 20th largest in Russia in terms of assets with a result of 531,484,381 thousand rubles. [12].

PJSC "Chelindbank" - a representative of large financial institutions of the Chelyabinsk Oblast. The bank was founded on the basis of the regional administration of Promstroybank of the USSR, where the founders were large regional enterprises. In March 2020, in terms of assets, Chelindbank became 89th in Russia with a result of 57,438,708 thousand rubles. [12].

Risks were calculated for PJSC Bank "FC OTKRITIE", PJSC "URALSIB Bank", PJSC "Chelindbank", based on the annual reporting as of January 1, 2019 according to the results of 2018 (table 1).

***Table 1***

*Risk assessment of financial stability of banks*

| Indicators | "FC OTKRITIE" Bank | "URALSIB Bank" | "Chelindbank" | Normative |
|---|---|---|---|---|
| N1 | 16.3% | 10.4% | 14.8% | >=8% |
| N3 | 176.6% | 74.7% | 137.1% | >=50% |
| Ccr. | 1.4% | 0.2% | 11.7% | <=15% |
| Cmar. | 69.0% | 20.4% | 13.2% | <=25% |
| N12 | 15.8% | 12.5% | 0.0% | <=25% |
| C or | 21338.2 million rubles | 180.7 million | 508,7 million rubles | |

In open ratings, banks are often evaluated by the degree of financial reliability, where the main criteria are [12]: the number and amount of deposits issued loans; total capital; amount of securities; value of total assets.

As noted above, the financial stability of the bank is characterized by the ability to maintain the basic parameters of economic activity (capital, profit) when changing the parameters of the macroeconomic environment [11]. Since the main goal of the work is to compare the obtained results of risk assessment, which the author defined as indicators of the financial stability of the bank, it is necessary to compare the results with the existing ratings of credit organizations of the Russian Federation. Key indicators were chosen as the base for rating assessment: N1 (capital adequacy ratio), loan portfolio reservation level [12].

The capital adequacy ratio reflects the degree of the bank to cover financial expenses from its own capital and includes the calculation of risk-weighted assets, which allows not to violate the control parameters established by the CB.

The level of provisioning for the loan portfolio also determines the degree of credit risk, which is one of the indicators of financial stability. The higher the degree of coverage of loans issued to borrowers, the less likely the credit institution to default.

***Table 2***

*The place of the compared banks according to the N1 rating and the reserve level for the loan portfolio according to the banki.ru rating for January 2019.*

| Indicators | "FC OTKRITIE" Bank | "URALSIB Bank" | "Chelindbank" |
|---|---|---|---|
| N1 | 333 | 440 | 281 |
| Loan portfolio reservation level | 93 | 214 | 268 |

So, in January 2019, according to the capital adequacy ratio, Chelindbank was ahead of "FC OTKRITIE" and "URALSIB Bank", while "URALSIB Bank" was second only to "Otkritie FC" in terms of provisioning for loan portfolio.

According to the method of pairwise comparisons, which is used for multi-criteria ranking of signs [8], in this rating, "FC OTKRITIE" and "Chelindbank" banks are assigned 1 rank, and "Uralsib" - 2.

In the aggregate ranking of these banks by assessed risks, the values of the indicators were scaled (table 3).

***Table 3***

*Scaled criteria for financial stability risks of banks*

| Indicators | "FC OTKRITIE" Bank | "URALSIB Bank" | "Chelindbank" |
|---|---|---|---|
| N1 | 1.00 | 0.00 | 0.75 |
| N3 | 1.00 | 0.00 | 0.61 |
| Ccr. | 0.89 | 1.00 | 0.00 |
| Cmar. | 0.00 | 0.87 | 1.00 |
| N12 | 0.00 | 0.21 | 1.00 |
| C or | 0.00 | 1.00 | 0.98 |

So, according to the resulting matrix, "Chelindbank" receives the highest score (table 4).

***Table 4***

*The resulting matrix of pairwise comparisons*

| | "FC OTKRITIE" Bank | "URALSIB Bank" | "Chelindbank" |
|---|---|---|---|
| "FC OTKRITIE" Bank | 1 | 0 | 1 |
| "URALSIB Bank" | 1 | 1 | 0 |
| "Chelindbank" | 1 | 1 | 1 |

Based on the previously obtained results, PJSC "Chelindbank" is ahead of "FC OTKRITIE" and "URALSIB Bank" in the ranked list of risks identified by the authors as indicators of financial stability. In terms of N1, "Chelindbank" is also ahead of its competitors; "FC OTKRITIE" and "URALSIB Bank" are ahead of "Chelindbank" in terms of loan portfolio reserves.

**Conclusion.**

In the absence of a single methodology for assessing the financial stability of a commercial bank that is equally interpreted by participants in the banking community, it is necessary to use a model that allows for a qualitative and quantitative assessment of primary indicators of financial stability for selected risk factors. Risks identified by the authors can be predicted in the future according to time series. It is also necessary to conduct a comprehensive quality check of the proposed model, on the basis of which a rating of commercial banks can be compiled according to the criterion of financial stability.

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# 数字化背景下企业企业创新战略形成的情景经济机制
# SITUATIONAL-ECONOMIC MECHANISM FOR THE FORMATION OF CORPORATE-INNOVATIVE STRATEGY OF ENTERPRISES IN THE CONTEXT OF DIGITALIZATION

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抽象。科学文章的内容揭示了企业创新战略的实质，差异和形式。提出了企业创新战略，作为管理企业创新活动的基础，该战略是在企业分析，计划和控制的基础上进行的，以所有者的利益为出发点。为了实施该策略，已经开发了一种情境-经济机制，该机制旨在反映在数字化和公司治理系统（公司的选择，发展和实施）的作用下企业功能预先确定的情况。使用方法，杠杆和工具的创新策略）。给出了其作用的特点，评价该机制有效性的标准。

关键词：企业创新战略，企业，情景经济机制，数字化，情景，情景方法，效率

***Abstract.*** *The material of the scientific article reveals the essence, differences and forms of corporate-innovative strategy of enterprises. The corporate-innovative strategy is presented as the basis for managing the innovative activity of the enterprise, carried out in the interests of the owners, which is carried out on the basis of corporate analysis, planning and control. To implement this strategy, a situational-economic mechanism has been developed, which is designed to reflect the situations predetermined by the functioning of the enterprise in the context of digitalization and the reaction of the corporate governance system (selection, development and implementation of a corporate innovation strategy using methods, levers and tools). The characteristics of its action, the criteria for evaluating the effectiveness of this mechanism are given.*

***Keywords:*** *corporate-innovative strategy, enterprises, situational-economic mechanism, digitalization, situations, situational approach, efficiency*

The corporate innovation strategy of an enterprise is the concretization in terms of corporate participation of the position of its effective functioning and development in the internal and external corporate environment in the direction of ensuring the beneficial exercise of ownership of capital in the process of innovative development. In contrast to the functional strategies discussed above, the corporate innovation strategy is primarily associated with the effectiveness of the innovative activity of the enterprise, which ensures the beneficial exercise of the company's ownership right to its own capital and to the capital of other objects of its corporate interest.

Taking into account the nature and characteristics of innovative activity, the forms of corporate-innovative strategy of an enterprise are determined (Fig. 1). The corporate innovation strategy as the goal of managing the innovation activity of an enterprise can be defined as the ideal model of innovation activity, in the process of which the interests of the owners are realized and which is carried out on the basis of corporate analysis, planning and control.

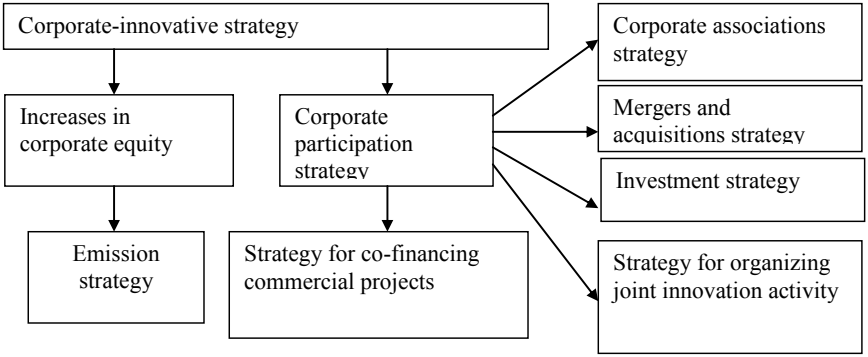


***Figure 1.*** *Forms and types of corporate innovation strategy enterprises*

orporate-innovative strategy - is a specific management plan of actions aimed at achieving the beneficial use of property rights by ensuring financial and resource sufficiency to meet the needs of the enterprise's innovative activities and obtain the final results - profit growth and strengthening financial stability (Fig. 2).

Corporate-innovative strategy of the enterprise - is a means of ensuring the beneficial realization of the owners' right to capital based on the results of effective innovation and the formation of financial and resource adequacy based on corporate analysis, planning and control.

The situational-economic mechanism for the formation of a corporate-innovative strategy of enterprises is not considered as a set of functional elements that, in

cooperation, ensure the activation of the process of innovative activity, the formation of corporate shares or the development of new areas of corporate relations and innovative development in the context of digitalization. This mechanism is designed to reflect the situations that are predetermined by the functioning of the enterprise in the digital environment and the response of the corporate governance system - the selection, development and implementation of a corporate innovation strategy using methods, levers and tools.

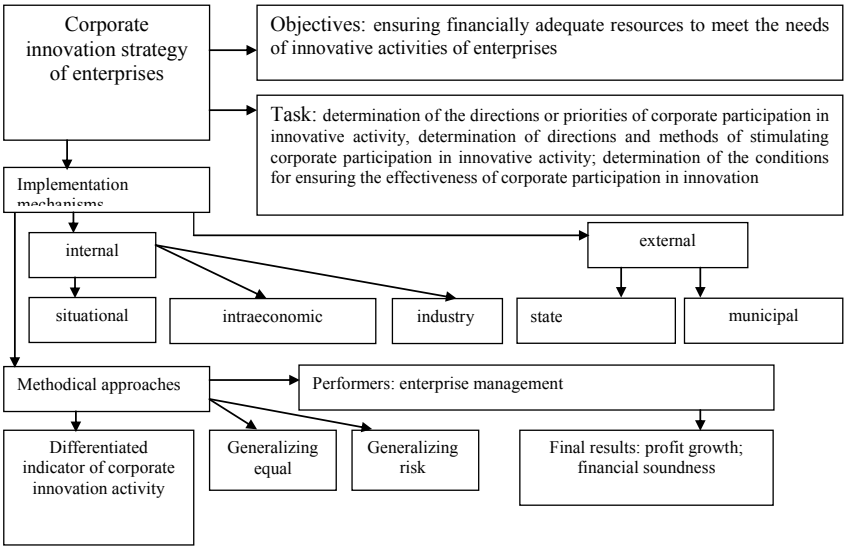


***Figure 2.*** *Formation of corporate-innovation strategy of an enterprise*

Measuring the effectiveness of the mechanism for the formation of corporate innovation strategies are absolute and relative indicators of the effectiveness of innovation and the adequacy of the working capital of an enterprise. The presence or absence, positive or negative values of indicators show the situational or non-situational nature of the corresponding mechanism.

The situational approach to creating a mechanism for the formation of a corporate strategy for adapting enterprises to digitalization, in contrast to the genetic approach, concerns the determination of the list of situations and the justification of corporate-innovative strategies appropriate for their solution (Fig. 3).

Situations that arise in the conditions of the enterprise in the process of its operation relate to:

1. the deterioration of the financial and economic condition of an industrial enterprise;

2. reducing the share of industrial enterprises in the market for manufactured products;

3. the availability of proposals for the acquisition of corporate shares from other enterprises;

4. the availability of proposals for participation in a corporate business combination;

5. availability of proposals regarding participation in financing of joint innovative (commercial, industrial, social) projects.

The solution to the first situation is associated with the intensification of investment and innovation activities of a corporate enterprise by developing and implementing a strategy to increase the number of corporate shares. The use of this strategy is associated with the implementation of the principles of digitalization - openness, security and two-pronged aspects.

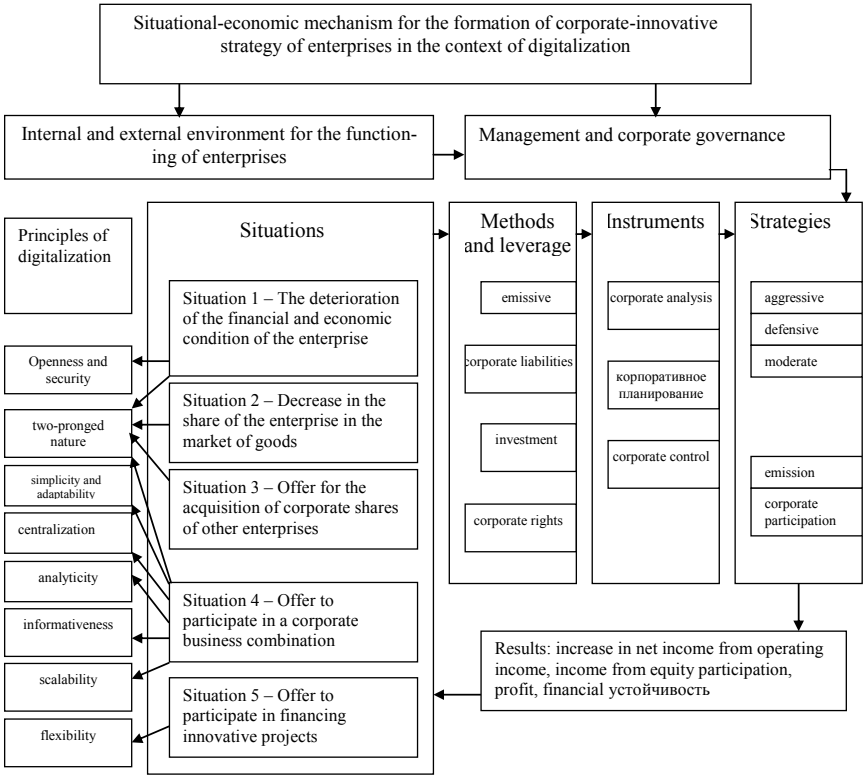


***Figure 3.*** *The structure of the situational-economic mechanism for the formation of corporate-innovative strategy of enterprises*

A solution to the second situation is the development and implementation of a corporate participation strategy, more precisely, a merger and acquisition strategy. This strategy also acts as a way to resolve situation 3 and to adhere to the principle of two-prongedity by enterprises.

The fourth situation is resolved by choosing one of the two components of the corporate participation strategy - either the strategy of corporate associations or the strategy of organizing compatible innovative activities of enterprises. If the reason for the merger is not related to a specific example of innovative activity, but is generalized - focused on the general principles of innovative development, then it is advisable to choose, develop and implement a strategy for corporate associations. The use of this corporate-innovation strategy ensures the implementation of such a digitalization principle as two-pronged.

If it is necessary to carry out a specific type of innovative activity or to implement a specific area of innovative development, it is recommended to use a strategy for organizing joint innovative activity. The application of this corporate-innovative strategy will ensure the implementation of the following digitalization principles in enterprises - two-prongedness, simplification, adaptability, centralization, analyticity, information and scalability.

The solution to the fifth situation is based on ensuring the implementation of the strategy of general financing of innovative (commercial, industrial, social) projects - the investment strategy, which will make it possible for enterprises to comply with the principle of flexibility.

A situational approach to creating a mechanism for the formation of corporate-innovative strategy of enterprises is associated with determining the maximum or minimum results in terms of its action. The minimum result is the formation of certain types of efficiency, the maximum is their increase.

The determination of the target priorities for the action of the situational-economic mechanism for the formation of the corporate strategy of the enterprise justifies the need to stimulate the intensification of corporate activity by establishing the procedure for determining part of the dividend fund that belongs to the enterprise — participants who have provided funds to finance the general project. The difference between this strategy and the existing financial strategies of enterprises is a mandatory requirement for corporate participation (including cross-corporate participation) with the formation of corporate shares and the subsequent optimization of investment income.

The situational-economic mechanism for the formation of a corporate innovative strategy for enterprises is an integrated set of elements that are interconnected by the implementation of the general functions of managing working capital, financial assets and innovative development through the use of corporate rights and obligations in order to ensure the effectiveness of innovative activities and the sufficiency of working capital.

The structure of the mechanism is made up of three components situationally-conditional, organizational-managerial and methodological-instrumental. Each of them ensures that the mechanism performs the corresponding functions - mobilization, stimulating and controlling functions, which is carried out through the activities of the respective management systems and corporate governance and using methods of corporate analysis, planning and control. The implementation of a set of methods is carried out through appropriate levers and tools.

The functionality of organizational and managerial support and use of tools needs to be coordinated with the current orientation of enterprises towards the formation of "quick" incomes from innovative activities, ensuring the reliability of investments, or a combination of these economic guidelines. The results of the mechanism's performance of its functions - indicators show the achievement of the goals of creating this mechanism. The most important element of the situational-economic mechanism for the formation of a corporate-innovative strategy is the methodological component, since it is through it that the action of other elements of the mechanism is provided. It is the investment and issue methods of allocation and mobilization of resources for the implementation of innovative development of the enterprise that contribute to the optimization of income from innovative activities and ensure the adequacy of working capital.

The situational-economic mechanism for the formation of a corporate-innovative strategy is formed on the basis of the provisions of the theories of economic interaction, innovative management and labor ownership.

The effect of the timely response of the corporate governance system to the formation of economic situations under the influence of the external and internal environments of enterprises functioning in the direction of innovative development is a qualitative result from the implementation of decisions (for each specific decision), expressed in the growth of indicators of profitability of innovative activities and ensuring the adequacy of working capital.

The effectiveness of the situational-economic mechanism for the formation of a corporate-innovative strategy of enterprises is considered as the result of the implementation of organizational and economic measures, which is compared with the costs of their implementation.

Therefore, the criteria for the effectiveness of this mechanism are:

- high results of financial and economic activities of enterprises due to the formation of profits from innovation;
- the economic effect of the speed of making managerial decisions on innovative development on the basis of taking into account the situations drawn up;
- the effectiveness of the actions of the components of the corporate governance system of enterprises - corporate analysis, planning and control;

- improving the financial stability of enterprises based on the results of optimization of income from innovation.

Evaluation of the effectiveness of the situational-economic mechanism for the formation of a corporate-innovative strategy of enterprises is carried out using two methods - the method of comparative efficiency and the method of calculating the economic efficiency of innovative enterprises. The indicated efficiency is measured by calculating the increase in profits of enterprises as a result of optimizing the income from innovation.

Organizational effectiveness turns out to be by establishing the actual presence of the organizational structure of corporate governance, capable of ensuring the intensification of analytical, planned and control work to profit from innovation.

Thus, the situational-economic mechanism for the formation of a corporate-innovative strategy of enterprises is a means of realizing the advantages of a collective form of ownership, since its action is aimed at determining the emission directions of working capital mobilization, investment sources of profit growth, as well as enhancing the investment potential of enterprises to create Resource support for the needs of innovation and development.

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国家对社会危险行为的反应：对问题的理论

# REACTION OF THE STATE TO SOCIALLY DANGEROUS BEHAVIOR: TO THE THEORY OF THE QUESTION

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抽象。 本文试图通过批判性的观点来探讨通过“行动–反应”概念的辩证法来应对社会危险行为的概念方法的基础，这些概念在辩证法的普遍定律中被视为成对类别。 在自然和技术环境以及人道主义和社会领域自然互动。 作者认为，每一种危害社会的行为，都不可避免地会引起对国家的消极反应，这种反应本质上是谴责的，应适度消极，即与所采取的行动相称，并符合社会上普遍存在的正义观念。

关键词：行动，反应，社会危险行为，普遍规律和辩证法的成对分类，对社会危险行为的反应要求

***Abstract.*** The article attempts to take a critical look at the foundations of conceptual approaches to the problem of countering socially dangerous behavior through the dialectic of the concepts "action-reaction", which are considered as paired categories within the universal laws of dialectics, which naturally interact both in the natural and technical environment, as well as in the humanitarian and social spheres. According to the author, each act of behavior dangerous to society should inevitably entail a negative state reaction condemning in nature, which should be moderately negative, i.e. proportionate to what was done, and in accordance with the prevailing ideas of justice in society.

***Keywords:*** action, reaction, socially dangerous behavior, universal laws and paired categories of dialectics, requirements for reaction to socially dangerous behavior

1. The national security of the country implies the harmonious development of public relations and the reliable protection of the rights and legitimate interests of participants in such relations - the individual, society and the state from

various threats, including and above all, from the actual infliction of harm to them by socially dangerous encroachments. Providing such security is a universal and fundamental task for civil society as a whole and its various institutions, but first of all it is, of course, the task of the state, for which the law enforcement function is one of the constitutional, and therefore most important. The realization of this important and complex function is impossible without the use of all the means and possibilities at the disposal of the state and society and the obligatory response to each case of socially dangerous behavior.

The centuries-old experience of not quite successfully solving this problem dictates the need to search for new tools and methods for its more effective solution. On this path, it seems appropriate to critically look at the very foundations of conceptual approaches to solving this problem. We propose to look at socially dangerous behavior as actions dangerous for society, causing them to be rejected and obligatory community response, through the dialectic of the paired categories "action - reaction", which finds its manifestations in various spheres of life of the human community.

2. The term "reaction" in the dictionaries of the Russian language is defined as "an action that occurs in response to a particular effect, irritation, ... the body's response to external or internal irritation, ... a sharp change, a transition to a state that is the opposite of the past ..." [1, p. 891]. according to the dictionary of foreign words, "reaction - (lat. Re ... against + actio - action) - ... action that occurs in response to a particular impact" [2, p. 419]. "React" means "to respond in some way to irritation, to action from outside," ... "to show your attitude to something, to respond in some way to this or that action, to act under the influence of something." [1, p. 891; 2, p. 419; 3, p. 583]. Thus, the term reaction implies a response, a response action (or inaction) to actio - another action or inaction preceding it.

For research purposes, it seems interesting to look at the concepts of "action" and "reaction" as non-paired categories that "obey" the universal laws of dialectics: the unity and struggle of opposites, the transition of quantitative changes to qualitative ones, and negation of negation. According to the first of them, "everything in the world has its opposite, these opposites are in constant struggle and dialectical unity (examples: positive and negative charges, white and black, good and evil, sweet and bitter, egoism and altruism, etc. ) ". The law reveals the driving forces of the development of nature, society and thinking, defines the causes of development - why it happens. The second law shows how the process of development and change occurs: quantitative changes accumulate and turn into qualitative ones, such a transition from one qualitative state to another, called a leap, determines the development in a spiral to a higher level of development. The third law determines in which direction change and development are taking place, and their tendencies are shown.

The reaction follows from the action and denies it as its reason for achieving higher goals that stimulate this process. The state as a social institution, responsible for the state of law and order in society and its safety, responds to socially dangerous behavior of a particular person and the very fact of the existence of such behavior as a negative social phenomenon as a whole, with the goal of reducing their number and overall level and minimizing their negative consequences.

The place of these concepts, in our opinion, is among other paired categories of dialectics, such as necessity and chance, possibility and reality, essence and phenomenon, content and form, cause and effect ... Action and reaction are paired categories, inseparable as action and reaction or cause and effect, naturally interacting both in nature, in the natural and technical environment, and in the fields of humanitarian and social: in philosophy, psychology, sociology, criminology and law. Statements that action and reaction - are "concepts related to human behavior", that they occur only in the sphere of human behavior, seem to us inaccurate. It is no accident that the concept of "reaction" is, among other things, defined as "physicochemical interaction between substances" [1, p. 891; 3, p. 583]; "The response of the body to certain external or internal irritations, for example: immunological, physiological, psychological and other reactions; ... a sharp change, a transition to a state that is the opposite of the past, for example, a loss of strength or mood after emotional stress ... "[2, p. 419], and one of the meanings of the term "react" is "... to enter into a chemical reaction" [2, p. 418].

Moreover, in all cases and in all areas, the former (actions, acts, actions, and often inaction) inevitably cause the latter (reactions in response to actions, counteraction to them), which are impossible without the former. They are closely interconnected: according to the laws of I. Newton, action always has an equal and opposite reaction [4, p. 19].

Of course, when the reaction comes, what it will be in its direction, features, properties and character - open questions, these are questions of fact. It is important to state that in one form or another (form) and manifestation, the response, according to Newton's laws, should be present, and it comes inevitably.

3. In the social sphere that interests us directly, first of all, in the sphere of unlawful behavior, and especially in the "sphere of combating crime and other offenses" [5, p. 3-8], action and reaction are concepts that are really directly related to the behavior of people, they are initiated and implemented. The essential features of the application of these concepts in social spheres are connected with the fact that both their content and significance, and their correlation are mediated by the behavior of a person or many people - participants in a wide variety of social ties and relationships as individuals or members of various human communities (including legal persons, public associations, corporations, government bodies) with legal personality in accordance with the law, according to which the speci-

fied behavior may entail legal consequences on the side of the "action" or, on the contrary, reaction.

*Action* in the social sphere is an action (or inaction) that is "triggered" by a person (people), by his (their) conscious decision and free choice, influenced by the needs and interests of the subjects of social relations. *Reaction* is a response action: that which necessarily occurs as a natural, also conscious and strong-willed response to an external influence, a response to the behavior of the specified subject, its inevitable consequence. The action most often serves as an occasion causing a reaction, and often its cause (or one of the reasons). The basis of the reaction may also be those or other unmet needs of subjects of public relations.

4. What should be this reaction, what properties should it possess? When, on what basis and how does this reaction arise, what is it in essence and in what is manifested - issues requiring serious scientific reflection. It is generally recognized that, to a large extent, the nature of the reaction, its orientation and intensity (volume) should be determined by the nature, orientation and intensity of acts of behavior that served as the reason for the corresponding reaction or its cause - features of the nature and degree of social danger of the committed act (acts) and the person committing them. But this is too general, abstract representation.

According to our (most general, preliminary ideas), in the social sphere, in particular, in the sphere of deviant behavior, the following requirements may be made to the state's reaction to socially dangerous behavior:

1) in direction: the reaction should be opposite in relation to the direction of the action causing it, to serve as a "negation of negation";

2) in social purpose: the reaction should be in the nature of counteraction of the action as an external influence;

3) in the nature of the applied legal restrictions, it must be negative - contain a negative assessment of the act of socially dangerous behavior and the person who committed it;

4) in its volume (size, limits) - commensurate with the deed, which is ensured based on the prevailing notions of justice in society;

5) in forms of implementation - regulatory, and therefore generally binding;

6) in enforcement - compulsory;

7) in order to be socially useful and effective - must be compulsory and inevitable, follow the response to each act of socially dangerous behavior, and to such behavior as a negative social phenomenon as a whole.

Moreover, the most important, key value for penetrating into the essence, content, goals and mechanism of the state's reaction to socially dangerous behavior, and ensuring its effectiveness in practice, have, in our opinion, three basic requirements: each act of behavior dangerous to society must inevitably entail the appropriate reaction of the state - its obligatory, *inevitable response* to the

fact of behavior dangerous to society, especially if it is connected with a violation of the prescription (prohibition) established by it. This reaction, by its nature and content, should be *negative, condemning* a malicious act and condemning the perpetrator for what was done, accompanied, if necessary, by deprivations and restrictions prescribed by law; however negative in moderation, i.e. *proportionate to the deed*, corresponding to the prevailing notions of justice in society [5, p. 101].

*The reported study was funded by RFBR, project number 20-011-00141.*

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国内刑事立法中对未成年人权利的刑事法律保护：历史回顾

# CRIMINAL-LEGAL PROTECTION OF THE RIGHTS OF MINORS IN THE DOMESTIC CRIMINAL LEGISLATION: HISTORICAL RETROSPECTIVE

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抽象。　作者得出的结论是，只有通过后苏联法典，我们才能讨论对未成年人犯罪责任的制度化：尽管在拒绝俄国法律革命前传统和形成苏联法律之后，却没有考虑到　犯罪学理论的先前发展，导致刑法质量下降，并逐渐提高，但未能在3月22日的《刑法》草案中实现对未成年人权利的刑事保护的法律法规和法律技术研究，　1903年。

关键词：侵害未成年人和家庭罪，侵害未成年人的发展罪，侵害家庭罪和未成年人在其中的权利，保护儿童的刑法。

***Abstract.*** *The author concluded that only with the adoption of the post-Soviet code can we talk about the institutionalization of responsibility for crimes against minors: although after the rejection of the Russian legal pre-revolutionary tradition and the formation of Soviet law without taking into account the previous developments of criminological doctrine, which led to a decline in the quality of criminal laws, and gradually increased, but could not achieve legal regulation and legal and technical study of criminal protection of the rights of minors in the draft Criminal Code on March 22, 1903.*

***Keywords:*** *crimes against minors and the family, crimes against the development of minors, crimes against the family and the rights of minors in it, criminal law protection of children.*

The most important legal act regulating liability for harming the interests of minors is the Criminal and Correctional Penal Code of 1845 [1], adopted during the reign of Nicholas I. In criminal law theory, criminologists who study the history of the development of law have subjected it to comprehensive analysis, but they did not come to a unified consolidated opinion about its qualitative characteristics from a legal and technical point of view, noting both the archaic nature of

the norms there, the lack of a coherent system for reporting crimes, and the non-critical reception of the provisions of foreign criminal law that it perceived, but for the purposes of our study, this act, Despite all its shortcomings, it seems very important, since it was in it that the legislator gave its expanded institutionalized development and interpretation of the norms on criminal liability for harming the interests of minors. It is noteworthy that it is in this act that the age gradation of minors appears, among which minors (up to 17 years) were identified, the age of majority was 21 years. The separation among minors of juvenile retains its significance in modern criminal law.

Some researchers (for example, A.V. Naumov) noted the merits of this document, referring to the positive aspects of its structure "a fairly complete gradation of crimes in terms of their danger, types and sizes of those who rely on their punishment" [2, p. 39]. This can also be fully attributed to crimes against the interests of minors, the subject of which could be not only parents (for example, forcing children to marry or having tonsured monasticism (art. 2078); involving minor children in a crime (art. 2079); corruption of children's morality, as well as indulgence in their depravity (art. 2080); appropriation and embezzlement of property belonging to children (art. 2082), but also guardians. With identical dispositions and sanctions, the crimes of these entities against minors, however, were located in different chapters of this regulatory legal act, and in one case it was about abuse of parental authority, and in the other - the power of guardians and trustees. Such a structural distinction between them seems somewhat illogical to us: it was enough to change the name of the chapters, articles and partially adjust the dispositions of these norms and not have them separately in the chapters of the second and fourth ninth sections.

We also note that responsibility for moral education and provision of content was borne not only by parents and guardians within the framework of the emerging institution of guardianship, but also by artisans, artisans who took their children to school and were obliged, under the threat of criminal punishment, to provide them with food and time for recreation and even punish for debauchery (artisans were punished for involving minor apprentices in drunkenness and visiting brothels) and teachers who were criminally responsible not only for favoring actions contrary to public morality or directly condoning them, but also for disseminating them in educational institutions works (verses, proclamations, etc.) that have a detrimental effect on the moral condition of children. Such offenses were spelled out in the fourteenth and third chapters.

After analyzing the entire amount of criminal acts against minors, concentrated in this regulatory act, Yu. Pudovochkin proposes two criteria for their classification, the first of which is the subject of the crime. Based on this criterion, he identifies four groups of crimes (committed by parents / guardians, artisans /

employers, teachers, private individuals), further dividing the first group into two more on the objective side of the crime: abuse of parental / guardian power and others. He identifies a separate fifth group of criminal acts, where the minority of the affected entities acts as a qualifying attribute [3, p. 19].

This normative legal act protected the religious interests of minors, however, this applied only to Orthodoxy, for the prohibition of rites of which (as well as admission to non-Christian rites) and for education not in the Christian faith, criminal punishment also followed, based on the norms section two, which contained crimes against faith.

Premeditated (i.e., preplanned) parental killing was considered one of the most serious crimes, while in relation to infanticide, the opposite tendency towards a gradual mitigation of punishment is observed, although it manifested itself inconsistently. S.V. Poznyshev, N.A. Neklyudov, I.Ya. Foinitsky and other leading pre-revolutionary criminologists, in their work, based on the data of his current level of development of medicine, insisted on a special somatic patrimonial and postpartum state of the mother, entailing her inability to reason intelligently and prudently, and it did not depend on the presence / absence of married status and, in their opinion, it should be taken into account in all cases of killing by the mother of a newborn child as a mitigating factor [4].

If in the XVIII century the punishments were rather severe (although they also gradually softened, varying depending on the estate of the woman who committed such a crime, whipping was not applied for women from privileged classes), then in the XIX century the punishment depended on the specific type of crime Infanticide: a complex gradation of infanticide occurred, which was of three types: the murder of a child born into a lawful marriage, committed "intentionally"; killing under the influence of fear and shame of an illegitimate child; the murder of a freak child who had a terrible and/or inhuman appearance. The latter happened with a mitigating circumstance when sentencing, consisting of deprivation of all the rights of the state to be sent to prison for a term of 1.5 to 2.5 years, the subject of this criminal act could be not only the mother who gave birth to the child. The most severe was the punishment for the first type of infanticide: deprivation of all rights of the state and life imprisonment, the second type of punishment was punished by imprisonment for 4 to 6 years, also with the deprivation of all rights of the state. It is noteworthy that the Code of Criminal Laws of 1832 divided crimes like "infanticide" and "child murder," referring to the first murder of children in the womb or young children, and the latter to other cases of killing children (art. 341), while the status of the baby and the nature of his birth did not matter. For child murder was punished as for ordinary murder (art. 342), and for infanticide - indefinite or for a certain period hard labor with stigma.

It is believed that in the normative legal act of 1845 qualified formations appeared in infanticide, although some researchers speak of the appearance of privileged compositions of murders (A.G. Babichev). Separately, the abandonment by a mother of a newborn child was criminalized, which led to his death. This was considered as the murder of a child under especially extenuating circumstances, but was not considered infanticide, which we see as some contradiction, overcome in the development of the draft Code of 1903, which indicated that infanticide could be committed through both action and inaction, i.e. failure to provide the child with the necessary assistance. However, a qualifying sign: the murder of a freak child, on the contrary, was lost and the punishment for it followed the general rules of art. 461 of this act with the use of imprisonment for a term of 4 to 6 years.

In the Draft Code of 1903 [5], the construction of such norms was significantly improved: the provisions relating to the criminal legal protection of the rights of minors were placed in a separate chapter (chap. 19), containing nineteen corpus delicti, and classified as “family rights”. In fact, they represented a revised and improved edition of the corpus delicti already available in the 1845 Code. Children who committed criminal acts in the form of failure to provide maintenance to parents were also punished for disobeying their will and for not taking it into account when they entered into marriage. Some of the criminal acts, the object of which were the interests of minors, were beyond the scope of this chapter: abduction of a child, surrender of a child to a guardian or parents (unless this was done in the best interests of the child), failure to report to the police about a lost or stray child within two weeks. It is interesting that many of the elements of crimes possessed qualifying features: for example, when substituting (kidnapping) a child, the purpose for which this was done was important: for begging, for another mercenary or immoral purpose. The compulsion of begging by parents was criminalized by a separate composition. The same applies to compulsion to enter into a marriage. A separate norm was established and the responsibility for the abduction of minor girls, even if it was done with their consent, for "indecent". The previously existing norms that established the responsibility of artisans for the apprentices entrusted to their care remained intact: their life and health were protected, masters could be held criminally liable for ill-treatment of a student and for preventing him from attending school.

It is noteworthy that in the draft of this normative legal act there was an age differentiation of minors: up to 12 years of age a minor was considered a child, up to 16 - a minor; separately, a age of 16 to 21 years was established as a qualifying attribute when criminalizing sexual violence against minors. The level of elaboration of the draft of this legal regulation turned out to be much higher from the legal and technical point of view than in the previous acts, not only due to the transition from casual to abstract construction of norms, the appearance of definitions, which

is also considered to be a manifestation of a higher level of legislative technique, but also because for a more detailed study of the dispositions of the norms, which suggested, in relation to our topic, a clearer distinction between “voluptuousness” (art. 435) (an analogue of the modern term “depraved actions”) and copulation, which were criminalized by separate compositions, although the previous acts terminologically and structurally, they did not differ.

The draft Code of 1903 did not fully enter into force (until 1917, the Code of 1845 was in force as amended in 1885). After the revolutionary events that radically interrupted the previous legal tradition during the construction of the “new type” state, which was supposed to die out after the victory of the proletarian revolution on a global scale, they tried to generally methodologically change the approach to understanding the phenomenon of crime, reject the principle of legality and abandon all “bourgeois law” ”, Including the criminal, and former criminals, unlike the“ former ”people who made up the highest social strata of the deceased empire, were declared class close. In these conditions, talking about improving legislative technology, or at least maintaining it at the same pre-revolutionary level, was pointless. However, one of the first decrees that came into force: the Decree of the All-Russian Central Executive Committee and the Council of People's Commissars of the RSFSR of December 18, 1917 “On Civil Marriage, on Children, and on Civil Status Acts” [6] established the mutual rights and obligations of children and parents, and also the concept of "parental authority" is derived from the legal field. The latter, I think, was made by the new government not without a self-serving goal: parental authority and the authority of the head of the family could interfere with the further recruitment of supporters of revolutionary theory from among the youth, so the rejection of parental authority, implemented in practice, was very beneficial to the new revolutionary power structures.

The Decree of the Council of People's Commissars of the RSFSR of March 4, 1920, "On the affairs of minors accused of socially dangerous acts" [7] partially restored responsibility for a number of criminal acts previously criminalized in the criminal legislation of imperial Russia. This act established a ban on child abuse, their exploitation, their involvement in socially dangerous activities and the joint commission of crimes with them (i.e., the institution of complicity began to revive). Almost all criminologists agree on the low level of elaboration of norms protecting the rights of minors in the first two Soviet codes, which in this respect did not differ from each other [8]. The norms protecting the rights of minors were not combined in one chapter, nor were they institutionalized. Nevertheless, the Criminal Code of the RSFSR of 1922 [9] introduced art. 165, which criminalized non-payment of alimony, and also criminalized the abduction, substitution and concealment of a child committed for selfish purposes, based on personal gain or vengeful motives. Despite the proclamation of a new society, it was not possible to

get rid of the beggars of the new government, however, forcing children to become impoverished was considered a criminal offense for which criminal liability for art. 158 of the Criminal Code of the RSFSR of 1926 [10].

It cannot be said that in the subsequent code (Criminal Code of the RSFSR of 1960) [11] the issue of increased protection of the rights of minors was ignored by the legislator, but the structural arrangement of the norms directly serving as the basis for protecting the rights of children was not institutionalized: they were not combined into one chapter and contained in chapter 3 and chapter 10, having different objects of criminal assault. However, of all Soviet codes, the total amount of legislative provisions protecting the rights of minors by criminal law was the largest in this codified act.

So, the analysis of the protection of the rights of minors by criminal legal means in a historical retrospective showed that in the most detail, with the transition from casuistic to abstract regulation of public relations, the protection of the rights of minors was enshrined in the Draft Code of 1903, which did not enter into legal force, In the same legal act, the legislative technique was significantly improved, the subsequent drop in the level of which can be fixed since 1917. This negatively affected both the structure and content of the codes of 1922 and 1926. in relation to the establishment of responsibility for criminal acts against minors, which in these acts were, but not in the quantity and much worse level from the legal and technical point of view, compared with the last of the codified acts prepared in tsarist Russia. The norms protecting the rights of minors by criminal law were prescribed in the Criminal Code of the RSFSR in 1960, but they were not formed as a single criminal law institution. Only with the adoption of the post-Soviet code can we talk about formalizing the institutionalization of responsibility for crimes against minors.

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对教育过程中参与者意义范围发展的心理和教学基础的理论分析

# THEORETICAL ANALYSIS OF THE PSYCHOLOGICAL AND PEDAGOGICAL FOUNDATIONS OF THE DEVELOPMENT OF THE MEANING SPHERE OF PARTICIPANTS IN THE EDUCATIONAL PROCESS

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抽象。本文对教育过程参与者意义领域的发展进行了理论研究。主要关注于意义-方法教学法，与认知（知识）方法相反，它允许将学习过程提升到个人意义水平。由于二十世纪初新科学的诞生，它特别关注了教育过程参与者的意义领域的发展，该新科学位于心理学与意义指导教学法的交汇处。教育的现代趋势是：人性化，“文化人”的形成，解决学生人格整体发展的问题。只有当培训的重点是发展学生的意义领域时，它们才会有效。为了评估这个目标，有必要建立一个意义广泛的意义教学原则，方法，工具等的系统基础。研究的新颖性在于对意义领域研究的现代科学方法的概括。为研究教育过程中参与者的意义领域创造教学基础。

在“方法”部分中，作者描述了意义学习理论的现代心理学和教学方法，并提请注意这方面的哲学和心理学方法论。本文提供的资料来源的分析评论反映了教育过程参与者意义领域发展的当前趋势，包括对文献的分析，并指出了使用教学定义的现代趋势。在“结果”部分中，作者总结了理论研究的结果，并建议进一步发展教育过程参与者的意义互动的教学基础。 “结果讨论”部分包含过去十年中有关此主题的科学研究。

关键词：意义领域，意义教学，意义形成，对话互动，意义教育。

***Abstract.*** *The article presents a theoretical analysis of researches on the development of the meaning sphere of participants of the educational process. The main focus is on the meaning-didactic approach to education, which, in contrast to the cognitive (knowledge) approach, allows to up bring the learning process to the personal-meaning level. Special attention to the development of the meaning sphere of participants of the educational process in the last decade was paid because of the genesis of a new science at the beginning of the XX century, which is located at the junction of psychology and meaning-didactic didactics. The modern trends in education are: humanization, formation of a "person of culture",*

*solving the problem of holistic development of students' personality. They will be effective only if the training is focused on the development of the meaning sphere of students. To estimate this goal, it is necessary to create a comprehensive, systematic basis of meaning didactic principles, methods, tools, etc. The novelty of the research is in generalization of modern scientific approaches to the study of the meaning sphere, which will allow to create a didactic basis for the study of the meaning sphere of participants in the educational process.*

*In the section "Methods", the authors describe modern psychological and pedagogical approaches to the theory of meaning learning, and also draw attention to the philosophical and psychological methodology of this aspect. The analytical review of sources presented in the article reflects the current trends in the study of the development of the meaning sphere of participants of the educational process includes the analysis of literature and identifies the modern trends in the use of didactic definitions. In the section "Results", the authors summarize the results of the theoretical research and suggest further development of didactic basis of meaning interaction of participants of the educational process. The section "Discussion of results" contains scientific researches on this topic over the past decade.*

***Keywords:*** *meaning sphere, meaning didactics, meaning formation, dialog interaction, meaning-oriented education.*

**Introduction**

The ongoing changes in the modern society, modern trends, digitalization, acceleration of the social development are turning the views of the scientists to the term “transitive society”, which means modernization, transformation of its inner structure, “conscious design of the future society by the participants of the historical process” [17, p.31]. The quality of education, its development and availability are humanistic criterion of the social progress. That’s why we cannot ignore that the theory of education requires transformation and rethinking.

For a long period of time existing cognitive (knowledge) approach haven’t been allowing the student, who is the main participant of the educational process, to fill his knowledge, gained in the learning process, with personal meaning. It is necessary to overcome this disunity “between learned and comprehended” to achieve success in any kind of activity and reveal the inner abilities of students. In the cognitive didactics the content of the training process goes through acquirement, assimilation, memorizing the learnt material. In contrast, the meaning didactics as a modern interdisciplinary science develops and nourishes students.

**Methods**

The meaning didactics, which arose at the beginning of the 20$^{th}$ century as an independent discipline combining psychology and didactics and closely connecting other disciplines, provides the meaning development of students, filling

the educational content with personal meaning and upbringing the educational process to the personal-meaning level (Abakumova, Fomenko, Ermakov). The process of learning makes sense while it initiates the interest in education and emotional condition, as meaning “is always the meaning of something” and also it is always “my meaning”
[4, p.26]. That’s why since the beginning of the 20th century the researches rethinking the didactic basis of the educational process, interaction of the teacher and the student are conducted. New strategies, which initiate the meaning formation of the students, emerge. These researches on development of the meaning techniques, meaning formation and strategies were conducted by I.V. Abakumova, P.N. Ermakov, V.T. Fomenko, M.V. Godunov, L.Ts. Kagermazova, A.M. Kukulyar.

The solution of the problem of humanization of education, development of holistic personality lies in the basis of the personality-oriented education (A.G. Asmolov, I.S. Yakimanskaya). The formation of “the person of culture” ( E.V. Bondarevskaya) is possible only if education “works” on formation of the personal qualities of a child. The semantic approach to learning as a "two-way process", in which the joint activity of the student (students) and the teacher is considered as "dialogic", assumes a systematic review of the process of teaching them from the subject-subject relations [1, p.46]. The consideration of the processes of «meaning comprehension” and “meaning transfer” is proposed within the framework of the concept of “the joint mental activity” of A.K. Belousova, S.M. Dzakupova, V.E. Klochko, D.F. Dautov, A.A. Matushkina, O.M. Krasnoryadtseva.

As the philosophical category "meaning" has its origins in the ancient times. Even Socrates, in his famous "Socratic dialogues", said that a person can come to the truth only through his own reflections. The teacher will not be able to convey the content to the student no matter how much he tries to do this until the content reaches so-called "my meaning”. The “Socratic dialogues”, which are often used by most psychotherapists mainly subconsciously, are powerful instruments for the development of the meaning sphere of students.

In works of M.M. Bakhtin, L.S. Vygotskiy, V. Frankl, S.L. Rubinstein we find philosophical-psychological comprehension of various aspects of meaning. Cult urological approach is one of the aspects of studying meaning. It is also a meaning formation factor. Culture as a carrier of meanings is closely related to training process. The theory of dialogue of cultures of M.M. Yachting suspects several aspects, one of which is the form of interpersonal communication. Exactly this is a dialog form: “The culture exists only somewhere, where at least two cultures exist” [6]. We can consider education as a process of continuity and rethinking the culture in a new context based on methodology of M.M. Yachting as he reveals the specificity of cultural continuity in his works. The most important inner reference point is a humanistic ideal of person. The idea of humanistic (person-oriented)

education and upbringing in the human first of all "humaneness" has its origin in antiquity according to T.S. Chermanteeva. In her work "Antique heritage and European humanism" the author compares the culture with personality. "Self-identification of person goes through memory, comparison of current self and previous self" [20, p.12]. She also supposes that the antique culture and self-identification of modern culture with its origins may serve as a starting point for philosophical consideration of problems of modern education. After all, the process of meaningful development of person originates in the "Ancient Greek paideia".

The researches of the problem of meaning as a psychological category were started by A.N. Leontiev. The personal meaning according to A.N. Leotiev is a driving force which leads the student to understanding of activity in which he is being involved by the teacher [13, p.99]. The term "meaning" takes a central place in psychology and pedagogic due to works of V. Frankl. Emphasizing that "the humaneness in human for a long period of time has been excluded from the field of vision" Frankl believes that the human essence should be put at the forefront and only in this case training will be creating a system of person's meanings [12]. The meaning according to V. Frankl is a "lifelong problem" and a driving force for its solution is a pursuit to perform the "own meaning" [18, p.183].

In psychological and pedagogical researches the importance of adolescence is pointed out, as it's a period of meaning conceptions formation. This is a period of more or less stable self-esteem and focus of personality formation. The child in this period is the most sensitive to changes, in this period the preconditions for formation of representations about the sense of life form. People also discover their "self" and formalize their worldview during this period (L.S. Vygotskiy, D.I. Feldshtein, M.A. Frizen). According to D.A. Leontiev the meaning sphere is a main part of a personality structure. He highlights the following components of personality regulation: situational (personal meanings, meaning settings, meaning formation motives) and stable meaning structures (meaning constructs, meaning disposition, personal values) [14, p.136].

M.A. Frizen investigates in his works some particular qualities of meaning sphere of adolescent. The author identifies two types of development of the meaning sphere: productive, which is characterized by openness, harmony and order of meanings and reproductive, which has a small volume of non-stereotypical meanings and can be characterized by disorder and centering [19].

I.V. Abakumova points out several criteria of the development of the meaning sphere of adolescent, which are: 1) the specifity of experienced by the subject's attitude to the realization of the goal of his activity; 2) the subjective attitude i.e. their self-locking; 3) the depth of personal attitude of the subject; 4) the availability of evaluation component. According to I.V. Abakumova, there are several levels of the meaning sphere development: low, medium and [2].

The scientists distinguish some types of meaning sphere of the students depending on the content of meanings: egocentric, groupcentric and (Frizen, 2005, Bratus, 2014). B. S. Bratus, calling the semantic sphere “an arena of confrontation between its main vectors, orientations”, considers it as a whole and distinguishes the “core of personality” as the highest level responsible for the production of meaning orientations [9].

Modern pedagogy sets itself many tasks, one of which is determining ways of identification of the most effective methods and technologies that contribute to increasing the motivation of students, the growth of their cognitive activity, as well as stimulating their potential. A special range of works are presenting the developments in the field of methodology, tools, technologies, which allow bringing the educational process to a personal-meaning level. E.S. Zorina, A.A. Zelenov offer a classification of meaning techniques that will make it possible to improve modern pedagogical technologies that initiate the meaning formation of the students [11]. In the process of this interaction between the student and the teacher, various definitions of the meaning acceptance, meaning dissonance inevitably appear. These difficulties in the educational process in psychological and pedagogical practice are called "the meaning barriers" [5 , p.1]. A.A. Osipova, L.I. Bozhovich, L.Ts. Kagermazova, I.A. Rudakova, R.Kh. Shakurova, L.S. Ter-Matiosova devote their works to the problem of overcoming the meaning barriers.

One of the characteristics, which are distinguished by researchers studying the levels of development of the meaning sphere, is the ability of students to solve the “meaning tasks” (V.M. Golubova, A.A. Zelenov, I.E. Nesterenko, I.A. D.V. Penkov, I.A. Rudakova, V.A. Slastenin, E.D. Fayzullaeva, V.T. Fomenko, E.V. Shelustyuk). D.A. Leont'ev defines the “meaning task” as the task which objective is determination of the place of an object or phenomenon in the life of the subject, which can be set in relation to his own action, as well as in relation to objects, phenomena or events of reality [14].

N.Yu. Zilberbrandt is developing a new typology of problems: 1) according to the criterion of “statement sources”: activity-creative, motivational-communicative; 2) according to the criterion “the nature of semantic connections” - affective-meaning, initial-meaning, tasks for self-realization, reflexive-semantic [10].

According to the studies of E.V. Belova, M.A. Lukyanenko, the following typology of tasks is distinguished: dialogue-interpretation, dialogue-inclusion, dialogue-pervasion, dialogue-experience [7].

V.A.Savin identifies the levels of realization of “meaning task”: the level of initiation of meaning formation, the level of actualization of meaningful settings, the level of independent activity (actually meaning formation), the level of the creative activity (meaning divergence) and the level of entrance to the interpersonal forms of meaning [16].

D.V. Penkov defines the mechanism underlying the “meaning task”, identifies the stages of passing the meaning increment in the process of solving problems of meaning, and also highlights the types of tasks of meaning depending on the specifics of the meaning choice at the initial stage (Penkov, 2019)

E.G. Belyakova presents the developments in the field of substantiation of the model of meaning-oriented education, meaning-oriented lessons in her studies. The author supplements the principles of teaching the meaning component: the principle of meaning orientation, integrality, meaning activity, meaning problematicity, systematicity, axiological nature. The tasks of the teacher, according to the model of meaning-oriented education, is to create a cultural-meaning field and the possibility of self-esteem of the students [8].

**Results**

The results of the analysis of the theoretical studies showed that, despite the presence of a very wide range of works, developed and experimentally tested didactic models that initiate the meaning formation of students, the meaning components in the context of the educational process are not represented enough. It seems possible to develop the basic didactic provisions that will determine the content, forms and methods of the meaning forming educational context. Being in a dialogue, subject-subject interaction, the teacher can have a direct impact on the stable components of the meaning sphere of the personality, and, therefore, the semantic sphere of the teacher, as a direct "presenter" of meanings requires the further study.

**Discussion**

Nowadays, there is a fairly extensive number of works devoted to the processes of meaning formation in the educational process. At the level of practical use in modern pedagogy, a conceptual didactic model built on the meaning saturation of the educational process exists [3]. Over the past decade, tools, methods and technologies that will ensure the initiation of meaning formation for students have been developed.

Also the number of studies devoted to meaning techniques, meaning strategies which initiate the meaning formation in the educational process has increased over the past decade [15]. The following problems were studied: the didactic approaches to the problem of overcoming the meaning barriers in teaching A.V. Bakulin (2009), L.S. Ter-Matiosova (2011), A.A. Osipova (2017); the development of technologies for the initiation of meaning formation Zorina (2017), D.V. Penkov (2019); the development of a model of situations of the meaning choice N.N. Mironenkova (2011); the strategies of students’ meaning formation S.V. Gurov (2012); the features of the formation of interpersonal meanings in a team interaction E.A. Pronenko (2019). In connection with the transformation of education, the inevitable forward movement of a transitive developing society, it is necessary to supplement, rethink the meaning didactic definitions, develop new meaning techniques, and describe new “meaning tasks”.

**Conflicts of interest:** The authors declare no conflict of interest

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俄语的动词动词及其在外国听众中的教学特点

# RUSSIAN VERBS OF MOVEMENT AND THE PECULIARITIES OF THEIR TEACHING IN A FOREIGN AUDIENCE

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抽象。 本文讨论了在学习俄语作为外语的初始阶段向外国学生教授最困难的语法主题“运动动词”之一的问题。 重点说明了难以掌握该词汇和语法类别的原因。 本文介绍了作者在外国听众在实践课中使用强化语言教学俄语的长期经验

关键字：外国学生培训的语言和方法，语言材料的选择和呈现，动作动词，教学问题，大学预科阶段。

***Abstract.*** *The problems of teaching foreign students one of the most difficult grammar theme "Verbs of movement" at the initial stage of learning Russian as a foreign language are discussed in this paper. The causes of difficulties in mastering this lexical and grammatical category are highlighted. The article describes the authors' long-term experience of using intensive methods of teaching Russian language in practical classes in a foreign audience*

***Keywords:*** *linguistic and methodological approaches to foreign students' training, selection and presentation of language material, verbs of movement, the problems of teaching, pre-university stage of training.*

The goal of teaching Russian as a foreign language at the pre-university stage is to teach foreign citizens to read, write, speak and understand Russian in the volume that will be necessary for studying in the first year of a Russian university. There is no doubt that the formation of communicative skills is impossible without mastering not only phonetic, graphic and lexical, but also grammatical norms of the language.

One of the most difficult grammatical themes in Russian as a foreign language

is considered to be linked with a verb group that occupies a central place in the semantic structure of a sentence. The formation of verb forms, as well as the variety of forms of management, is one of the main problems that foreigners have when they learn the Russian language. The variety of semantics associated with the invariance of common-species meanings causes additional difficulties. Verbal vocabulary, therefore, is an important object of study. As a part of the verb vocabulary the following are distinguished as verbs of speech, feelings, perceptions, movements and others [6]. As practice shows, it is the verbs of movement that are the most difficult lexical and grammatical group for foreign students to master.

The term "verbs of movement", introduced into linguistics by professor Isachenko A.V. [2], continues to be the subject of research by linguists who note the richness and variety of forms of this lexical and grammatical category, their stylistic capabilities, extensive connections with other lexical and grammatical categories. A continuing interest in the verbs of movement is also explained by their complexity, inconsistency and use in different functional styles.

The verbs of movement are a closed lexical and grammatical union of a small number of words characterized by common indicators, as well as the peculiarity of use in speech [1, p. 5]. The verbs of movement are the most moving verbs in the Russian language, they are polysemic, they are constantly in dynamics, giving rise to new meanings. Polysemy is one of the features of the verbs of movement. For example, in the "Explanatory dictionary of the Russian language" the verb to go has 23 meanings, the verb to walk – 7, to run – 8, etc.

As noted above, at the initial stage of training Russian as a foreign language the verbs of movement are one of the most difficult themes to learn. Difficulties may arise due to the following reasons:

1) Unlike other languages, in Russian there is a distinction according to the spatial orientation of movement: unidirectional verbs to go, run, fly, swim (идти, ехать, лететь, плыть etc.) and multidirectional (ходить, ездить, бегать, летать, плавать etc.). The first group indicates a single movement in one direction and the second one is non-directional movement, or movement in different directions, or regularly repeated movement.

2) In Russian, there are groups of verbs that differ in the way they move (without the help of transport, with the help of transport). These verbs are also grouped in unidirectionality / multidirectionality, and, in addition, in multiplicity and non-multiplicity of movement.

3) More than 20 productive prefixes interact with the verbs of movement, giving the words of this category the meaning of different shades of motion (в-, во-, у-, по-, от-, при-, у-, от-, за- etc.) which makes their understanding even more difficult.

4) The aspect differences between the words of this lexical and grammatical

category have their own characteristics: unidirectional and multidirectional verbs of movement are the verbs of an imperfect aspect, but when prefixes are attached, they change the lexical meaning and aspect – the prefixed verbs of unidirectional movement become verbs of a perfect form, and multidirectional verbs remain an imperfect form .

5) Paired correlation of the verbs of movement (their number remains controversial: for example, in A.V. Isachenko's works, verbs of motion are represented by 17 correlating pairs: идти – ходить, ехать – ездить, бежать – бегать, лететь – летать, плыть – плавать and others [2].

6) The presence of a large number of figurative meanings in the verbs of movement: the bus is walking? Rain goes, time flies, hours run .and many others (автобус идет, дождь идет, собрание идет; тебе идет этот костюм; время летит, часы бегут). Often, their attitude to the mental and physical state of a person is emphasized by their multiple meanings, and multiple use in stable phrases is based on it – to recover, to lose temper = прийти в себя, выйти из себя.

In order to develop the skills of using Russian verbs of movement, the ability to form prefixed verbs and their specific pairs, an educational manual for foreign students "Verbs of movement" was created at the Russian language department № 1 of the preparatory faculty of Rostov State Medical University. The structure of the manual is based on the main principle of teaching methods – "from simple to complex". The development of a clear gradual and step-by-step strategy for presenting the grammar material helps to remove psychological barriers, activate gained in speech knowledge and, therefore, increase motivation in learning Russian language. The authors of the manual had the following tasks – to select speech material, find the easiest ways to explain grammatical features, create system of training exercises and, thus, to form the skills of using Russian verbs of movement in speech.

It was established that learning is faster and the transfer of existing skills is more effective if the students understand the principle of the actions that they perform. Before starting work on the theme, the teacher carries out work on repeating the accusative and prepositional cases with the meanings of the prepositions "in" and "on" (в, на) presented in the tables. Traditionally, at the initial stage of training acquaintance with Russian verbs of movement begins with working out the correct pronunciation and mastering the most often used non-prefixed verbs идти – ходить, ехать – ездить (of the go–go) – and prefixed: пойти – поехать. Using tables, figures, diagrams and specially selected exercises, the concept of unidirectional and multidirectional verbs of movement is introduced.

Namely, "these verbs are able to cover the true communicative needs of students at the initial stage. The inclusion of others, as a rule, gives rise to imaginary communication, which can be artificially stimulated by the teacher, but it turns out to be of

little use for the daily life of students" [4, p. 15]. Therefore, at this stage it is advisable to minimize the verb vocabulary with the aim of its more productive learning.

Much attention is paid to the correct conjugation of the verbs and a clear statement of stress in the forms of the verbs я иду / я еду [8, p. 34].

While acquaintance with prefixed verbs, it is necessary not only to explain the meaning attached to the prefixed verb, but also to focus on syntactic compatibility – verb management, i.e. the use of certain prepositions, the question and the case and prepositional forms that are used after the verb. To facilitate understanding and the correctness of their use, special tables of the meanings of prefixes in combination with the verbs of movement, correspondence between prefixes and prepositions are offered [8, p. 58, 59, 64].

The correctness of the use of verbs of movement in oral and written speech is practiced in the classroom on a variety of exercises such as: completing a sentence using the verbs of movement in the necessary form, changing the sentence using the verbs of movement, choosing the correct verb of movement from the proposed options, composing a microdialogue based on the created text. The purpose of this set of exercises is to use mastered speech patterns in communicative situations that are as close as possible to natural ones.

It is also proposed to diversify the class work with game tasks that create a positive emotional background and stimulate the interest of foreign students in studying this grammatical theme. The manual is equipped with a large amount of infographic material represented by grammar tables, graphical diagrams, drawings, maps of the area, movement routes, which facilitate the process of understanding and remembering the features of the verbs of movement functioning. The use of the students' regional geography allows them to bring the acquired knowledge to a personal – semantic level, increasing the effectiveness of studying this theme (for example, they are invited to conduct a tour along Rostov–on–Don, using the plan, to tell about their path to the faculty, to the library or hostel, diversifying these stories with options for singleness – repeatability of the action).

Many tasks of the manual are aimed at developing the analytical thinking of students. For example, they are invited to analyze the contextual use of the verbs of movement and independently explain their meaning. Independent work of thought contributes to the active formation of the students' sense–sphere, enriching their linguistic picture of the world.

A wide range of tasks completing the manual, allows them to individualize the training process and determine for each student the best way to master the material. The success of mastering this lexical and grammatical material is verified by understanding the texts of the literary style, jokes, poems and lyrics, completing the manual.

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# 问题状况是组织问题教育的主要工具
# PROBLEM SITUATION AS THE MAIN TOOL FOR ORGANIZING PROBLEM EDUCATION

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抽象。 基于问题的学习是一种发展教育的技术，旨在学生主动获取知识，研究方法的形成，认知活动，对科学研究的熟悉，创造力以及对专业意义上的个人素质的培养。 本文探讨了基于问题的学习的概念性设备和结构，这是发展学生创造性思维和创造力的主要方法之一。 此外，还要注意问题情况的分类以及如何创建它们。

关键词：教育，问题教育，问题状况，创造性思维，创造力。

***Abstract.*** *Problem-based learning as a technology of developing education is aimed at the active acquisition of knowledge by students, the formation of methods of research, cognitive activity, familiarization with scientific research, creativity, and the upbringing of professionally significant personal qualities. The article examines the conceptual apparatus and structure of problem-based learning as one of the main methods of developing creative thinking and creativity of students. Also, attention is paid to the classification of problem situations and how to create them.*

***Keywords:*** *education, problem education, problemat situation, creative thinking, creativity.*

The publication of the main theoretical works in the studied area, generalizing the initially accumulated experience and setting the benchmarks for new research, falls in our country in the second half of the 70s of the last century. Subsequently, only certain aspects of problem education were subjected to theoretical analysis.

Studying the experience of teachers of computer science and information technology at the university and computer science teachers at school suggests that the compilation and solution of problem problems still causes difficulties, despite the fact that the theoretical foundation has been determined by many authors and confirmed by numerous studies. The lack of creative components of the training

process for future teachers, called upon in their professional activities to form the creative thinking of students, leads to the fact that many are not capable of the methodological reflection, which is so necessary for professional growth. Today, the problem of preparing a future teacher for the implementation of problem-based education remains relevant. In the pedagogical literature there are several definitions of this concept.

So, for example, V. Okon understands problem learning as “a combination of such actions as organizing problem situations, formulating problems, providing the student with the necessary assistance in solving problems, checking these solutions and, finally, guiding the systematization and consolidation of acquired knowledge” [1].

Analyzing the psychological basis of problem learning, T.V. Kudryavtsev outlined the consequences arising from it:

1. “the laws of occurrence and resolution of problem situations that were defined in the psychology of thinking are simultaneously the laws on the basis of which the process of mastering new knowledge and methods of action is built;

2. program material, the content of training aimed at developing creative abilities, should be represented by a system of problem tasks of various levels of complexity;

3. development of students' creative potential is inextricably linked with the formation of theoretical thinking methods in them;

4. the teacher must take into account the creative nature of assigning the younger generations of socio-historical experience;

5. “projections” to the plane of learning are subject to those theoretical and experimental models of intellectual activity in which the supra-situational-transformative nature of thinking is reproduced ”[2].

M.I. Makhmutov gives the following definition of the concept of “problem-based learning”: “Problem-based learning is a type of developmental education that combines the systematic independent search activity of students with the assimilation of ready-made conclusions of science, and the system of methods is constructed taking into account goal-setting and the principle of problemity; the process of interaction between teaching and learning is focused on the formation of the worldview of students, their cognitive independence, sustainable motives of learning and mental (including creative) abilities in the course of mastering or scientific concepts and methods of activity determined by the system of problem situations ”[3].

I.Ya. Lerner, on the other hand, sees the essence of problem-based learning in that "students under the guidance of a teacher take part in solving new cognitive and practical problems for him in a certain system corresponding to the educational goals of a modern school" [4].

Problem-based learning as a technology of developing education is aimed at the active acquisition of knowledge by students, the formation of methods of research, cognitive activity, familiarization with scientific research, creativity, and the upbringing of professionally significant personal qualities. The main didactic purpose of problem-based learning is the pedagogical management of active search activities of students. Figure 1 shows the organization of problem-based learning:

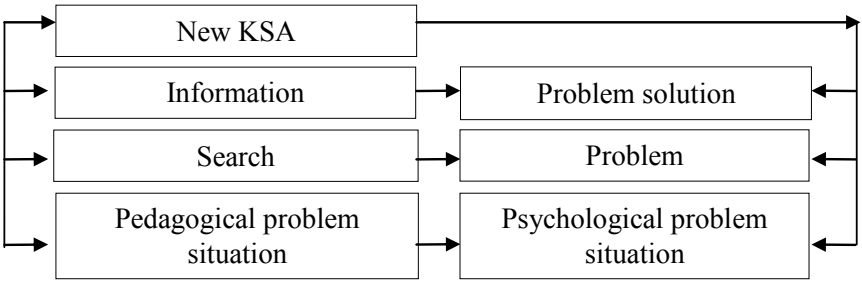


***Fig. 1.*** *The scheme of organization of problem education*

Problem situations can be divided into two main types:

a) is characterized by the fact that a person cannot fail to notice the problem situation arising in the course of his activity (an obvious problem situation, which contains a pronounced contradiction between the desire and the ability to continue the previous actions);

b) non-obvious problem situations, that is, those that arise in the course of a certain activity may go unnoticed.

As noted by I.A. Ilnitsky, the problem situation is the initial, starting point in thinking. In her opinion, the discovery of this pattern is extremely important for the development of the ideas of problem-based learning, for the correct construction of the learning process, as it helps to resolve issues of not only managing the process of mastering knowledge, but also of developing the cognitive needs of students [5].

A problem situation is a means of organizing problem education; this is the initial moment of thinking that causes the cognitive need for learning and creates internal conditions for the active assimilation of new knowledge and ways of working. In the classification of problem situations, A.M. Matyushkin laid the three most common grounds: action (problem situations in which the assimilated unknown is the goal; problem situations in which the assimilated unknown is the mode of action; problem situations in which the unknown are new conditions of action), the level of development reached by students, the level of intellectual, creative abilities of the child [6].

Z.K. Meretukova [7], having systematized the methods of creating problem situations proposed in the psychological and pedagogical literature, identifies, in addition to the above, the following:

a) comparison or sharpening of conflicting facts, phenomena, events, documents;

b) the clash of conflicting opinions of great thinkers of the past;

c) the clash of opinions of scientists of the past and present;

d) a clash of opinions, judgments of the students themselves;

e) the use of typical and atypical mistakes of students or their one-sided approach to phenomena and the involvement of students in their refutation;

f) issues confronting the struggle of ideas in the history of science, ways of solving certain problems;

g) statement by the teacher of a deliberately false position, judgment and involvement of students in his refutation;

h) taking, as it were, the protection of those phenomena to which the students gave a negative assessment and involve them in a reasoned proof of the fidelity of their position;

i) the formulation of the question, task, requiring an alternative solution,

j) the presentation of several ready-made answers, solutions to a particular question, as well as situations and an urge to choose one of them, followed by argumentation of the correctness of choice;

k) demonstration of experiments that led to a particular discovery and the involvement of students in explaining the course, process, cause-effect relationships;

l) raising questions, tasks requiring thought, assumptions, forecasting the future and based on the study of trends, patterns of development of nature and society;

m) involving students in the identification and formulation of problems and problem tasks.

Classification of problem situations, as well as methods for their creation are presented in Fig. 2.

Thus, the problem situation is created by the teacher by applying special methodological techniques: the teacher leads students to a contradiction and suggests that they find a way to resolve it; encounters contradictions of practical activity; sets out different points of view on the same question; suggests considering the phenomenon from various perspectives; encourages students to make comparisons, generalizations, conclusions from the situation, compare facts; poses specific questions (for generalization, justification, specification, reasoning logic); defines problem theoretical and practical tasks; poses problem tasks (with insufficient or redundant initial data; with uncertainty in the formulation of the question; with conflicting data; with deliberately made mistakes; with limited decision times; to overcome mental inertia and others).

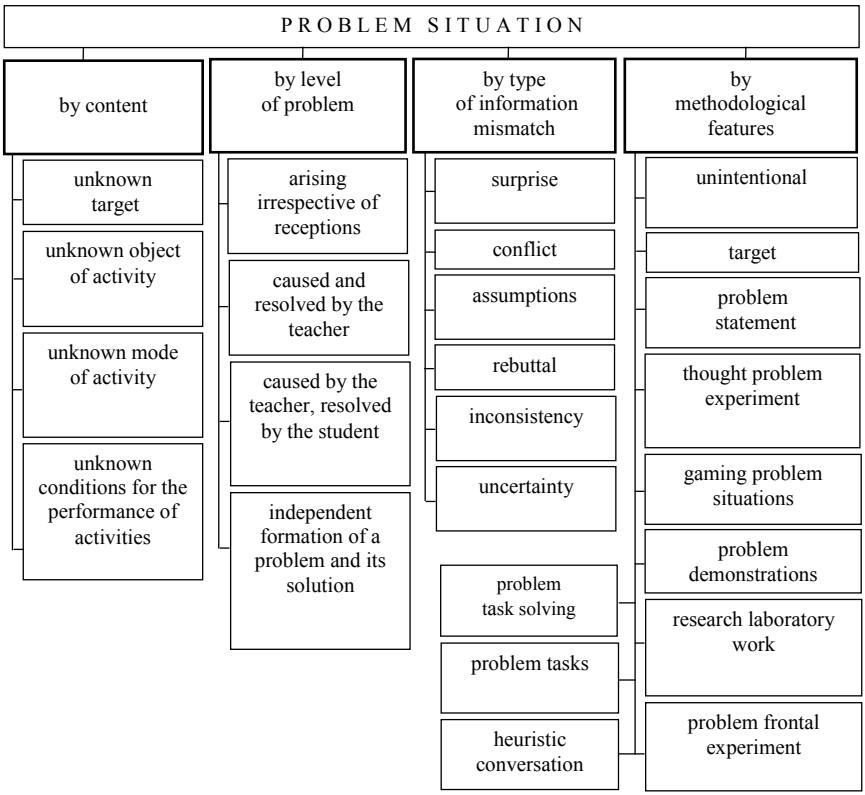


***Fig. 2.*** *Classification of problem situations*

The most effective means to create problem situations is to use contradictions, a conflict between acquired knowledge, familiar methods of solving a certain class of problems and the requirements that a new task presents. The teacher deliberately aggravates the conflict, emphasizes the emerging contradiction, stimulates attempts to find a way out of the situation, to resolve the contradiction.

Conflict situations used in problem education, as it were, push students into mistakes. This contradicts the long prevailing position in the methodological literature on the need to protect students from mistakes. In problem teaching, when creating conflict situations, material is usually used, the basis of which is an in-depth understanding of the basic relationships between its essential features, laws, general principles for solving a whole class of problems, etc. Problem-tasks place the student in conditions of uncertainty, and the occurrence here mistakes are quite possible. Such mistakes are not terrible if the teacher draws the attention of

schoolchildren to them and achieves an understanding of the causes that generated the errors and ways to overcome them.

In the structure of the conflict, one can distinguish: the interaction material (various utterances), the transformations made with this material, the foundations of the transformation actions, the carrier instances of the actions as a unity of the basis of the action and the action itself. In the dynamics of the conflict, three successive stages were observed each time: the occurrence of the conflict from the moment of mutual dependence in manipulation, the process of transformation of the material as a sequence of samples for solving the inconsistencies, the end of the conflict, represented by signs of autonomy of actions and having a solution.

The main task of the teacher is to see the contradictions that arise in the consciousness of students during the educational process, to sharpen them, which mobilizes the driving forces of the educational process and the development of students.

According to scientists (A.V. Brushlinsky, Z.I. Kalmykova, A.M. Matyushkin, M.I. Makhmutov, etc.), to implement the problem technology, the following is necessary:

a) selection of the most urgent, essential tasks;

b) determining the features of problem-based learning in various types of academic work;

c) the construction of an optimal system of problem education, the creation of teaching and methodological manuals and textbooks;

d) the personal approach and mastery of the teacher, capable of causing an active cognitive activity of the child.

The degree of complexity of the task is determined by the number of significant relationships in its condition, the number of mediations and transformations leading to finding the desired one. It also depends on the level of independence in the formulation and solution of the problem. The least independence is required from students when the teacher himself poses a problem and outlines the main milestones for solving it, including schoolchildren only in separate links of reasoning leading to the definition of what is sought. Usually this is a problem type lesson at the initial stage of work on a fundamentally new section of the program for students, when the basis for solving such problems is still very small. Having created a problem situation, the teacher should let the students try to solve it themselves on the basis of existing knowledge and make sure that this knowledge is clearly insufficient to achieve the goal, and then take part in building the links of reasoning available to them that lead to new knowledge.

With the accumulation of initial knowledge, the degree of independence of the search for a solution should increase. The teacher, having posed the problem, allows the students to search for a way to solve it themselves, now giving only

the most general tips about the direction of the search. Further, he only poses a problem and confines himself to criticizing false moves of thought when schoolchildren try to find a solution. Finally, when the students in the studied area have accumulated the necessary knowledge and skills, they should be given the opportunity to see a new problem for themselves in the assumed initial situations, formulate it and find a way to solve it, and the teacher will only in extreme cases if the students themselves entered the discussion dead end, provides them with minimal help, hinting at how to get out of it.

As I.Ya. Lerner notes, problem-based learning does not imply a random collection, but a system of problem situations, problems and problem tasks that meet the following indicators [4]:

a) the system should include the basic and accessible to schoolchildren types of problems that are characteristic of this field of science and practice;

b) it should contain types of methods of science that are accessible and important for general education culture, and generalized methods of aspect problems;

c) the system should provide for the manifestation and thereby the formation of the main features of creative activity previously described;

d) the system is built on the principle of increasing complexity and therefore must meet the criteria of complexity.

Scientists divide the main functions of problem education into general and special. General functions of problem-based learning: students mastering the knowledge system and methods of mental and practical activity; development of cognitive independence and creative abilities of students; the formation of dialectical materialist thinking of schoolchildren as the basis of their worldview. To the special functions we attribute: the development of skills for the creative assimilation of knowledge (the use of logical techniques or individual methods of creative activity); education of skills in the creative application of knowledge (application of acquired knowledge in a new situation) and the ability to solve educational problems; the formation and accumulation of experience in creative activity (mastering the methods of scientific research, solving practical problems and artistic reflection of reality).

The nature of the interaction allows us to determine the levels of problem-based learning:

1) the level of non-independent activity - the students' perception of the teacher's explanation, the assimilation of a model of mental action in a problem situation, the student performing independent work, reproducing exercises, oral reproduction;

2) the level of semi-independent activity is characterized by the application of previous knowledge in a new situation and the participation of students in finding a way to solve the problem posed by the teacher;

3) the level of independent activity - the performance of the reproductive-search type of work, when the student himself decides according to the text of the textbook, applies previous knowledge in a new situation, designs, solves problems of medium difficulty, proves hypotheses with little help from the teacher, and so on;

4) level of creative activity - the performance of independent work requiring creative imagination, logical analysis and guesswork, the discovery of a new way to solve a learning problem, independent proof; independent conclusions and generalizations, inventions, writing of literary works.

Thus, we can conclude that problem-based learning is a category that has a complex structure, and, therefore, for the implementation of this educational tool in the educational process, special training of the teacher is required, which involves the inclusion of problem situations directly in the process of preparing future teachers. An important role is played by the educational environment, which has as one of the characteristics of creativity.

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掌握数学知识过程中年轻学生概念形成的心理和教学机制

# PSYCHOLOGICAL AND PEDAGOGICAL MECHANISMS FOR THE FORMATION OF CONCEPTS IN YOUNGER STUDENTS IN THE PROCESS OF MASTERING MATHEMATICAL KNOWLEDGE

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抽象。 本文对小学生概念形成的心理学和教学方法进行了分析。 指出了小学生的思维特点，并描述了形成小学生理论类型思维的教学和逻辑前提。 作者以几何概念（多边形）形成为例，说明了儿童教育初期理论知识形成的过程。

关键词：概念，思维，认知学，小学生，几何概念，多边形，教育过程，方法论。

***Abstract.*** *This paper presents an analysis of the psychological and pedagogical approach to the formation of concepts in elementary school students. Peculiarities of thinking of younger schoolchildren are noted, pedagogical and logical prerequisites for the formation of a theoretical type of thinking of younger schoolchildren are described. The author on the example of the formation of geometric concepts (polygon) shows the process of formation of theoretical knowledge at the initial stage of children's education.*

***Keywords:*** *concept, thinking, cognitology, primary school student, geometric concept, polygon, educational process, methodology.*

Current programs of primary mathematical education create preconditions for the full development of various aspects of the thinking of younger schoolchildren, thereby contributing to the comprehensive development of their personality.

Practical in the entire psychological and pedagogical literature, various points of view on the ways of forming abstract concepts are presented: figurative, abstract-theoretical, subject-sensory (sensually-specific) way of knowing the truth, empirical, inductive, etc. All of them, from our point of view, under various circumstances, the ways of forming concepts, have the right to exist. So, S.L. Rubinstein emphasized that figurative and abstract-theoretical thinking are “equally adequate ways of knowing” the various aspects of objective reality, noting in them

the relativity of differences and the presence of constant mutual transitions. "Logical abstract thinking at the stage of its formation is inextricably linked with a sensually visual basis, and at the same time, at any, even the highest level of thinking, they act not only as a concept, but also as an image" [2, p. 351].

A special approach to the problems of the development of thinking of primary schoolchildren is implemented in the works of DB Elkonin and V.V. Davydov. So, V.V. Davydov specifically developed the question of the correlation of concrete and abstract knowledge, as applied to teaching mathematics in elementary school, assuming that theoretical thinking is a higher degree of cognition, and concepts that are characteristic of theoretical thinking differ from empirical ones, called representations [1, p. 40]. The function of theoretical generalization consists, according to V.V. Davydov in the introduction and fixing of the original connections and relationships.

The way in which theoretical thinking is carried out, according to V.V. Davydov is the path of ascent from the abstract to the concrete.

The consideration of the question of the psychological prerequisites for the formation of scientific concepts using the "method of ascending from the abstract to the concrete" needs to be taken out particularly, since in the formation of the concept special attention should be paid to the analysis of the real process of assimilation of educational material.

The process of mastering a concept should be structured so that from the very beginning it creates the conditions for mastering generalized knowledge and skills, that is, the "problem of transferring knowledge or skills" must necessarily "work" [1, p. 5]. However, in the practice of schools, the application of knowledge organized by the teacher does not always coincide with the independent process that the student performs when he is required to use the knowledge gained in new situations. Therefore, in our opinion, the basis of "transfer" is the fundamental factor that allows us to judge the level of mental development achieved by students.

The ability to perceive, use, distinguish between facts, phenomena of the external world (reality) *is the first step in mastering a concept.* So, the perception in elementary school of such a thing as length is accompanied by spectator, tactile organs; perception of a polyhedron - its shape, vertices, the presence of sides, etc. accompanied by visual (possibly tactile) sensations; the mass is muscular.

"Reflection in the sensations of some properties of the objects under consideration (" have a length "," have a shape "," have a mass ") inevitably leads to a real reflection in the consciousness of the subject as a whole" [3, p. 107]. So in fact there is a direct, sensory perception of objects of the real world, a set of properties of objects in the form of a sensually visual image.

"The introduced concept evokes the greatest excitement in the cerebral cortex, in the cerebral hemispheres, in other departments at the same time inhibition occurs, therefore, other objects and concepts that surround the object we highlighted are perceived as background, fuzzy" [2, p. 48]. In order for students to adequately perceive the selected object, the teacher must select a system of similar objects for perception. For example, polygons that are different in perception are offered (Fig. 1), different sizes, shapes, colors are available for perception (which can be touched).

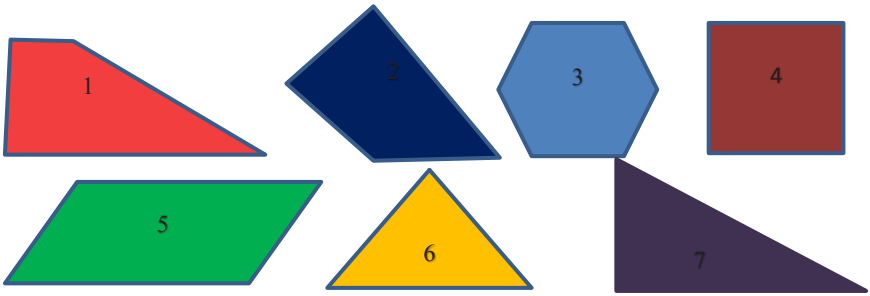


***Fig. 1***

The accessibility of objects ensures the accuracy of perception. "This is a polygon," the teacher says, pointing to one of them. And all figures similar to them are polygons "(verbal definition).

In order to achieve an adequate understanding of the concept of a "polygon", the general and various properties of these polygons and the place of each of them in the system of other objects of a particular class are determined, which subsequently generates their division into classes according to certain properties.

The next stage in the formation of concepts is the stage of creating representations. The idea of a particular object "is created if the object or phenomenon is stored in the memory of the child, the sensually visual image of the subject is stored in memory" [3, p. 108]. So, if the teacher's question: "What is higher: a passenger car or a crane?" students confidently answer: "Crane", then visual images of a passenger car and a crane are preserved in their consciousness, rearranging these objects of perception. These and other ideas serve as a transitional step to the highest form of cognition - abstract thinking.

"In cognitive science, according to which each person perceives the outside world through the prism of the cognitive system created by him" [3, p. 112], a concept is defined as a form of scientific knowledge that reflects the objectively essential aspects of things and phenomena, and is fixed by special terms and notations. Of the many qualitative features of any subject under consideration, a

concept determines the value, its important properties, which receive the value of universality. This is the meaningful, distinguishing feature of a concept. Such an understanding of a concept does not contradict the above definition of a concept from philosophical, logical, psychological positions. It complements and expands the definition of a concept. So, a concept

– is a philosophical category;

– has a logical structure;

– relies on psychophysiological processes;

– is the content of the pedagogical process.

It is obvious that without concepts, without introducing them, the learning process is impossible, since it is the basis in the knowledge of reality. At the same time, a concept is the result of organized thinking of many generations of people, a reflection of their being, a means of mental operations.

The presentation of scientific concepts can be carried out from the abstract to the concrete and from the concrete to the abstract, which corresponds to the methods of cognition of real reality. "The thinking of schoolchildren in the process of educational activity has something in common with the thinking of scientists setting forth the results of their research through meaningful abstractions, generalizations, and theoretical concepts that function in the ascent from abstract to concrete" [4, p. 37].

So, schoolchildren do not create concepts, do not create values and norms, they "appropriate them in the process of educational activity, reproducing the real process of creating these concepts, images, values, norms by people, and at the same time carrying out actions that are adequate to those that historically generated data products of spiritual culture. Therefore, school education in all subjects must be built in such a way that it in a concise, abbreviated form reproduces the actual, historical process of birth and development of ... knowledge "[4, p. 38].

So, students do not create concepts. What is the actual process of forming ideas about scientific concepts according to the method of teaching from the abstract to the concrete?

Starting to master a concept, students with the help of a teacher analyze it, identify a certain general property, attitude. At the same time, they discover that some common property is also contained in other respects, objects of the material under consideration. Fixing in some sign form a noticed common property, attitude, students:

– abstract the noticed property of an object;

– reveal the regular relationship of the observed property (relationship), its various manifestations;

– get a meaningful generalization of the noticed property;

– use the obtained generalizations to derive particular cases.

So, the psychological prerequisites for the introduction of the "method of climbing from the abstract to the concrete" in the educational process of primary schools, according to its authors, the many years of experience of teachers in the current educational program are:

– effective mental development of students, which directly depends on both the working teacher and the teaching methods used by him;

– the implementation of rapprochement in the study of similar topics helps to facilitate the assimilation of educational material (students independently make comparisons and contrasts, identifying similar and different signs in the material being studied, generalize and formulate generalizations);

– the possibilities for comparison, generalization are the result of the development of not only thinking, but also meaningful, logical memory, based on the processes of correlation, semantic grouping, classification;

– the absence of bulky, artificial, so-called standard problems that many solved without realizing their mathematical structure, on the basis of mechanical association.

Research of Z.I. Kalmykova, T.V. Kudryavtseva, D.N. Epiphany, N.A. Menchinskaya et al. determine the psychological prerequisites for the intense mental development of schoolchildren by the presence of methods and approaches to learning. Students do not receive ready-made knowledge, they themselves, without the help of a teacher, have to solve the problems that arise.

Such teaching methods require high intellectual activity from students, which, of course, has a positive effect not only on the acquisition of knowledge, but also on the general mental development of students. During such training, the problem of a differentiated approach to students, which occurs in all educational programs of primary schools, has not lost.

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# 意义建构背景下的学习的人学模型
# PERSONOLOGICAL MODEL OF LEARNING IN THE CONTEXT OF MEANING-MAKING

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抽象。 作为意义形成研究的一部分，在教学过程中开发并实施了个性化的训练模型，旨在提高学生的学习动机。 为了使教育过程具有个人取向，该模型基于对学生的主观体验的实现，即使用选择情况作为第一时间的意义。

关键字：文化化，个性化，内在动机，个人培训模型，主观经验，发展，原则，技术，Moodle平台。

***Abstract.*** *As part of the study of meaning formation, a personality model of training was developed and implemented in the pedagogical process, aimed at increasing the motivation of students. To give a personal orientation to the educational process, the model is based on the actualization of the subjective experience of students using situations of choice as the first moment of meaning.*

***Keywords:*** *culturalization, personalization, intrinsic motivation, a model of personal training, subjective experience, development, principles, technologies, Moodle platform.*

The affirmation by a person of himself as a person, the realization of a human essence proceeds through the culturalization and personalization of the subject (individual) [1]. Culturalization is associated with subject-transformative activity, ends with the creation of objects of material and spiritual culture, personalization implies an assumption of self in another person, in which "... I would be perceived by you as ... an integral part of yourself" [1, p.50]. Personalization of an individual serves as a continuation of his being, expresses his individual representation, his otherness in other people, in other words, this is the transformation of the subject into a person who has found his own individuality, his own personal meaning.

Educational activity, the driving basis of which is personal meaning, takes the form of internal motivation, which subsequently affects the quality of training. Therefore, the use of the personological approach is considered among the "characteristic accents of successful educational reforms" of the present time. According to R. DeLorenzo, personalized education is a vector for the development of the educational system in the world [2]. Personalization is sometimes also seen as the "core" of the digital transformation of education in Russia [3]. The conference in the framework of the Eastern Economic Forum (2019) [4] was devoted to the discussion of personalization in the development of school education in Russia.

As part of the study, a didactic model of personal training was developed and implemented in the pedagogical process, aimed at increasing the motivation of students by creating situations of choice for the student using the mechanisms of meaning and psychotechnical influence. The "core" of the personological model of learning is the actual significant subjective experience of the learner, "filled" with personal meanings, thanks to which the processes of "distribution" and "completion" of knowledge are carried out. To give a personal orientation to the educational process, the model is based on the actualization of the subjective experience of students using situations of choice as the first moment of meaning. The main goal of personalization as a factor in the development of personality is the stimulation of the value-semantic aspiration of the personality, the development of responsibility, the formation of the subjective position of a person in the system of the general sociocultural orientation of education.

In accordance with the purpose of the model, it seems appropriate to distinguish the following didactic principles: personality-semantic orientation; content integration; problematic; openness humanization; alternativeness; flexibility and variability; the subjectivity of all participants in the process; creating a positive emotional background; creating psychological comfort in a learning environment; individualization and differentiation; research and creative orientation. The proposed principles make it possible to systematically and holistically update the personal experience of students, to satisfy needs and semantic preferences.

In the context of meaning formation, a classification of technologies and methods of teaching personological training is proposed [5]:

1) associative-figurative technologies (association, personal-semantic generalization, work with images, with a personal-semantic context, the method of a different picture, the method of free associations, the translation of theoretical material into a figurative, structural-logical scheme, symbolic vision, image collision method, color images, semantic immersion);

2) technologies of self-expression (situations of choice, personalization, living situations, self-reflection, the method of survival, empathy, imagination, the method of projects, the method of free choice, game, identification);

3) originative (creative) technologies (creative tasks, essays, art technologies, art didactics technologies, installation, inversion, joint presentation, art therapy methods (music therapy, library therapy, game therapy, park-therapy, art-therapy, etc.), photo projects).

A prerequisite for personalizing training is the use of integrated content. It is impossible to build your educational path, relying on individual qualities and abilities, to build your educational path without integrating content, since the more characters and roles, the more clearly the student will find his own among them! We note that by integration we mean the creation of internal unity, cohesion, which is expressed in the identification of collective, cohesion of a group as its value-orientational unity, objectivity in assigning and accepting responsibility for success and failure in joint activities. Thus, integration allows us to collect the problems of morality and the problems of egocentric meanings into a "common node".

A personalized approach is often associated with the use of digital technologies, thanks to which there are opportunities for its implementation in wide educational practice. Therefore, platforms focused on e-learning or distance learning are becoming more and more popular. In Russian universities, for example, the Moodle platform (Modular Object-Oriented Dynamic Learning Environment) is widespread, the technical ability of which is able to provide some conditions for the individualization and differentiation of education. Individualization is created by providing multilevel laid out training material on the platform: in terms of depth of presentation, in the degree of scientificness, in the degree of semantic richness. Differentiation is ensured through the use of various ways of presenting information: text, multimedia, video. The capabilities of this platform can allow the student to create an individual educational trajectory. However, its use does not completely exclude attending classes in groups, but only complements and enables students who are "lagging behind" or "succeeding" to choose an individual pace outside the classroom activity.

In accordance with the proposed components of the model, a stating and formative experiment was organized, in which 44 students of the South Russian State Polytechnic University took part. The key strategy of a personalized variative approach in education is the value orientation towards the development of the student's internal motivation, his readiness for changes in a changing world. To determine the level of internal motivation of students' learning activities, a survey was conducted according to the methodology for diagnosing the direction of motivation for studying a subject Dubovitskaya [6]. To diagnose the current level of formation of the personal-semantic sphere of students in higher educational institutions before the experiment and after it, an ideographic approach was used that allows us to record qualitative indicators of the level of development of the semantic sphere of the personality (situational, egocentric, group-centric, based

on questionnaires, interviews and observations of teachers), prosocial, spiritual), allowing to use the criterion of signs to assess the effectiveness of the application of the personalological model of learning.

The results of the survey at the final stage of the study according to the method of T.D. Dubovitskaya confirmed the effectiveness of the application of the personalological training model: the percentage of students with intrinsic motivation grew by almost 15%. There was an intrinsic motivation for learning activities, which is confirmed by empirical data. During the training of one semester course, students underwent intermediate control (2 control points). Average academic indicators throughout the entire formative study showed an increase in the quality of training in the discipline. Qualitative indicators (rating "good", "excellent" with a five-point grading system) of academic performance increased by approximately 18% (there were 68.18%, it became 86.36%).

The results of the study, presented as comparative results at the stages of ascertaining and formative experiments, indicate the general dynamics of the value-semantic and motivational-personal development of schoolchildren. The personalological model of training allows you to create optimal conditions for the formation of personal qualities of the subject and the disclosure of its potential, contributing to the successful socialization of the individual.

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# 乌兹别克语与中文的数字成语对比研究
# A COMPARATIVE STUDY OF DIGITAL IDIOMS IN UZBEK AND CHINESE

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摘要
乌兹别克语同汉语的成语对比研究，对于两个民族之间的文化，历史，传统习俗，互相理解及深入交流有很大的作用。

关键词： 成语，文化，民族传统，理解，渊源，掌握，流利，交流，互相，历史

乌兹别克斯坦与中国之间的友谊关系越来越密切。两个国家的经济合作领域逐步扩大，在这种情况下语言的交流是建立良好关系的最主要桥梁。大千世界，几乎所有的语言中都有成语的存在，它们在人类的生活实践中形成并发展起来，同时又反映了人们生活实践的方方面面。透过成语可以了解一个民族的自然环境、社会生活状态、历史文化、宗教以及传统习俗等。研究两个民族的成语，有利于我们学习彼此的文化，了解双方的历史，民族传统等等。

乌兹别克语成语从乌兹别克民族悠久的社会生活发展历史中积淀留存下来, 凝聚了乌兹别克民族的智慧, 反映了丰富多彩的乌兹别克文化, 是乌兹别克语言里的一颗璀璨明珠。数字不仅表达数目, 而且还蕴含着鲜明的民族特性, 也是民族文化的重要组成部分。乌兹别克语成语底蕴深厚, 而且有很多数字成语。我们都知道，语言不仅是人类在进化过程中发展的必然交际方式, 而且还是人们沟通交流思想的媒介。语言这种文化现象不仅仅在过去、现在或者将来，都会不断地变化和发展, 所以自然而然的，对政治、经济和社会乃至科技发展及文化汇通都会产生一定的影响。因此, 人们就借助了语言的这种特殊功能来保存和传递人类的文明。如果语言是各个民族的重要特征之一, 那么成语则是其中最特殊的成员。原本数字在语言中只是用来计数的符号, 可是随着各国文化的不断发展变化，这些普通简单的数字却产生了不同的含义，也彰显出了各种文化的特征。就中乌两国来看, 汉语与乌兹别克语中的数字成语在不同的语言环境和文化传统中有相似之处, 但也有各自不同的方面。数字成语本身具有很多特点, 表达含义也非常丰富, 在生活、工作、学习或者书面上还是口头上，人们经常都会用到数字成语, 如表达赞赏、歉意、夸张的时候。数字成语的特点之一, 表达语意又简单又方便, 来举个例子, 如 *“бир*

*ёқадан бош чиқармоқ* 一心一意” 从书面上看是一颗心，实际是指“对某件事情专心致志，从不改变”的意思。乌兹别克语*“Emmi ўлчаб бир кес”*七次量一次裁成的意思，汉语表达为“三思而后行”，英语*“Measure thrice and cut once”*三次量一次裁成。依据笔者的研究目的，我们对乌兹别克语数字成语的选择范围更大一些，既包括那些带有数字*“1,2,3,4,5,7,10,100,1000”*例如：*Бир тийин устида тик турмоқ; бахил*字面理解是在一分钱上站直，但整体意思是形容为人非常吝啬，这与汉语成语 “一毛不拔” 具有相通之处(铁公鸡，一毛不拔)，*”Қўйчивон кўп бўлса, қўй ҳаром ўлади*一国三公” ，“一龙一蛇 *васиқаси йўқ одам”*，*“ икки қўллаб”* 完全同意 (心悦诚服)。汉语成语95%四个字组成的，带这些数字*“1,2,3,4,5,6,7,8,9,10,100,1000,10000”* 。一诺千金，一目十行，乌兹别克语中的数字成语与汉语中的相比，乌兹别克语里的数字成语没有象汉语的那么多。但是乌兹别克语的数字成语也具有丰富、生动、象征的意义。如：*Икки қулоғим сенда*(两个耳朵都在听你说) 我认真地听你的意思；*“Икки оёғи бир этикка тиқилмоқ”* 双脚穿进一只靴子里的意思， 中文（ 走投无路；山穷水尽）比喻处境极困难，找不到出路的意思。*“Икки шингил* (两句话，谈一会儿)[1]. *Ойбек “Кутлуғ қон” романидан*(作家阿义别克小说 “神圣的血”). *Хўп, келибсиз,икки шингил гаплашайлик-чи.*（你来的正好了，聊一会儿吧..)。

汉语还有部分成语甚至是全由数字组成的，例如： 一五一十（*ипидан игнасигача гапириб бермоқ*，*деярли*七七八八（差不多的意思），但乌兹别克语没有全由数字组成的。

乌兹别克科学家*Sh. U. Rahmatullayev, Sh. Shomaksudov, M. I. Umarhojayev, A. E. Mamatov, Sh. A. Ganiyev* 等研究了乌兹别克语成语进行具体研究的。

马国凡（1978）对成语的形成、范围、结构特点、语义关系进行了详细研究。并且详细阐释了成语的民族性问题，认为汉语成语从形式到内容无一不体现出中华民族的历史传统和风俗习惯。虽然没有对数字成语进行具体研究，但是却为汉语数字成语的研究奠定了理论基础[2]。

章康美老师(1993)在《数字成语的抽象义说略》一文中已经探讨成语中数词的功能意义，能帮助我们去理解成语中的意义与结构，并且提升了我们的阅读和写作能力。成语中的数词所表示的意义是实义的，如：“一草一木”、合二为一、“三心二意”、“四面八方”、五福临门、六六大顺、“七嘴八舌、“七上八下”、八拜之交、九牛一毛、“十全十美”。

丁秀菊研究者(2003)在《数词成语的文化阐释》曾发表的成语中，数词的意义都被虚化，研究现代汉语时，不能忽略对数词成语的研究，也不能忽视文化背景的起源。

李三衡在(2008)年的文章《数字成语里的中国文化》中已探讨了“一”到“十”，他提出了民族的文化都体现在语言中，并且成语是能展现出前人所表达的智慧，包含深厚的文化内涵。

[1]Ш.Раҳматуллаев “Ўзбек тилининг фразеологик луғати” Тошкент 1992й 110 бет

[2]马国凡. 成语[M].呼和浩特：内蒙古人民出版社，1973:38~54.

*“Бир ўқ билан икки қуённи урмоқ”*一弹打两个兔子(一箭双雕； 一弹打两鸟；一石二鸟)

*“Бир палакдан минг хомак; бир палакда неча хил қовун бўлади”*[3]. 一个藤上的瓜个个不相同；一个藤上有各种甜瓜（ 一娘生九子，九子各不同；一龙九子；一龙生九个孩子，每个都不相同）。

一娘生好几个孩子， 他们外形互相相，但他们的性格， 脾气， 勇气不一样的意思。

*“Бир қўлдан қарс чиқмас”*一只手拍不响（孤掌难鸣）

*“Алихўжа- Хўжаали”*（半斤八两，铢两悉称）

*“Тўрт томони қибла”* 四面方西。人生气的时候说： 随便走吧！这是你的事儿

*“Кўзи тўрт бўлмоқ”*（望眼欲穿，期待，盼望的意思)大家眼巴巴地等着他回来。

*“Беш бармоғидай”*了如指掌（ 一清二楚）

*“Беш қўлни оғзига тиқмоқ”*把五个指头同时塞到嘴里（眉毛胡子一把抓）

*“Беш кетмоқ”* 佩服的意思。我佩服你（心服口服； 心悦诚服）

*“Беш қўл баровар эмас”*五个指头不一般齐(十个指头不一般齐)说明事物总是参差不齐, 有好有坏, 有高有低, 存在差别的。马烽、西戎《吕梁英雄传》第三十一回:“可是十个指头不一般齐, 各人有各人的想法, 有人愿学, 很热心, 有些人思想没打通, 他就不学[4]。这个成语乌兹别克人用： “五个指头不一般齐”，中国人用： “十个指头不一般齐” 差别不大，意思一样的。

在结构规律上， 乌汉成语是经过加工定型的“现成话”， 结构都是固定的， 不能随意变动词序、更换或增减构成成分。如： “三头六臂” 不能说成 “一头六臂*қўли гул*”，“九牛一毛*денгиздан бир томча, заррача”* 不能说成“一毛牛九”。*“Иштони йўқ тизаси йиртиққа кулибди*没有裤的，对破裤的笑（五十步笑百步）。乌汉“数字”成语是人类生活经验和思维认识的总结，是千百年来约定俗成的，结构固定，不可随意更改。

乌兹别克族和汉族生活地区， 想法， 文化， 宗教， 民族传统等方面不一样，所以理解成语难, 翻译也难。我们要学习成语里面的民族文化，成语故事之后再去理解成语的意思。

人们对生活总是有不同的体验，对客观世界有不同的认识，因此彼此用词、理解词义的方式、角度总是不一样，然而，我们同属于人类，生活在同一个物质世界里， 自然生活条件基本上是相同或相似的。因此， 我们各自的语言里就会存在选词、用词上的相同之处。这种语言特征叫“不同语言间的偶合现象”[5]。乌汉语言中也自然存在这种现象。如：

*“Бир пул”*一钱不值（一文不值；）

*“Минг ўлиб бир тирилмоқ”* 千死一生（九死一生）

[3]Ш.Шомақсудов, Ш.Шораҳмедов “Ҳикматнома” Тошкент 1990й 44бет

[4]www.baidu.com

5谭再喜：《翻译学》，湖北教育出版社，2000 年，第 73 页

*“Бир кун уч йилдек ўтди”* 一日三秋

这些词汇在语义内容、结构形式上都相同，基本上具有相等的意义和形象色彩。基于相同或相似的生活经验，两种语言中存在着相对应的成语，这种成语便于学习掌握。但是需注意的是有的成语是完全偶合，基本义、引申义完全相同，有的则基本义吻合而引申义大致相同，有的则引申义吻合而基本义有所偏差，在翻译过程中，不能一概而论。如，这个成语完全相同的“*Деворнинг ҳам қулоғи бор* 墙上有耳朵”，*“юз марта эштгандан бир марта кўрган яхшироқ*百闻不如一见”，*“Айтилган сўз-отилган ўқ*一言既出，驷马难追” 一句话说出了口，就是套上四匹马拉的车也难追上。指话出口，就不能再收回，一定要算数。乌兹别克语“说出去的话，就像射出去的箭”，射出去的箭还能收回来？

结语

成语固定词组，多为四字组成，结构固定，意义完整，有些可根据字面意思理解，有些则需了解其来源才能理解。正确理解成语，需要掌握它的来源和含义，只有这样，才能在理解其本义的基础上，掌握成语意义变化的过程。由于居住环境、生活环境、宗教信仰等的不同。乌兹别克语中有关“ 数字”的成语为数不多，不像汉语中的“数字”成语那么多。我们不但学习汉语而且还有学习中国文化，五千年的历史，民族传统，这样的才能够掌握并且流利的使用汉语。

附录

| | 汉语成语 | 翻译乌兹别克语 |
|---|---|---|
| | 一文不值 | *бир пул; сариқ чақага арзимайди* |
| | 一问三不知（少管闲事） | *туя кўрдингми- йўқ* |
| | 一毛不拔 | *бир тийин устида тик турмоқ* |
| | 一刻千金 | *вақт- пул* |
| | 一寸丹心 | *садоқатли* |
| | 一德一心 | *бир ёқадан бош чиқармоқ; бир ният-бир мақсад* |
| | 一手遮天 | *ойни этак билан ёпмоқ; кўз бўямоқ* |
| | 一语中人 | *гап жондан ўтмоқ; гап сўякдан ўтмоқ* |
| | 一鼻子灰 | *бурнига емоқ* |
| 0 | 一日三秋 | *бир кун уч йилдек ўтди* |
| 1 | 一清二白 | *нуқсонсиз; пок* |
| 2 | 二姓之好 | *қуда бўлмоқ* |
| 3 | 二一添作五 | *тенг бўлишмоқ; тенг тақсим қилмоқ* |
| 4 | 三百六十行 | *ҳар хил ҳунар; турли касб* |
| 5 | 三寸不烂之舌 | *гапга чечан, гапга уста* |
| 6 | 三头六臂 | *қўли гул* |
| 7 | 四面楚歌 | *мушкул аҳволда қолмоқ* |
| 8 | 五花八门 | *ранг-баранг* |
| 9 | 五十步笑百步 | *иштони йўқ тизаси йиртиққа кулибди* |

| | | |
|---|---|---|
| 0 | 六亲不认 | *қариндошлар ўзаро келиша олмаслик* |
| 1 | 七上八下 | *така- тука бўлмоқ* |
| 2 | 七窍生烟 | *ғазабланмоқ; сочи тикка бўлмоқ* |
| 3 | 八面玲珑 | *айёрлик қилмоқ* |
| 4 | 八字大开 | *гапнинг очиғини айтмоқ* |
| 5 | 九九归一 | *от айланиб қозиғини топар* |
| 6 | 九死一生 | *минг ўлиб бир тирилмоқ* |
| 7 | 九牛一毛 | *денгиздан бир томчи; арзимас нарса* |
| 8 | 九牛二虎之力 | *тиришмоқ; жонини жабборга бериб* |
| 9 | 十羊九牧 | *ўн қўйга тўққизта чўпон; қўйчивон кўп бўлса қўй ҳаром ўлади* |
| 0 | 十全十美 | *мукаммал* |
| 1 | 十室九空 | *ўн уйнинг тўққизи бўш; уй ҳувиллаб қолмоқ* |
| 2 | 十冬腊月 | *қахратон совуқ кунлар* |
| 3 | 百闻不如一见 | *юз марта эштгандан бир марта кўрган яхшироқ* |
| 4 | 百折不挠 | *қайсарлик* |
| 5 | 百年树人 | *одам бўлиш қийин ;яхши одам бўлиш учун юз йил керак* |
| 6 | 百思不解 | *ўйлаб ўйлаб тагига ета олмаслик* |
| 7 | 千真万确 | *тўғри* |
| 8 | 千钧一发 | *қил устида турмоқ* |
| 9 | 千古奇闻 | *алмисоқдан қолган ривоят* |
| 0 | 千差万别 | *катта фарқ* |
| 1 | 千金一诺 | *ваъдасида турмоқ* |
| 2 | 千金之子 | *бойвачча, бойнинг боласи* |
| 3 | 千万买邻 | *яхши қўшни тиллодан аъло* |
| 4 | 千言万语 | *кўп гап* |
| 5 | 万象更新 | *ҳамма нарса ўзгармоқ* |
| 6 | 万想不到 | *ҳеч ўйламаган, ҳеч эсга келмаган* |
| 7 | 万众一心 | *бир ёқадан бош чиқармоқ; ҳамма бир ниятда* |
| 8 | 万马齐喑 | *ҳамма ичидагини гапира олмаслик* |
| 9 | 万难不屈 | *ҳар қандай қийинчиликка бош эгмаслик* |
| 0 | 万念俱灰 | *орзу- армонлари пучга чиқмоқ* |

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# 乌兹别克斯坦和China-战略伙伴关系的历史：结合国际关系的社会政治术语
# UZBEKISTAN AND CHINA - HISTORY OF STRATEGIC PARTNERSHIP: SOCIO-POLITICAL TERMINOLOGY IN CONJUNCTION WITH INTERNATIONAL RELATIONS

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抽象。本文致力于对汉语某些社会政治术语的翻译细节进行词汇语义，词源学和认知分析，以及一些与中国古代外交政策有关的术语的起源。从中国古代政治学的外交角度分析了一些社会政治用语的词源特征，用语的形成和发展，发现了中国国内外目标受众互动的发展趋势。根据政治起源，对中国内外交政策的历史影响，社会政治用语包括与全国重大的社会政治生活事件以及与经济和文化有关的方面的定义。在这方面，翻译人员应注意以下事实：翻译一般文化用语时，考虑中国的文化传统和历史背景更为准确。

关键词：词汇和语义特殊性，词源，社会政治术语，成因，外交，影响。

***Abstract.*** *The article is devoted to the lexical-semantic, etymological and cognitive analysis of the specifics of the translation of some socio-political terms of the Chinese language, the genesis of the development of some terms related to the foreign policy of ancient China. The analysis of some socio-political terms according to their etymological characteristics, the formation and development of terms in the era of the establishment of diplomacy in Ancient China showed a growing trend of interaction between the national and international target audience of China. Depending on the political origin, historical impacts in the domestic and foreign policy of China, socio-political terms include definitions relating to nationally significant events of socio-political life, as well as to the aspects related to the economy and culture. In this regard, translators should pay attention to the fact that when translating general cultural words, it is more accurate to take into account the cultural traditions of China and historical background.*

***Keywords:*** *lexical and semantic specificity, etymology, socio-political terms, genesis, diplomacy, impacts.*

In Uzbekistan, sinology has a history of several thousand years, because since ancient times our homeland was an important economic, transport, communica-

tion, and logistics center that connects the East and West on the Great Silk Road. China carries out mutually beneficial cooperation with other countries in the fields of culture, science, literature, art, etc., and ensures the development of interregional and Intercontinental trade and humanitarian relations.

Leading Uzbek, Chinese and other foreign scientists conduct systematic research on the study of multilateral Uzbek-Chinese relations in the field of history, linguistics, literature, source studies, archeology, Islamic studies and other fields.

A comprehensive study of the deep history of relations between Uzbekistan and China requires even more work, search and analysis of foreign sources. The potential of such research should meet international requirements, and the results achieved should be presented to the scientific communities of developed countries. One thing is certain – true international relations have a multi-thousand-year history. To explain this thesis, you can refer to the following aspects.

First, since ancient times, representatives of Central Asia have traveled to East Asian countries, including China, where they settled and engaged in trade, culture and science.in particular, there is written information about the important role of our compatriots in the development of astronomy, medicine, geography, law and public administration in China. For example, during 1984-2000, more than 120 thousand manuscripts on the history, language and literature, traditions, folklore, medicine and religion of the small peoples of China were found in China. Of these, 110000 and 5000 manuscripts were ordered and published, respectively. [12,86] These historical facts show the close relations of the peoples of Central Asia with ancient foreign countries, including China.

Secondly, even in the I – II centuries BC, our merchants and scientists regularly visited China. This indicates that our compatriots have been familiar with the Chinese language since ancient times. Such connections existed long before the opening of the great silk road, according to some experts, for 20 thousand years BC.

Third, the bones of an ancient man who lived several thousand years ago and is now stored in the Amir Temur Museum, the mummy of a man found in the Takla-makan desert with a 5 thousand-year history, petroglyphs found on rocks in Uzbekistan depicting the process of hunting and work, ritual dances and travel, as well as other archaeological finds, which indicate a similar level of development of human society in Uzbekistan and China, close relations between the two regions, migration processes.

Fourth, in the I – III centuries, the great silk road became the main factor in establishing and developing closer international trade and other relations between the four great empires of the world at that time: in Europe – Rome, in the Middle and middle East – Parthia, in Central Asia and Afghanistan – the Kushan Empire and in the far East - the Han Empire.

Experts associate the opening of the great silk road with two trips of the Ambassador of the ruler of the Western Han, Zhang Qiang, to Fergana, Kanga, and UiSyun in 164-114 BC[2.439].

In 630 after his journey through Central Asia the Chinese traveler Xuanzang pointed out several developed cities in the region in his Chronicles. During the Tang dynasty (618-907). there were also close trade and cultural relations between the States of Central and East Asia [3,593]. It should be noted that information relating to the end of the XI century and the beginning of the XI Century about the implementation of regular trade by Central Asian traders with the state of Genghis Khan has been preserved. For example, in 1215, Genghis Khan in Beijing received ambassadors under the leadership of Beh ad-din Razi, who came from the state of Khorezmshahs.

In 1218, Genghis Khan's ambassadors returned to Mawarannahr. As indicated in historical sources, one of the ambassadors was from Khorezm, the second - from Bukhara, and the third -from Otrar [2,623]. According to V. Barthold, one of these ambassadors was a man named Mahmud from Khorezm, who was later appointed ruler (Governor) of Beijing [2,129]. Mahmud Yalavach died in 1254, when he was serving as the ruler of Beijing. Important information about Mahmud Yalavach was left by such Islamic historians as Juvaini, Wassaf, Rashid al-din, and in the Mongolian "Secret legend" (translated by Kafarov)is also told about him. About the confrontation between Mahmud Yalavach and Chigatay, the works of Rashid al-din "Chigatay Ministers"are given. The son of Mahmud Yalavach Masudbek ruled one of the most developed regions of Central Asia – the Zerafshan valley. Masudbek was buried in Maasudiyemadrasahin Bukharabuilt by his command. His son, i.e. the grandson of Mahmud Yalavach in the XIV century was the ruler of Kashgar, where he built the same Maasudiyemadrasah.

Fifth, there are so many written sources testifying to the migration of some of our compatriots from Central Asia to China, who settled there and held important positions. For example, Liu Yingsheng pointed out that in 1263, about 3,000 Turkestan families lived permanently in Beijing [7,276]. It took more than a dozen years for them to settle in Beijing and get used to the local traditions, climate and conditions. A special judge (Kazi) was appointed to manage the Turkestan Diaspora, i.e. approximately 16 thousand people. Liu Yingsheng pointed out that the above-mentioned Mahmud Yalavach held a high position in Beijing. Turkestan liaspors also lived in other provinces of China. For example, during the yuan dynasty (1280-1367), Turkic Salars moved from Central Asia to Qinghai province. They live here to this day, have preserved their national traditions, economic way of life, and partially their language. According to data from 1997 about 105 thousand people of Salar nationality live in China[12,158]. In total, according to the population census conducted in 2000, China has a population of 1 billion 265.83

million (excluding Hong Kong, Taiwan and Macao). 91.59% of the Chinese population, i.e. 1 billion 159.4 million people are khans. The remaining 8.41%, i.e. 106.43 million of the population are 55 small nations.

For the total population the indigenous peoples are in the following order: Chuang, Manjur, Huei, Maochan, Uighurs, Tongjiang, Yiyang, Tibet, Buitan, Dunc, aotian, Koreans, BAM, Hani, Kazakhs, Liyang, let Sean, licuan, Galatian, Dongxiang, Lakhuti, Shui Wai, Nasi, Qiang, Tui, Mulautyan, Sibotyan, Kirghiz, Daur, Jinpotyan, Maonan, Salar, Bulan, Tajiks, Achan, Pumi, Evenki, Nusuan, Jing, Jinotyan, Dean, Baoan, Russian, Uyghur, Uzbeks, Manbai, Orochon, Dulun, Tatars, Hecheyar, Gaoshan and Lobai [12,9-10]. According to this list, the largest of the small peoples is the Chuang, and the smallest is the Lobai.

China is the home to more than 17 million Muslims, including the Hui (Dungans, tungons), Uighurs, Kazakhs, Kirghiz, Tajiks, Tatars, Salars, Uzbeks, Dunsians, Baons, and others[4,47]. In terms of numbers among these peoples, the largest nation is the Hui. According to the population census conducted in 2000 in China, they are 9.8 million people. "The early Hui," Wang Tsan wrote, "are the descendants of Arab and Persian traders who traded with China in the seventh century. The main part of the Hui is made up of Muslim migrants from Central Asia. After they were assimilated into the khans, Uighurs, and Mongols, a new Hui nation emerged in China"[12,114-115]. Our diplomatic, commercial, cultural and other relations with China developed especially during the period of Amir Temur's Empire. According to the decree of Tamerlane, 8 Embassy caravans were sent to China in 1387-1396 to develop diplomatic and trade relations with China, including:

- 1387 and 1389 under the leadership of Mawlyan Hafizi;
- 1388 caravan with the Ambassador Taj ad-Din;
- 1391, Ambassador Sohail was sent;
- 1392 Ambassador Nigmat ad-Din;
- 1393-1395 twice under the leadership of the Dervish Ambassador;
- 1396 under the leadership of Ambassador Alomat at-Din.

As it was written in the chronicle of the Ming dynasty (1368-1644), Samarkand ambassadors and merchants who arrived at the court of the Chinese Emperor brought with them thoroughbred horses, camels, lions, leopards, silk, processed leather, fabrics, silver, gold and various products made of precious stones, including dishes, knives and other handicrafts.

In 1395, the Palace of Amir Temur hosted the first Ambassador of the Chinese Emperor Hun Lungin Central Asia, Bo An (An Zhitao), who was allowed to open the first Embassy in Samarkand. Together with the Ambassador, 1,500 merchants arrived from China. It took the Ambassador more than 10 years to circumvent the territories of Amir Temur's Empire. In 1397, the largest caravan

arrived in Samarkand under the leadership of the Ambassador Cheng Deveng. Written information about Amir Temur's diplomatic relations with the Chinese emperors in the XIV century has been preserved to this day. In 1996, in Beijing, employees of the Embassy of Uzbekistan found several such written confirmations in the Chinese state archives. This information was translated from ancient Chinese with the participation of Professor Yasin Ashuri. A number of ancient manuscripts are currently stored in the Amir Temur Museum [1]. Representatives of the next generation of the Timurid dynasty also continued relations with China. During the reign of the fourth son of Amir Temur, Abu Nasr Shahrukh Bahadir Sultan (1377-1447), the international authority of the Timurid Empire was strengthened. Shahrukh paid special attention to the development of interstate relations, including the exchange of ambassadors. Shahrukh Mirzo received ambassadors from the rulers of China, India, Egypt, the Middle East, Byzantium and European countries. Mirzo Shahrukh also sent ambassadors to these countries. As it is known from sources, during the era of Amir Temur and his descendants (XIV –XVII centuries), more than 107 ambassadors and trade caravans were sent to China from Turkestan, Khurasan, Shiraz, Herat, Isfahan, Tashkent and other centers[6,50-59]. In historical sources of the Timurid era, there are diaries and memories of the journey of Giyasiddin Nakkash, who visited China in 1429-1422[9,112-115]. Of course, this information is only a drop in the ocean, because in this area, especially great challenges are faced by source studies. For example, in 2009, our scientists Mashrabov Z., V. Rakhmanov, F. Saidamatov, Sh. Sotkinovavisited India to explore the history of Zahiriddin Muhammad Babur and baburids, visited the tomb of Muhammad Haidar Mirzo – author of the encyclopedia "Tarihi Rashidi" Jahanname" and "Mahmudname" in the cemetery in the old part of Srinagar. On a tombstone erected by an English Explorer, the captain William Morecraft, they read the following words:

"Mirzo Haidar Kurgan Ibn Mirzo Muhammad Hussein Kurgan ibn Yunuskhan. The cousin of the ruler Babur, vizier of Abu Said – the son of Ahmadhan – the ruler of Yarkend and Mogolistan. A descendant of the khans of Tugluk Timurhan, Chigatay Ibn Genghis Khan. Mirzo was born in Uratyube, in 805 - the happy Hijra year. After many years, at the behest of Abu Saidhan, he returned to Yarkend, and after conquering Tibet with 4,000 cavalry, conquered Kashmir on 4 days of the Shaaban month. He returned the Kashmiri padishah Muhammad Shah to his throne and returned to Tibet to Sultan Saidhan. Sultan Saidhan appointed Mirza the Governor of Lhas and died on his return to Yarkend". Muhammad Haidar Mirzo (1449-1500) was born in Tashkent in the family of Muhammad Hussein and khub Nigor Khanum. For three years, he was raised by Zahiriddin Muhammad Babur. From 1540 to 1551, he was appointed Governor of Kashgar. He is the commander who conquered Tibet and Kashgar (1445-1448) [8].

The first Ambassador of the Russian Tsar Fyodor Isaevich Baykov, who visited China in 1654 and talked about it with officials of the Qing Emperor, told about the relations of Amir Temur and the Timurids with the Chinese Empire: "as they say, our great-grandfathers came to China together with Timur, but there is no exact information about this, we can only talk about some letters"[10,14]. Sending the first Ambassador from Russia to China only in 1654, which are historical neighbors and have several thousand kilometers of common border, suggests a certain idea[13,159]. This fact clearly shows that the policy established by Amir Temur for the development of international relations has overtaken the international policy of other countries for three centuries. This alone confirms that our great ruler pursued a long-term and promising foreign policy. As the First President of the Republic of Uzbekistan Islam Karimov noted, "after the rule of the Timurids, i.e. in the period from the XVII to the XX century, Turkestan fell into decay.

We all know that the internecine wars of the three khanates led to disastrous consequences not only in terms of economic, financial and military components, but also in terms of social and spiritual development"[5,50-51].

From the 19th century to the end of the 20th century, we know how "in the dark ages of our history, which lasted almost 150 years, our homeland, which surprised the world with its statehood, great figures, high culture and science, well-maintained cities and villages, suffered severe suffering" (I. A. Karimov "High spirituality is an invincible force") [5,25].

During this period, the centuries-old ties that existed between Uzbekistan and China were interrupted. After gaining independence, or to be more precise, on January 2, 1992 in Tashkent, the Republic of Uzbekistan and the people's Republic of China established diplomatic relations. From a historical point of view, it is only a moment. However, if we take into account the pace of development of bilateral relations and their positive results, it would not be an exaggeration to say that a huge amount of work has been done, which is no less important than historical relations.

Studying the genesis of Chinese socio-political terminology, of course, you should look at the history of Chinese diplomacy. This choice is based on the following circumstances. First, any concept, including a system of political terms, systemizes, generalizes and studies other scientific aspects of certain terms. Second, Chinese socio-political terminology is developing in conjunction with international relations and socio-economic progress in foreign policy, trade, investment, Finance, science and technology, culture, education, sports, and other areas. Third, in contrast to common words, socio-political terms are under constant control of the state, government and society. In Chinese, as in other languages, socio-political terms do not arise by themselves. On the contrary, they are composed as necessary, gradually introduced into circulation, i.e. a certain term is "run-in" within the country, in the speeches of state and party leaders, and then enter into use at the international level.

In the aspect of developing equal and mutually beneficial relations with China, the study of the Chinese language and literature, its history and economy is of current scientific and practical importance. In our opinion, the main reasons for the above are the following.

First, China is a peace-loving state with broad economic opportunities that consistently pursues a policy of good-neighborliness. Second, China is the third largest country in terms of land area after the Russian Federation and Canada. China is bordered to the North by the Russian Federation and Mongolia, to the North and West by Kazakhstan, Kyrgyzstan and Tajikistan, to the southwest by Afghanistan, to the East by the DPRK, to the South and southwest by Pakistan and India, and to the Southeast by Myanmar, Vietnam, Nepal, Bhutan and Laos. The total length of borders on land is 22,117 km. China shares Maritime borders with the Republic of Korea, Japan, the Philippines, Brunei, Malaysia and Indonesia. Third, China ranks first in the world in terms of gold and foreign exchange reserves and annual exports, and second in terms of gross national product production. Fourth, China is a permanent member of the UN Security Council, a member of the organization for cooperation of Asia and the Pacific, The organization of South and East Asian countries in the 10+1 and 10+3 formats, and the founder of the Shanghai cooperation organization. Among the main factors of increasing China's authority in the world, we can name its accelerated development over the past quarter of a century, high achievements in science, economy, foreign trade, space and technology.

The prospects for relations between Uzbekistan and China assign young and talented researchers the task of conquering new scientific peaks in these areas.

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# 传统医学中的象形文字病
# HIEROGLYPH 病 IN TRADITIONAL CHINESE MEDICINE

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抽象。 中医术语与西方有根本的不同。 这主要是由于中文的结构根本不同，以及西方人对人体和治疗方法的不同。 本文的撰写是由于需要解析和翻译传统医学中的病原字符。 由于乌中两国之间的紧密联系和友谊，每年都有越来越多的乌兹别克斯坦游客对中国的治疗方法感兴趣。 因此，需要翻译中药的医学说明和术语。

关键词：医学术语，中药，西药，中文字的简化拼写。

***Abstract.*** *The terminology of Chinese traditional medicine is fundamentally different from Western. This is primarily due to the fundamentally different structure of the Chinese language and a different approach to the human body and treatment methods from the Western one. The writing of this article is due to the need to parse and translate the character 病 in traditional medicine. Due to the closely established ties and friendship between Uzbekistan and China, every year more and more Uzbek tourists are interested in Chinese treatment methods. Therefore, there is a need to translate medicinal instructions and terminology of Chinese medicine.*

***Keywords:*** *medical terminology, Chinese traditional medicine, western medicine, simplified spelling of Chinese hieroglyph.*

**Introduction**

Today, linguistics is actively developing new areas of knowledge that are reflected in the language. Both in domestic and in foreign linguistics there are many works devoted to the theory of the term. Many linguists are interested in medical vocabulary, which is explained by the special conditions for the functioning and development of the language of medicine.

The continuous development of such a sphere of human life as medicine allows us to replenish the terminological layer of vocabulary on an ongoing basis, giving new and developing established nominations for the studied objects. The increase in the number of terms of various sciences overtakes the growth in the number of commonly used words of the language, and therefore it is necessary to study special vocabulary [3, p. 276], [7, p. 237], [10, p. 8].

**The main findings and results**

Medical terminology - a set of words and phrases used by specialists to refer to scientific concepts in the field of medicine and healthcare.

The terminology of Chinese traditional medicine is fundamentally different from Western. This is primarily due to the fundamentally different structure of the Chinese language and a different approach to the human body and treatment methods from the Western one [8, p. 1428], [11, p. 203]. The relevance of this article is due to the need to parse and translate the character 病 in traditional medicine. Due to the closely established ties and friendship between Uzbekistan and China, every year more and more Uzbek tourists are interested in Chinese treatment methods. Therefore, there is a need to translate medicinal instructions and terminology of Chinese medicine.

The popularization of ancient Chinese culture was mainly based on literature. Over the course of long historical eras, literary monuments have made the transition from inscriptions on animal bones and tortoise shells, letters on silk, bamboo tablets to paper books. The evolution of Chinese hieroglyph has gone through a long process of historical development - from the inscriptions of the jiaguven of the Shang dynasty to the style of writing of the kaishu of today. The process of their evolution lasted 3,000 years, going through different stages of changes in the style of writing - jiaguven, jinwen, xiaochuang, lichen, kaisha. Gradually, the lines of the drawings turned into features of hieroglyphs, pictograms into written symbols, moving from complex to simpler forms. Simplification of writing has always been the main component of the development of Chinese hieroglyphs [12, p. 41].

Similarly, medical literature has undergone a process of evolution from inscriptions on tortoise shells to paper tracts, continuously changing the form, content and method of its publication.

In Chinese pharmacies, there is a fairly common medicine called “dragon bone” (龙骨). The dragon in ancient Chinese myths is an animal endowed with mental abilities, and even in ancient China, the dragon was a symbol of power. How can the medicine be a dragon bone? In fact, the "dragon bone" is a medicine from crushed bones of fossil vertebrates, but not the bone of a mythical animal.

For over 2000 years, the Dragon Bone has served as a cure for disease. No one would ever have thought that one very important secret was hidden behind it.

At the end of the reign of the Tsing Dynasty [1] (清), during plowing, peasants in the cities of Anyang 安阳 Henan (安阳) often found pieces of shells of turtles and bones with and without hieroglyphs. They assumed that they were most likely medicines for the dragon bone and sold part to pharmacies, while the other part was ground into powder for subsequent use. Once, in 1899, the Qing era paleographer Wang Izhong was forced to take medicine for the traditional medical component of malaria, his attention was constantly attracted to the dragon bone

hieroglyphs in his prescription. After careful study, he found that a large number of "symbols" engraved by people are found in them. By an elementary comparison, Wang Jun came to the conclusion that all these symbols belong to the ancient writings that arose in the Shang period (陕) between the 16th and 11th centuries BC In other words, these are hieroglyphic inscriptions on bones and tortoise shells, which in Chinese are called "jiaguen" [2] (甲骨文), where the character "jia" (甲) means tortoise shell, "gu" (骨) - bone (most often the bone of a bull or shoulder blade) other animals), "wen" (文) - text, inscriptions or hieroglyphs. The discovery of the inscriptions "jiaguen" ( 甲骨文) fills the gaps in the history of Chinese hieroglyph of the early period and provides valuable material for studying the sources of Chinese writing and its original form.

"To date, about 160,000 tortoise shells and bones with inscriptions have been found during excavations, 323 of which are associated with diseases." From these inscriptions you can see that already in the Shang era, people had accumulated knowledge about the human body. Using different symbols, they distinguished between ears, eyes, nose, mouth, tongue and teeth. Also, among the inscriptions on the bones and tortoise shells there are symbols related to internal organs or some physiological phenomena, for example, heart, blood, pregnancy.

Take for example grapheme "疒", this is the initial spelling of the character "病" (illness), that is, it represents the category of "sick". The ancient character "疒" depicted a man lying on a bed, sweat protruding on his body, which meant that the person was sick. This living picture is difficult to see in today's character "病". However, if you know the ancient spelling of this character, you can see a pictographic trace in it. Almost all the hieroglyphs associated with diseases include the element "疒", for example, compound hieroglyphs such as "疼" (illness), "痛" (pain), "18" (hurt), etc. [12, p 123].

During the existence of inscriptions on the shells and bones, people did not know about the internal causes of the disease. They believed that diseases arise for external reasons or serve as punishment from ancestors.

In the same historical period, there were similar letters of "jinwen" 金文 (inscriptions on ancient bronze vessels). Later, a connection was found with a symbol, meaning a person and a bed, which in the style of "small zhuan", looked like this: 病. In the Chinese character, all the hieroglyph associated with diseases are written with the addition of the corresponding key sign "disease".

Thus, we see that at that time different diseases were not considered as separate phenomena, but intentionally combined them using the key character "疒" meaning discomfort, impaired function and suffering.

As for the expression of the names of the disease, the inscriptions on the tortoise shells and bones had their own specific method for this, namely, the element "疒" was added to the symbol meaning the sore spot. For example: 目- eye disease,

首- sore head, 耳- ear pain, etc. Thus, more than 40 diseases were indicated, but still at a superficial level. For example: 疾病- jibing - disease，illness，症 zheng (illness, disease, symptom)，疲倦 pijuan (tired, exhausted)，癫 dian (insanity, mental illness), 痫 xian (epilepsy)， 疼痛 tengtong (pain)， 痒 nue (malaria)，痉 jing (cramps, cramps), 痹 bi (numbness, rheumatism)， 疮 chuang (wound, ulcer, abscess)， 疖 jie (boil)， 疔 ding (abscess, boil)， 痈 yong (carbuncle, abscess), 疹 zhen (rash, measles)， 疸 dan (jaundice)， 癃 long (urination disorder)， 瘟疫 wenyi (infectious disease, plague, epidemic).

Modern, square-shaped hieroglyphs still retain the pictographic factor in terms of conveying meaning. These signs, consisting of a set of traits and capable of conveying a certain meaning, not only contribute to the analysis of picto-phonetic hieroglyphs, but also help to distinguish homonyms and hieroglyphs with similar spelling. In the eyes of people who are well versed in the field of Chinese hieroglyph, this pictography is supposed to allow the hieroglyph to become amazing visual symbols.

Among the Chinese hieroglyph there are a large number of homonyms. They cannot be distinguished only by sound, but if you see their spelling, the problem will be immediately solved. For example, take two tables: 治病 (treat) and 致病 (lead to illness). The first word means: a person is sick and, after consulting a doctor, heals his illness. The second word means: the person was healthy, but ill.

**Conclusion**

To conclude, we can say that medical terms do not differ sharply from other terms in their way of formation. By the scope of their use, you can not only easily remember, but also understand in context. This is especially helpful in translations of medical terminology.

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# 互联网行为的动机预测因素
# MOTIVATIONAL PREDICTORS OF INTERNET BEHAVIOR

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抽象。 本文概述了用于研究互联网行为的现有诊断方法，并提出了一种基于动机预测因子的研究互联网行为的新方法。 作者分析了互联网行为动机方法的方法论基础，并在理论分析的基础上提出了互联网行为动机模型。 所提出的模型成为作者用于研究互联网行为的动机预测因素的诊断方法的基础。
关键字：网络行为，动机，网络行为模型

***Abstract.*** *This paper gives an overview of existing diagnostic methods for studying Internet behavior and proposes a new approach to research Internet behavior based on motivational predictors. Authors analyze the methodological foundations of the motivational approach to Internet behavior and suggest the motivational models of Internet behavior on the basis of theoretical analysis. The proposed models became the basis for the author's diagnostic methodology for the study of motivational predictors of Internet behavior.*
***Keywords:*** *Internet behavior, motivation, internet behavior models*

*The article was supported by the Russian Foundation for Fundamental Research (Project No. 18-29-22004) (2018) «Psychological and genetic studies of users' behavior predictors that determine the perception of Internet content of various informational orientation»*

The Internet has become an essential part of the modern person life: on the Internet we communicate, work, study, find information, share our emotions and news, etc. Strategies of user's internet behavior are becoming the subject of psychological study, as well as human behavior in real life situations.

Modern studies distinguish three vectors of research on human behavior in the informational space. The scientists make research on informational behavior (M.J. Bates, T.D. Wilson, R.S. Taylor, N.J. Belkin, E.V. Kulakova, Yu.N. Dresher, T.A. Atlanova , R.A. Pavlyuk, G.B. Parshukova, M.A. Shchedrin, N.V. Koksin), media behavior (M.V. Zhizhina, I.V. Zhilavskaya, I.V. Zadorin), Internet behavior (O.N. Arestova, A.V. Belyaev, A.E. Voiskunsky).

As a working definition, we use Internet behavior. Following O.N. Fablinova, we understand the Internet behavior as a behavior of the individual in the Internet environment, in the reality surrounding the individual on the Internet, characterized by non-linearity, artificial creation, globality, unity, continuity [2].

An urgent problem in the study of Internet behavior is the search for reliable diagnostic methods and criteria characterizing it. An analysis of existing approaches to the study of this phenomenon showed that most authors use only quantitative indicators in assessing behavior, focusing on the dependent behavior and its criteria. Such common methods include Internet addiction Test (C. Young), Chen Internet addiction Scale (S. Chen with Russian adaptation V.L. Malygina, K.A. Feklistova), the Internet Perception questionnaire (E.A. Shchepilina ), "Behavior on the Internet" test (A.E. Zhichkina), "Test for detecting Internet addiction" (S.Kulakova). [1] In our opinion, this diagnostic approach is outdated, since people use the Internet for a greater variety of purposes every day: communication, education, legislation, health care, banking, shopping, personal finance, work, etc. Thus, the time spent in World Wide Web is not an indicator of addiction.

In the early 2000s Internet accessibility has begun to grow, including due to a revolution in the development of technical means (the advent of smartphones and mobile Internet). This led to shifting from determining whether there is an Internet dependence to the study of user's behavior and its influence on the user's personality. So, the "Attitudes towards the Internet" questionnaire (by R. Davis with Russian adaptation by E. Gubenko) can be used to measure the overall indicator of the problematic Internet use and already includes scales related to the psychological characteristics of the person. The proposed by A.E.Zhichkina and E.A. Shepilina version of the "Unfinished sentences" test allows to study the subjective attitude of the respondent to the Internet: it highlights the positive and negative properties of the Internet and evaluates the position of the respondent on the Internet. [1]

Motives of behavior on the Internet, studying of search queries and their use in an individualized online marketing system are the subjects of large online corporations researches. So, Google researchers proposed a classification of behavioral patterns of mobile users, which is based on the motivation for accessing the Internet:

1) “Repetitive Now”: using mobile applications to search for current, updated and repeating information to stay up-to-date. As a rule, it is viewing the same data type, but at different dates and time intervals (weather forecast, discounts, sports results);

2) “Bored Now”: the behavior of users who just need to “kill time”, something to entertain themselves, have fun, while they wait. It is characterized by short-term connection to the network and social services using a mobile device;

3) “Urgent Now”: This pattern of behavior is inherent to users who need access or information, and who are very time-limited. As a rule, they look for information that is actual to the time of day, social or situational context [2].

In a study conducted by “The New York Times Customer Insight Group” under the direction of B. Brett in 2018, the main groups of motives that make people share content online were identified:

1) to bring interesting entertaining content into the life of others

The motive is to make the life of people around them more eventful: 49% of respondents share content that allows them to inform others about products that could potentially change something in their life or induce some action. 94% of them clearly understand how useful and why the information they share can be used.

2) to become more understandable to others

The motive is to give people the opportunity to understand better what kind of person you are-68%.

3) to improve and develop relations

The motive is to stay in touch with those people with whom there is no other way to communicate, 78%; to communicate with people with similar interests, 73%.

4) self-development

The motive is to be involved in the world - 69% of respondents feel their importance in this way.

5) the ability to share their opinions (motive-to share what is important to you-84%)

In our opinion, it is user motivation that is the most important link in behavioral models on the Internet. Understanding motivation as the determination of behavior in general, one should include in the concept of motivation all kinds of motivations - motives, needs, interests, aspirations, goals, drives, attitudes, etc. [3]. This understanding of motivation as a complex of factors influencing behavior and determining it led us to distinguish five models of Internet behavior: entertaining, informational, communicative, productive, pragmatic. It should be emphasized that within the framework of the author's motivational approach to Internet behavior models, the consumed content is not as important as the motive for using this content.

Each model is distinguished by a certain orientation of behavior and a complex of various motives.

The behavior within the entertainment model is aimed at the process of activity and at oneself: the user himself receives knowledge, emotions, impressions in the process of consumption of entertainment content. This model includes motives associated with the use of information to maintain or change your emotional state, as well as just to pass the time and get distracted.

The user's behavior in informational model is aimed at the result of the activity and at oneself. This model is a classic consumption of information from the Internet to solve one's educational, professional and even everyday tasks. Moreover, the emphasis is on the search result, and not on its process, as described in the entertainment model.

The communicative model of Internet behavior includes all forms of behavior involving interaction with other users (both active and passive). In this case, the activity is aimed at oneself and others. The process of communication is more important than its result.

A productive model involves the creation of new content, a product of your creativity, which is important to share with others, i.e. in this case, the activity is aimed at the result for others.

In the framework of the pragmatic model of Internet behavior, two types of behavior can be distinguished: 1) users who sell something and thus earn; 2) users who buy something, thereby satisfying their needs.

Based on the presented theoretical approach, we developed author's diagnostic methodology for studying Internet behavior models. The technique has passed experts evaluation and is the process of validation.

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社会感知在线消费条件

# SOCIAL - PERCEPTUAL ONLINE CONSUMPTION CONDITIONS

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抽象。 Internet资源使用强度的增加引发了销售领域的变化，在线商店在消费者中变得越来越受欢迎，这促进了该领域研究的兴趣和增长。 这项研究的目的是确定和构建在线消费的社会感知条件。 通过进行定性研究，可以确定和描述作为评估在线消费基础的必要工具的标准。 拟议的方案使您可以根据目标受众调整在线消费条件并改善市场。

关键词：消费者选择，人类消费者，消费者行为，消费者行为理论，消费者行为效用，购买消费者行为，消费者行为研究

***Abstract.*** *The increasing intensity of the use of Internet resources initiates changes in the sales sphere, online stores are becoming increasingly popular among consumers, which contributes to the interest and growth of research in this area. The purpose of this study is to identify and structure socially perceptual conditions of online consumption. A qualitative study conducted made it possible to identify and describe the criteria, which are a necessary tool, the basis for evaluating online consumption. The proposed scheme allows you to adjust the conditions of online consumption according to the target audience and improve the marketplace.*

***Keywords:*** *consumer choice, human consumer, consumer behavior, consumer behavior theory, consumer behavior utility, purchasing consumer behavior, consumer behavior research*

## Introduction

The growing intensity of the use of Internet resources dictates its conditions and changes in the field of sales. For effective communication with a potential buyer, you must be part of where consumers spend their day - on their mobile phones, chatting with friends and social networks.

The emergence of online sales sites is the result of technological progress and the reality. Modern technologies make it possible to detect what users are viewing, where they click, what they convert. The data obtained at the services are systematized and analyzed.

Social perception - is not a new, but incredibly influential source, and its optimization in the context of online consumption is one of the components of the whole set of problems to explain the individual reasons that arise in the field of consumption that affect consumer assessment and marketplace conversion.

**Investigation of consumption assessment criteria**

In the framework of the designated topic, the study focuses on the problem of the need to create a theoretical and methodological base of socio-perceptual conditions on sales sites.

The purpose of this study: to identify and structure socially perceptual conditions of online consumption.

The main stages and results of the study:

The study involved respondents - users of online stores aged 23 to 46 years. The number of subjects was 38 people. Participation was voluntary.

The research procedure involved a survey of respondents about the types of characteristics that could describe or distinguish the marketplaces that they use, what attracts them, and what is most important. The methodology of the applied structured interview is used to understand how consumers translate the properties of products into meaningful representations, described and justified by Modesto Veludo-de-Oliveira 2015. [10] is represented by three techniques that reveal the essence of the product: product attributes (A); benefits of using the product - consequences (C); as well as values (V).

During data processing, a content analysis was carried out, the results were grouped according to the meaning in the criteria.

The analysis of existing works and scientific results achieved in a relatively recent direction - online consumption, made it possible to connect the results of studies devoted to one problem to test the hypothesis describing the proposed criteria, which are invariants of social perception, are subjective in nature, and are guidelines for perception, understanding and evaluation of consumption.

Table 1. “Description of the criteria for assessing consumption” presents a description of the criteria, and the authors in whose works these criteria were reflected.

The first column provides a brief description, the second contains the respondents 'keywords characterizing the criterion obtained as a result of the interview, the column “mentions in the authors' works” presents the authors whose empirical studies describe the content of this criterion in one way or another.

***Table 1.***

*Description of consumption assessment criteria.*

| Criterion description | respondent's keywords | Mentions in the works of authors |
|---|---|---|
| ***Savings*** are determined by what can be calculated in monetary terms. Auctions, discounts, promotions, etc. | profitable, discounts, bonuses, costs | Lim and Dubinsky, 2004 [9]; Rox, H., 2007 [14]; Vasić N. et al., 2019 [17] |
| ***Affiliation*** A warm approach to the buyer. Online service around the clock, the ability to ask questions around the clock and receive support or help. | contact, relationships, communication, social networks, reviews | Prasad and Aryasri, 2009 [12]; Ramlugun V. 2014 [13]; Tauber, 1972 [15] |
| **Prestige** Famous marketplace, branded products, products available only online. | reputation, fame, image, brand | Lim and Dubinsky, 2004 [9]; Prasad and Aryasri, 2009 [12] |
| **Utilitarian** Convenient, logical interface, good download speed. Simplify work, reduce travel, save time | convenient, fast, accurate terms, conditions | Childers et al., 2001 [1]; Hofacker, 2001 [4]; Prasad and Aryasri, (2009) [11]; The Tech Faq, 2008 [16]; Vasić N. et al., 2019 [17]; Wang et al., 2005 [18] |
| **Safety** Internet trust, true reviews. Security of registration data provided, including credit card number | no risk, reliability, easy to use, no problem, recommendations, safe service. | Comegys et al., 2009 [2]; Laudon and Traver, 2009 [7]; Liang and Lai, 2002 [8]; Prasad and Aryasri, 2009 [12]; Ramlugun V. 2014 [5]; Vasić N. et al., 2019 [3]; Wang et al., 2005 [10]; |
| **Gnostic** Easier access to information about the quality of goods / services, news, reviews. | interesting, news, technical innovations, informative, comparison service, structured. | Lim and Dubinsky, 2004; Ramlugun V. 2014 [13]; Vasić N. et al., 2019 [17]; Wang et al., 2005 [18]; |
| **Autonomy** The ability to autonomously and independently make decisions without control of the site, without intrusive advertising and chat bot | no one bothers, calmly choose, intrusive, a lot of advertising, consultant window (constantly pops up / too big), annoying | Laudon and Traver, 2009 [7]; The Tech Faq, 2008 [16]; Goldsmith and Flynn, 2005 [3]; Parks, 2008 [11] |
| **Aesthetics**. Beautiful, attractive web design - color scheme, interesting site structure | beautiful, like, original, harmonious, tasteful | Koo et al., 2008 [6] Ramlugun 2014 [13] Wang et al., 2005 [18] Liang and Lai, 2002 [8] |

**Systematization of socio-perceptual conditions for evaluating consumption criteria**

The undertaken systematization of the described criteria is presented in the form of a scheme of socio-perceptual conditions. The modes of thinking System 1 - System 2 proposed by D. Kahneman [5] turned out to be adequate for this purpose, which made up a horizontal scale. The vertical scale social - individual, based on the levels of social representations of S. Moskovichi [19].

Diagram 1. presents a diagram of socio-perceptual conditions for evaluating consumption criteria.

According to Kahneman's theory, two systems are distinguished in the human psyche:

System 1: it works automatically and very quickly, almost without any effort and without giving a feeling of intentional control.

System 2: Provides the attention necessary for conscious mental effort, including for complex calculations.

In the process of consumption, both systems work: the first - automatically, and the second - in the minimum effort mode.

In the case of the dominant criteria: aesthetics, safety, prestige, as a rule, there is enough data that we get thanks to System 1. For example, aesthetic preferences arise based on the voice of one's own aesthetic feeling: beautiful - ugly, like - don't like. Personal addictions are unique, other people's tastes do not require discussion, in this matter it is impossible to prove anything by rational means, just as it is impossible to refute the arguments of subjective experience and aesthetic feelings.

The criterion of prestige, also rarely passes a deep cognitive analysis, the consumer, as a rule, quickly makes an impression of the necessary level of the brand.

Regarding safety, people are also more prone to intuitive assessments, including under the influence of cognitive distortions that allow trusting dubious offers.

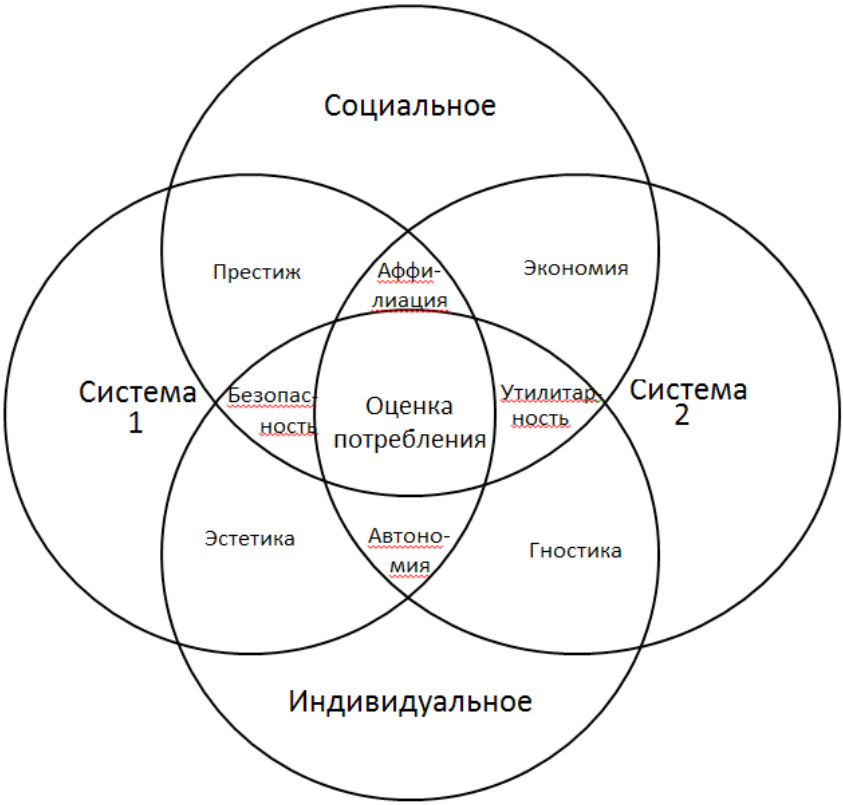
Despite the fact that System 1 basically performs its functions perfectly, logic and statistics are poorly served, therefore, when it comes to criteria: saving, utility, gnostics, the consumer is determined to study the data more carefully, and System 2 is turned on. For example, the Gnostic criterion involves the collection and analysis of product information, a comparison of qualities.

The utilitarian criterion involves the analysis of options that provide convenience, simplify work, reduce travel, save time, and maintain established habits.

The criterion of saving is mainly determined by what can be calculated in monetary terms - how much a person can save. Such a comparison is possible only in relation to other conditions of consumption, so we turn to the vertical scale of the scheme: social - individual. The criterion of saving is considered by the consumer in the context of comparison with other users, with other options for offers, so that it is more economical relative to others.

***Diagram 1.***

*Scheme of socio-perceptual conditions for evaluating consumption criteria*




In the case when the prestige criterion is dominated, our actions aimed at presenting ourselves, driven by the desire to create a certain image, to receive attention, recognition and encouragement from others, in this case, the social orientation is obvious.

With the dominant criterion being affiliation, consumers are happy to accept the help of a consultant, look for a community of interests, it is appropriate to sell some products on social media sites rather than an online store.

**Conclusion**

Social perception involves mechanisms by which people understand, interpret and evaluate consumption, reflect both the current moment and his life experience and position. The criterion is a method, a necessary tool for assessing the essential features of an object, but the assessment itself is not. A criterion is a means of

detecting an object, the basis for classification, grouping of objects of their assessment. The proposed scheme allows you to classify the conditions of consumption and choose the most promising areas according to the target audience and improve the market place.

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反思对师范大学生生存能力的影响

# INFLUENCE OF REFLECTION ON THE VIABILITY OF STUDENTS OF A PEDAGOGICAL UNIVERSITY

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抽象。这篇文章提出了一个科学问题，研究反射对一所师范大学大学学生生存能力的影响。 18至25年是成年年龄链中最重要的阶段之一。在这个年龄段，一个人将获得实施未来专业活动所必需的基本知识和技能。他开发了一种价值取向系统，该系统确定了人格的核心，社会活动的内容以及对世界，对他人和对自己的通向，这为年轻人的社会地位赋予了意义和方向。另外，在此期间，一个人学习了各种各样的防御性思考选择，在此基础上，他形成了保护行为的刻板印象，这种行为只允许局部促进体验，而不能从根本上解决问题。研究还表明，学生在不利条件下选择的主要行为策略本质上是致病的，并且依赖于各种情感状态的经历。这不允许他们应付生活中的困难，并有尊严地管理自己的行为，而又不损害自己的健康。

关键字。反射，生源反射，保护性反射，个人生存能力，教育大学的学生。

***Abstract.*** *The article presents a scientific problem of studying the influence of reflection on the viability of students of a pedagogical University. The period from 18 to 25 years is one of the most important stages in the chain of Mature ages. During this age period, a person acquires basic knowledge and skills necessary for the implementation of future professional activities. He develops a system of value orientations that determine the core of the personality, the content of social activity and a General approach to the world, to other people and to himself, which gives meaning and direction to the social position of a young person. In addition, during this period, a person learns a wide range of options for defensive reflection, on the basis of which he forms stereotypes of protective*

*behavior that allows only to locally facilitate the experience, and not to radically solve the problem. It is also shown that the main behavioral strategies that students choose in adverse conditions are pathogenic in nature and form a dependence on the experience of various emotional States. This does not allow them to cope with life's difficulties and manage their behavior with dignity and without compromising their health.*

***Keywords.*** *Reflection, sanogenic reflection, protective reflection, personal viability, students of a pedagogical University.*

**Introduction**

In modern science, viability is considered the basic ability of a person, which refers to integral formations and is formed in the process of socialization of the individual. The American philosopher E. Glasersfeld believed that the body can be called "viable" if he, faced with various factors of the external environment, adequately reacting to them, continuing their existence. Directly the question of viability was first raised by the Russian scientist-encyclopedist A. A. Bogdanov in his works. In the work "Struggle for viability", the author refers to this concept as the ability of a living being to live, its ability to prolong its existence [1; p. 148].

E. F. Zeer notes that subjectively, viability is perceived by a person "as satisfaction with their own life", since it allows them to maintain a normative life activity, which is actualized in connection with the need to solve life problems and provides a dynamic retention of life in constant conjunction with the requirements of social life [2, P .69-76]. An important aspect of viability is also the fact that a person not only adapts to a changing environment and changes in it himself, but also transforms the surrounding reality. Speaking about the viability of the student's personality, it is necessary to indicate the content of the term "viability of the student". One of the most detailed studies on this topic belongs to O. A. Kondratenko. In the article "Raising the viability of a University student in the conditions of humanization of education", she analyzes various approaches to understanding the concept of "viability" and deduces the term "student viability", which means the individual ability of a young person to manage their own personal resources in the context of mastering educational and professional activities [3, P. 102-105.].

The theme of viability gets a special sound when we are talking about a developing personality, the personality of a child, a teenager, a student. Most people, including young people, are not able to correctly understand their activities and behavior without harm to their health, they are not able to cope with negative emotions, solve problems, and overcome life difficulties. Therefore, by learning to control their feelings and not fall under their power, they will be able to in-

crease their vitality and as a result change their lives. Results of the research by M. sh. Nepomnyashchey showed that " most students of the faculty of pedagogy and psychology are able to cope productively, without strong internal stress, with emerging stressful situations, and perceive them as less important; they feel quite psychologically well-off; students are able to cope with themselves and the world and can go to internal and external requirements and proposals, correlating them with their own values. They are open, determined, receptive, ready for action, and have a sense of duty [4].

Viability actualizes intrapersonal resources of a person on the basis of mental health potentials and corrects negative behavioral patterns, as well as the choice of constructive behavior programs that ensure the formation of positive socio-psychological attitudes in various areas of human life. In this regard, the search for factors that increase the viability of the individual becomes significant. From our point of view, such a factor is sanogenic reflection. It contributes to the harmonization of internal mental development and external conditions of life and allows a person to remain resistant to adverse influences of the surrounding world. In a stressful situation, sanogenic reflection helps to reduce the suffering from experiencing the corresponding emotion (Morozyuk S. N.) [5; p. 67]. The function of sanogenic reflection is to recognize stereotypes of thinking and behavior programs that trigger negative emotions that destroy human health (Orlov Yu. M., Morozyuk S. N.) [6]. In other words, sanogenic reflection is aimed at awareness of psychological defenses and regulation of an individual's emotional States.

**Materials and methods**

The research was conducted at the Moscow state pedagogical University. The respondents were 50 students: 25 people-students of the history Department and 25 people - students of the mathematics Department. The following research methods were used: the projective "Cognitive-emotional test" (Orlov Yu. M., Morozyuk S. N.) [7] and the method "Viability of an adult" (Makhnach A.V.) [8].

**Results**

After conducting an empirical study using the methods and research methods presented above, we analyzed the results obtained. The correlation of defensive reflection in respondents with the severity of their viability indicators (according to R - Spearman) is shown in table 1.

The results of the study showed that the more likely respondents are to build expectations in relation to other people, they are shy and touchy, and at the same time they are more likely to manage other people by imposing a sense of guilt on them. This is confirmed by the presence of reliable feedbacks of the indicator "Perseverance" (Makhnach A.V.) with indicators of defensive reflection "Protection from a sense of shame" (r=-0.37), "Arousal of guilt in others" (r=-0.30), "non-Compliance of the behavior of others with my expectations" (r=-0.33).

**Table 1. Correlation of defensive reflection in pedagogical University students with indicators of their viability (n=45)**

| CET indicators (Orlov Yu. M., Morozyuk S. N.) | Indicators of viability (Makhnach A.V.) | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Volume of defensive reflection from the fear of failure | -0,07 | -0,25 | -0,31* | -0,12 |
| The amount of defensive reflection from guilt | 0,17 | 0,13 | -0,29* | 0,01 |
| Aggression against others | -0,07 | -0,15 | -0,26 | -0,29* |
| Aggression against yourself | 0,02 | 0,31* | -0,11 | -0,06 |
| Rationalization by circumstances | -0,07 | -0,29* | -0,35* | -0,20 |
| Protection from guilt | -0,24 | -0,11 | 0,32* | -0,12 |
| Protection from feelings of shame | -0,37* | -0,33* | -0,46** | -0,05 |
| Protection from envy | -0,11 | -0,15 | -0,38** | 0,17 |
| The arousal of guilt in others | -0,30* | -0,14 | -0,14 | -0,04 |
| Sanogenic thinking | -0,21 | -0,25 | -0,36** | -0,22 |
| Mismatch of other people's behavior with expectations | -0,33* | -0,11 | -0,21 | -0,34* |

*Note: statistically significant relationships** - at the p ≤0.01 level; * - at the p ≤0.05 level*

1-Persistence, 2-Internal locus of control, 3-Adaptation, 4-Social and family ties

Also, the more shy the respondents are and tend to devalue the circumstances, the less they tend to find positive solutions for themselves and others, control their life and events, perceive themselves and others positively, and, accordingly, they are also prone to autoaggression. This in turn makes them more convinced of their personal failure and leads to deeper negative experiences. We find confirmation in the presence of reliable negative links of the indicator "Internal locus of control" (Makhnach A.V.) with the indicators of defensive reflection" Protection from a sense of shame "(r=-0.33)," Rationalization by circumstances "(r=-0.29) and positive reliable links" Aggression against oneself " (r=0.31).

We also found a link between protection from the fear of failure, shame, envy, and guilt with the adaptation of respondents. The more pronounced the respondents ' indicators of defensive reflection from fear of failure, shame, envy, and guilt, the less they are able to resolve problems constructively. Low ability to emotional self-regulation does not allow them to cope with the requirements of the environment, effectively interact with the social environment. They also tend to devalue existing situations. It was also found that there are feedbacks between the indicator "Sanogenic thinking" and "Adaptation" (r=-0.36). Attention is drawn to the presence of feedbacks of the indicator "family and social relationships" with the indicators of defensive reflection "Aggression against others" (r=-0.29) and "non-Compliance of the behavior of others with my expectations" (r=-0.34). In other words, the more aggressive respondents are towards others and the more

they build expectations towards them, the less actively they participate in social relations, improve models of family communication, care and discipline, maintain emotional closeness between family members, and form positive family relationships.

Thus, the key obstacles in a student's life are fear of failure, shame, envy, and guilt. The more pronounced these qualities are, the more they seek to protect themselves from them and the less they are able to search for and solve life problems, to emotional regulation and self-regulation. We see sanogenic reflection as the main factor of viability. It allows you to remove the internal stress of the individual and maintain resistance to adverse influences of the surrounding world, forms skills of mental behavior, performs the function of regulating mental States and health of a person, returns him to self-confidence and harmony of relations with the world, thereby influencing the viability.

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# 小学生设计与研究活动的心理和教学条件
# PSYCHOLOGICAL AND PEDAGOGICAL CONDITIONS OF DESIGN AND RESEARCH ACTIVITIES OF PRIMARY SCHOOL CHILDREN

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抽象。 本文讨论了在年轻的学龄前儿童中进行设计和研究活动的条件。 该主题的相关性是由于以下事实：在现代教育系统中，可以使用设计和研究活动来发展年轻学生的认知功能。 但是，要进行此类教学，老师必须了解该年龄段儿童的年龄和心理特征

关键词：学龄前儿童，项目活动，认知能力的发展，尤其是小学生的发展，研究活动。

***Abstract.*** *the article deals with the conditions for conducting design and research activities in younger preschoolers. The relevance of this topic is due to the fact that in the modern education system it has become possible to use design and research activities for the development of cognitive functions of younger students. However, to conduct this kind of classes, the teacher is required to understand the age and psychological characteristics of children of this age*

***Keywords:*** *younger preschoolers, project activities, development of cognitive abilities, especially the development of primary school children, research activities.*

This article considers the problem of the psychological and pedagogical conditions of design and research activities with younger students. The relevance of the topic is due to the fact that design and research is a technology that contributes to the development of many cognitive functions, but for younger students it is used with a number of conditions based on the age characteristics of children.

Considering the problem of a child aged 7-9 years, we can say that his main occupation is the game. In the game, the child mimics the behavior of an adult

and plays out situations that, in his opinion, could arise. His "opinion", as a rule, is based on what he saw in cartoons, films or in the behavior of his parents. This game not only entertains the child, but also prepares him psychologically for adulthood, the child loses situations that he might encounter on his life path. But in the life of younger schoolchildren, studies also appear. Game and study are psychologically different kinds of activity. A sharp rejection of the game and the transition exclusively to educational activities from preschool to primary school age is harmful.

Therefore, with children of primary school age it is recommended to conduct classes in a playful way, through direct manipulation of objects, signs, materials. It is important for children of this age to give them the opportunity to master various knowledge, for example, by offering them didactic games. Such work with children corresponds to their needs, both conscious (they want to play) and unconscious (they need development).

Turning to the psychological and pedagogical conditions of design and research activities for younger students, we would like to say that this type of activity is carried out in individual work, in group and pair work, as a rule, the duration of this type of activity is one lesson or several lessons within a month [3, p. 71].

Now, we would like to dwell on the features of the design method for younger students:

1. Younger students should not be given a full-fledged project activity, because it does not correspond to their age characteristics. In this regard, restrictions are set for one to three lessons per trimester (quarter). Extracurricular activities are also allowed.

2. Primary schoolchildren must first be taught to solve design problems. The peculiarity of the design tasks is that they require group work and do not strain the child. Also, as part of the project task, schoolchildren have a ready-made set of tasks. [4, p. 254].

3. When choosing a topic for projects for primary schoolchildren, the areas of educational subjects that they have already learned in the lessons are best suited. It is also worth considering that the topic under discussion should be meaningful and interesting for children. Thus, the involuntary attention of children will be involved, they will be involved in the lesson. The teacher and the children need to identify learning goals: “What skills will be needed to complete this project? Do you possess these skills? How can they be learned? ” [5, p. 63].

4. To select a topic that is interesting to children, you can use the questions that appeared in children during extracurricular activities, for example, when visiting museums or theaters together with the class [5, p. 63].

5. Training in design and research activities in elementary school, it is advisable to start with training classes [5, p. 63].

Based on the analysis of the project activities of younger schoolchildren, the fact is highlighted that, unlike other types of educational activities, the components of project activities (learning situations, learning activities, educational control, assessment) of elementary school students are formed purposefully in the process of fulfilling project tasks. As a result, the teacher, using information technology, has the ability to carefully control the formation of each of the components of the structure of educational activities.

The tasks that the teacher offers to younger students in the context of project activities should familiarize children with general methods of mastering knowledge, in particular, it can highlight the properties of objects and solve various classes of problems. The educational task set for schoolchildren, as a rule, is oriented so that the child can find a general way to solve it (taking into account options and particular and specific conditions). The assimilation of common methods for solving problems occurs with the help of educational actions that children perform under the guidance of a teacher. Famous domestic teacher-psychologist D.B. Elkonin believed that at the initial stages of schooling, children do not know how to set learning tasks and solve them independently. Thanks to project activities, primary schoolchildren mastery the formulation of educational tasks, which in turn contributes to the formation of their independent educational activities [2, p. 49].

One of the essential characteristics of educational activity as a whole is the way it is organized. It is believed that project activity as a type of educational activity at all its stages should be carried out together with the teacher. Because the teacher is a consultant for children, directing their efforts within the group towards a joint solution of the task assigned to them. We believe that it is the project activity that has all the advantages of joint activity, since in the process of its implementation, children gain rich experience in joint activity, shared with both adults and peers [1, p. 39].

From the point of view of pedagogical psychology, the topic of a project or study, ensuring the desire of children to be included in independent work, should be in the zone of proximal development and meet the needs of students' cognitive interests.

It is worth paying special attention to the final stage of the project activity (presentation/defense) for younger students. This is due to the fact that it is the completion of an action that is significant for the child, on the basis of this, he acquires a completed model of cognitive actions, and in the next life he will be guided by it when performing educational tasks. Thus, if the teacher does not successfully close the gestalt at the end of the project, children in the future may have problems in such tasks, which will be based not on the cognitive abilities of the child, but on emotional experiences.

To complete the project, children need help to make a self-assessment of the completed task. After that, they need help to evaluate the design process itself using leading questions. Students will also need help in preparing the project for

presentation. The presentation (protection) of the project itself is the final stage of the project when students report on their work. As a rule, protection of projects is carried out in the form of an exhibition of those products that they created. It is also advisable for the teacher to ask the children to prepare a short presentation with a story about their project.

After presentation of the project, the manufactured products can be left in the classroom as exhibition material or allowed children to take them home and present to someone close to them. Thanks to this, children will be able to feel that their work is valuable to others and now they can not only craft something with their own hands, but also invest a certain meaning in their creations.

Project activities in primary schools are designed to develop the intellectual and creative potential of the personality of a child of primary school age, to promote the development of creative thinking of students, to form their understanding of research teaching as the leading way of educational activity, and to stimulate interest in students in basic and applied sciences.

In conclusion, we would like to say that for children of primary school age, project activities should be applied taking into account their age development. At the same time, the specialist who conducts classes with children must take into account a number of conditions under which it is allowed to carry out project activities in children of 7-9 years old. These conditions include the following characteristics of classes:

1. Design and research activities can be carried out several times in a quarter, and similar classes for children can be held outside school hours;

2. The theme chosen by the teacher for setting the task should correspond to the interests of children, it should be close and understandable to them.

3. The teacher should pay special attention to the completion of the project activity – to tell the children how best to perform, what to present.

4. Children must see the results of their labor and understand that they are beneficial.

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在小学生中发展认知兴趣的问题

# THE PROBLEM OF DEVELOPING COGNITIVE INTEREST IN PRIMARY SCHOOL CHILDREN

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抽象。 本文专门讨论小学年龄儿童的认知兴趣形成问题。 考虑其对人格形成和培训成功的影响。 情感成分已被研究为形成稳定的小学生认知兴趣的最重要领域之一。

关键词：认知兴趣，小学年龄，教育活动，智力活动，认知情绪态度，情感。

***Abstract.*** *This article is devoted to the issue of the formation of cognitive interest in children of primary school age. Its influence on the formation of personality and the success of training is considered. The emotional component has been studied as one of the most important areas for the formation of a stable cognitive interest of primary school students.*

***Keywords:*** *cognitive interest, primary school age, educational activities, intellectual activity, cognitive-emotional attitude, emotionality.*

Emotional intelligence - is an extremely important tool used to solve certain issues of school activity and interpersonal relationships. The development of emotional intelligence becomes an educational goal, starting from the very young age of children. The objectives of the school subject "personal development", included in the program of preschool and primary school education, relate to the components of emotional intelligence. The interest shown in self-knowledge and a positive attitude towards oneself and others, as well as an adequate expression of one's emotions when interacting with both children and adults they know, are common skills that include components of emotional intelligence.

Most psychologists specializing in the study of emotional intelligence and the psychology of emotions (P. Ekman, 2011, J. Cosnier, 2007, M. Zlate, 2000) believe that the main emotions are the following: happiness, surprise, sadness, fear,

anger; shame, guilt, contempt, despair, curiosity are added to them. All these basic emotions are involved in solving the fundamental issues of current life, which requires a quick response. The expression of basic emotions is universal, so they can be quickly and correctly recognized. These numerous emotional expressions (facial expression, gesture, pose, tone of voice) are consistent. Understanding them is not so easy at any age in children.

The problem of the formation of interest of younger schoolchildren in the educational process has long been one of the most important psychological and pedagogical problems. It is no coincidence that many studies of domestic and foreign teachers, psychologists and methodologists are devoted to this.

Development - is the changes that occur throughout life. These changes occur in an orderly manner (that is, development includes stages, and until the previous stage is completed, the next stage does not begin) and adaptively (that is, all processes and actions at each stage of development are suitable for this stage). This can be physical (development that can be seen directly and measured; for example, growth in height and weight), cognitive (development of the brain; development that is measured through thought processes), or social (development in how people interact with the environment and people around them, the ability to work in groups) in nature. Development follows an orderly and predictable pattern. Different children develop at different speeds. Development constantly depends both on nature (genetics, instincts, innate characteristics), and on upbringing (environment, acquired factors). Studies have shown that early childhood may be the most important stage in life for brain development. Scientists have found that babies' brains develop in response to stimulation. Children who receive stimulation develop faster and have a more reliable image of themselves.

Cognition can be defined as mental processes through which knowledge is acquired, developed, accumulated, extracted and used to solve problems. Cognitive development, on the other hand, refers to changes that occur in children's mental skills and abilities over time. When children are about 6 years old, their ideas about the world begin to change. During this period, preschool egocentric thinking is left behind, and they begin to develop more mature ways of thinking. These cognitive abilities continue to develop over the next 4-5 years, when the child engages in sequential, complex, and symbolic tasks (Anita, 2004; Osakwe, 2009).

In the psychological and pedagogical literature there are a large number of studies devoted to the problem of the cognitive interest of the individual. The works of A. N. Leont'ev, N. G. Morozova, S. L. Rubinstein, G. I. Shchukina, and others are devoted to the analysis of the concept of “interest” (including cognitive interest) and its components. The works of these authors emphasize the unity of the emotional, electoral, and intellectual aspects of cognitive interest, and thought processes are described as the main structural core.

It is known that the child's cognitive interests arise quite early, and the child often comes to school with a worldview that goes far beyond the information contained in textbooks. The knowledge that a child receives in school, as a rule, is not systematized; their transformation into a logical and holistic picture of the world occurs with the participation of the teacher. Thus, we can say that the problem of managing the development of the cognitive interest of the child is quite significant in modern psychology of education.

Interest - is a complex, meaningful education for an individual. The concept of "interest" has a large number of different interpretations. From the point of view of S. L. Rubinstein, interest appears as the selective orientation of a person, his attention, his thoughts [3, p. 121].

English dictionary of psychological terms explains the term interest - this is the tendency to engage in activities, things, or the process of occupation [5, p. 36].

The psychological meaning of the term interest reflects a large number of significant processes for students from the individual, up to its completeness, and is expressed in the needs and relationships of the individual.

The analysis of the cognitive interest of primary school children by A. N. Leontyev shows that the formation of cognitive interest in schoolchildren is a complex process that is part of the general line of their development.

The level of training and education at school is largely determined by the extent to which the pedagogical process is focused on the psychology of the age and individual development of the child. This is especially important in the lower grades of the school, when purposeful preparation of the personality begins, when learning becomes the leading activity, in the bosom of which the child's mental properties and qualities are formed, primarily cognitive processes and attitude to oneself as a subject of cognition. The younger student is in a new environment for him — he is included in socially significant educational activities, the results of which are highly or low evaluated by close adults.

Significant differences are observed among younger students in the field of cognitive interests. Deep interest in the study of any school subject in elementary grades is rare, usually it is combined with the timely development of special abilities. There are only a few of these children who are considered gifted. Most children of primary school age have a low level of cognitive interests. But well-functioning children are attracted to various objects, including the most complex ones. They are situational in nature, at various lessons, in the study of various educational materials give interest, increase intellectual activity.

The formation of cognitive interests in younger students occurs in the form of curiosity, with the inclusion of attention mechanisms. The formation of the cognitive interests of students begins from the very beginning of schooling [2].

The main thing in the system of work on the development of cognitive interest of younger schoolchildren: the educational process should be intense and exciting, and the communication style should be soft and friendly. It is necessary to maintain a sense of joy and interest in the child for a long time.

A higher level of interest is curiosity, when a student shows a desire to understand a phenomenon that is studied more deeply. At the same time, the student as a whole is also active in the classroom, asks questions, participates in the discussion of the results of demonstrations, examples, and also reads additional literature, equipment diagrams, independently conducts experiments, etc. However, the student's curiosity usually does not extend to the study of the whole subject. The material of another topic or section may be boring for him, and interest in the subject will disappear. Therefore, the task is to maintain curiosity and the desire to create a steady interest in the subject, in which the student understands the structure, logic, of course, the methods used in it to search and prove new knowledge, in his studies he is captured by the process of understanding new knowledge and independent troubleshooting Non-standard tasks are a pleasure [5].

Thus, the cognitive interest of younger students is an important factor in learning and, at the same time, an important factor in the formation of personality.

The game form of the lesson is created in the classroom using game techniques and situations that act as a means of encouraging and stimulating students to study.

The implementation of game techniques and situations in the solid form of classes takes place in the following main areas: the didactic goal is intended for students in the form of games, tasks; educational activities are applicable to the rules of the game, educational material is used as its elements.

When using gaming technology in the classroom, the following conditions must be observed [7]:

1) the relevance of the games to the educational objectives of the lesson;

2) accessibility for students of a given age;

3) alleviation of the use of games in the lesson.

Game technologies occupy an important place in the educational process, as they not only contribute to the formation of cognitive interests and enhance student activity, but also perform other functions: a properly organized game, conditioned by the nature of the material, trains memory, helps students develop language skills; stimulates the mental activity of students, develops attention and cognitive interest in the subject; The game is one of the methods to overcome students' passivity.

The important role of fun games, exercises in the lesson is that they help relieve stress and fear when writing in children who feel their own failure, creating a positive emotional flow during the lesson.

The child is happy to complete any tasks and exercises of the teacher. And the teacher thus supports the correct speech of the student, both oral and written. The game helps to create a phonemic perception of the word, enriches the child with new information, activates mental activity, attention and, most importantly, stimulates speech. As a result, children show interest in the Russian language. Not to mention the fact that games in Russian contribute to the formation of spelling ingenuity among a younger student.

An important factor in enhancing educational and cognitive activities is the promotion. Thus, the successful use of rewards promotes the development of interest in cognitive activity; a gradual increase in the amount of work in the lesson as a result of increased attention and well-being; enhancing the creative abilities of children shooting at new jobs, showing initiative in their search. The general psychological situation in the classroom is also improving: children are not afraid of mistakes and help each other [6].

At present, school supplies as the organization of their activities ensure the development of individual abilities and a creative approach to the life of each student, the introduction of various innovative educational programs, the implementation of the principle of a humane approach to children, etc. In other words, the school is very interested in studying the characteristics of the mental development of each individual child. It is no accident that the role of practical knowledge in teacher training is growing. The level of training and education at school is largely determined by the extent to which the pedagogical process is focused on the psychology of the age and individual development of the child. It includes a psychological and pedagogical study of students throughout the entire period of study in order to identify individual development opportunities, creative abilities of each child, enhance his positive activity, identify his personality, punctual assistance in case of lagging in school or unsatisfactory behavior. This is especially important in the lower grades of the school, when purposeful teaching of a person begins, when teaching becomes a leading activity in the womb, creating intellectual properties, as well as the characteristics of the child, in particular, cognitive processes and attitude towards oneself as a subject of cognition (cognitive motives, self-esteem, ability to cooperate, etc.).

The use of gaming techniques in the classroom is an important means of education and training. Often, as a result of such classes, novice undergraduates show interest and learn better, and also develop an interest in reading, which is very important in elementary grades. Many children show great ability, initiative and ingenuity.

During the period of cognitive growth, children of primary school age begin to think about themselves more sophisticatedly. This thinking leads to introspection, a change in the self-concept and self-esteem in children, as well as to the fact that

children compare themselves with others. The level of reasoning of children in primary school can be called immature. For example, they cannot solve problems correctly (in children, the ability to solve problems depends on the age of the child), because the process of solving problems requires abstract thinking. Abstract thinking is the ability to imagine other perspectives or alternatives, as well as the ability to anticipate needs and actions. This means that children in this age group usually do not understand the concept of time (that time is changing). But cognitive skills quickly mature, and problem-solving skills develop accordingly; this means that cognitive development includes an ordered and predictable model. With regard to education, we can learn about the cognitive development of children both from studying their incorrect answers to test tasks, and from studying their correct answers. Piaget and Vygotsky proposed better ways of understanding children's cognition and cognitive development.

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# 中国在解决现代阿富汗问题中的地缘政治作用和影响
# CHINA'S GEOPOLITICAL ROLE AND INFLUENCE IN SOLVING THE MODERN AFGHAN PROBLEM

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抽象。 本文重点介绍旨在解决阿富汗问题的中国地缘政治。 文章分析了北京与喀布尔和塔利班的关系，以及中国影响阿富汗地缘政治进程的机制。

关键字：“一带一路”，塔利班，新疆维吾尔自治区，阿富汗内部对话，CPEC，QCG，上合组织阿富汗联络小组，QCCM。

***Abstract.*** *This article focuses on China's geopolitics aimed at solving the Afghan problem. The article analyzes Beijing's relations with Kabul and the Taliban, as well as China's mechanisms for influencing the geopolitical process in Afghanistan.*

***Keywords:*** *OBOR, Taliban, XUAR, Intra-Afghan dialogue, CPEC, QCG, SCO-Afghanistan Contact Group, QCCM.*

## INTRODUCTION

The People's Republic of China (PRC) has a special role and influence in the geopolitical trends in Afghanistan . Unlike the United States and Russia, China is a major neighbor with a common border with Afghanistan. China has a great influence on the geopolitical processes of Central Asia and South Asia, which determines Beijing's strategy to involve Afghanistan in these processes as well. Also, the escalation of terrorist and separatist activities in China's Xinjiang Uyghur Autonomous Region (XUAR) is directly related to the unstable situation in Afghanistan, the expansion of US influence in the macro-region and the central role of Afghanistan in these processes, factors such as the need to ensure the security of China's One Belt One Road (OBOR) project in the region and the fact that Afghanistan is part of such projects are among China's geopolitical interests in Afghanistan.

## THE MAIN FINDINGS AND RUSULTS

In the future, China can play a major role in the Afghan peace process. This needs to be considered in two important ways.

**First,** Beijing has a major role to play in bringing the Kabul government and the Taliban movement (TM), which are Afghanistan's domestic political forces, into the negotiations. For example, China is the largest investor in the current Kabul government, providing $ 240 million in 2002-2013 and $ 320 million in 2014-2017 to rebuild Afghanistan's infrastructure. China has also signed a $ 3 billion contract with the Kabul government to develop the Aynak copper mine in Logar province [1]. This explains the fact that Ashraf Ghani, who was elected President of Afghanistan in 2014, will pay his first foreign visit to China [2]. According to Chinese expert Zhao Huasheng, China is the first country where the Afghan government has signed an agreement on the extraction and use of its oil and gas resources. This will play a significant role in completely eliminating Afghanistan's dependence on oil and gas imports in the future [3. 6]. Following the withdrawal of NATO troops from Afghanistan in 2014, the Chinese leadership quickly appointed its special envoy to Afghanistan [4]. In addition, as the PRC strengthens military cooperation with Kabul, various media outlets have begun to report on the construction of a Chinese military training base in Afghanistan's Badakhshan province [5]. In this regard, some experts believe that Beijing may play a key role in the future geopolitical processes in Afghanistan. In particular, according to Richard Vays , director of the military-political center of the Hudson Institute, in the future, China may replace the multilateral assistance of the West in Afghanistan [6]. In turn, China also has relevant historical ties with TM. In December 2000, Chinese Ambassador to Pakistan Liu Shulin reportedly held secret talks with "Taliban" leader Mullah Omar in Kandahar on the Uyghur issue [7]. Meanwhile, Chinese officials held talks in Beijing in 2014 with two Taliban (along with Pakistani officials), and in 2015 in Urumqi with former Pakistani intelligence officials and Afghan government spokesman Muhammad Masum Stanikzai [8]. Today, China is also actively involved in the policy of leading and regional power centers to negotiate with the "Taliban" movement in the geopolitical processes in Afghanistan. According to A.Shpunt, Beijing's key role in the Afghan political scene is due to the fact that in June 2018, the Afghan government and the "Taliban" were behind the three-day ceasefire agreement on Eid al-Fitr [9]. This demonstrates Beijing's potential to exert significant influence on two major political forces in Afghanistan - the central government in Kabul and the "Taliban". Chinese diplomats held talks with a delegation led by the head of TM.'s political court in Doha, Abdulgani Barodar, who visited China in June 2019[10]. It should be noted that TM's relations with Beijing have helped to further strengthen the movement's position in the negotiations. Therefore, Abdulgani Barodar's return visit to China in September 2019 [11]. It is closely linked to President Trump's decision to suspend talks between the United States and the "Taliban". Barbara Keleman, an expert at the Central European Institute

for Asian Studies, says the Sino-"Taliban" relationship is pragmatic and will in itself be an alternative platform for US-"Taliban" talks [12]. In this regard, China has announced its readiness to hold an "Inter-Afghan Dialogue" in Beijing in October 2019. Chinese Foreign Ministry spokesman Gen Shuang said China strongly supports inclusive talks between all Afghan forces, including the Afghan government and the "Taliban", and reaffirms that "inter-Afghan talks" will be held in Beijing [13]. However, the "Inter-Afghan Dialogue" scheduled for Beijing has been delayed for various reasons. We believe that there are three main reasons for the failure of China's "Inter-Afghan Dialogue" initiative: the leading military and political influence of the United States in Afghanistan, the failure to announce the results of the Afghan presidential election, and the Islamic factor.

**Second**, China has been actively communicating with the rest of the participants in the Afghan geopolitical game. In particular, China's geopolitical partner in Afghanistan policy is Pakistan. According to the report, China-Pakistan Economic Corridor - CPEC Beijing plans to invest $ 62 billion [14]. For the Pakistani leadership, this corridor will play a key role in reducing India's regional influence through China. China is also the initiator of the "Afghanistan-China-Pakistan" regional cooperation at the level of foreign ministers [15]. Through this tripartite dialogue, the PRC can act as a mediator in resolving disputes between Afghanistan and Pakistan. In this regard, the main aspect of Beijing's geopolitics is that For China, Islamabad will be able to effectively use strategic goals not only to involve Afghanistan in the OBOR project, but also to prevent the threat from Afghanistan to the Xinjiang Uyghur Autonomous Region, and to involve the Taliban in negotiations with the central government of Kabul. In addition, China is the organizer of the Quartet Coordination Group (QCG) established in Islamabad – (Afghanistan, Pakistan, China and the United States) - to stabilize the situation in Afghanistan. Deng Xijun, special envoy of the Chinese Foreign Ministry for Afghanistan, said that the QCG should develop common guidelines for achieving peace in Afghanistan and create incentives for negotiations between the Afghan government and the "Taliban". [16]. Barnett Rubin, a well-known American scholar on Afghanistan, believes that the activities and importance of this group are extremely important because the United States has great influence in Kabul and China in Islamabad [17]. Although "Taliban" representatives were present at the QCG talks on January 11, 2016, the movement's leaders said they would not attend the next meeting scheduled for May. The main reason for this is the killing of TM leader Mullah Akhtar Mansoor in Pakistan's Balochistan province by a U.S. rocket without pilot strike. [18]. These U.S. actions can be seen as an attempt to stop QCG's activities, / especially in Afghanistan and the region, in an attempt to reduce the Chinese factor.

Under the agreement between the United States and the "Taliban", China's policy could be intensified if the US military withdraws from Afghanistan. In these trends, China has the potential to strengthen its role and position in the image of the SCO, the only regional organization that includes the entire Eurasian continent, including Afghanistan and all its neighbors. In the future, Chinese initiatives will play a key role in increasing the effectiveness of platforms such as the "SCO-Afghanistan" dialogue group and the SCO regional anti-terrorist structure.

In addition, China is paying close attention to military factors in Afghanistan, not limited to geopolitical and geoeconomic interests. In particular, the "Quadrilateral Cooperation and Coordination Mechanism in Counter Terrorism" was established at the initiative of Beijing to combat terrorism [19]. It should be noted that the PRC aims to build a regional security ring around itself through this mechanism, which consists of high-ranking military officials from Afghanistan, China, Pakistan and Tajikistan.

## CONCLUSION

The analysis of Chinese geopolitics in solving the modern Afghan problem shows that official Beijing has established close relations not only with the domestic political forces of Afghanistan, but also with regional geopolitical players. This could pave the way for an increase in China's role and influence in the future in relation to the forces in the geopolitical landscape of Afghanistan. Based on the results of the US-"Taliban" agreement, it is expected that the role of the regional factor in the stability process in Afghanistan will increase significantly in the near future. From this point of view, it is expedient to increase the role and influential influence of the SCO in the peace process in Afghanistan. In particular, given the forthcoming geopolitical scenarios in Afghanistan, the issue of admitting Afghanistan as full membership to the full membership of the SCO may also be relevant.

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# 为中小学生教授个人声乐
# TEACHING INDIVIDUAL VOCALS FOR CHILDREN OF PRIMARY AND SECONDARY SCHOOL AGE

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抽象。 这篇文章致力于在个别课程中为中小学年龄的儿童教授学术声音的方法论原则。 基于他们在实践教学活动方面的长期经验，作者制定了目标，程序和技术任务，结果，材料选择原则，工作形式，组织功能以及一些向学童教授个人声乐的特定条件。

关键字：个人声乐，学术歌唱，教学法。

***Abstract.*** *The article is devoted to the methodological principles of teaching academic vocals for children of primary and secondary school age in individual lessons. Based on their own long-term experience of practical pedagogical activity, the authors formulate goals, program and technological tasks, results, principles of material selection, forms of work, organization features and some specific conditions for teaching individual vocals to schoolchildren.*

***Keywords:*** *individual vocals, academic singing, pedagogy.*

Teaching children of primary and secondary school age individual vocals is aimed at their artistic and creative development and is in line with the current trends of modern education - its increasing humanization, increasing the importance of individual development of the child's personality, strengthening the focus on early professionalization of education. The latter is oriented toward pre-vocational training, which is a component of the relevance and pedagogical expediency of this type of creative education: "vocal training in the system of additional musical education for children and adolescents, while maintaining a" common denominator ", has various targets and levels of professionalization - a general developmental <...> and preprofessional. These two approaches change the traditional structure of the educational process, create new learning conditions for students and teachers, require updating approaches to music education, the choice

of its forms and methods ”[1, p. 212–213].

The methodological base of children's vocal training is made up of the technologies of Russian and foreign vocal pedagogy, the achievements of modern collective theory and research in the field of child psychology. A number of methodological positions have the quality of a certain substantial novelty, due to the specifics of the subject of training.

The main methodological provisions include a number of positions developed in the process of practical pedagogical activity. First of all, it is necessary to emphasize that the methodological foundations of children's vocal pedagogy as a whole coincide with the principles and technologies of teaching adult singers; the difference lies in the volume and intensity of the learning load. The methodological substantiation of this provision is the identity of the performance of individual singing tasks (work on breathing, sound extraction, diction, strokes, etc.) at different biological ages.

The relevance of early vocal training is especially dramatically highlighted in comparison with the early professionalization of instrumental musicians; The lag in this respect of vocal pedagogy entails shortening the period of active creative activity of singers. In this regard, it is proposed to conduct vocal specialization at an early age, forming students' perceptions and skills of various singing manners (academic or opera, choral, folk, pop). It should be added that the results of many years of observation lead to the conclusion that the traditional idea of the negative impact of singing at an early age on the outcome of the mutation period is untenable; therefore, there are no good reasons for refusing classes at the homework stage and inhibition of the general musical and professional development of students. At the same time, the correct and careful attitude to the children's voice at the pre-mutational and early mutational stages is extremely important [see about that: 3].

Individual vocal training for schoolchildren also has an important educational function. The group education prevailing in the conditions of a modern school has drawbacks consisting in leveling individuality, slowing down personal development, and the child often assimilating the norms and values of children’s groups of negative orientation. Individual training of such a specific skill as solo singing contributes to the spiritual and emotional development of the student, the disclosure of his creative and artistic abilities, acceleration of personality growth, and the formation of a mature life position based on positive value orientations. Thus, in the process of individual learning, the principles of subject-subject pedagogy are realized, which involves the vision of the student as a unique person, not only formed as a result of external influences, but also actively shaping the world.

The main purpose of teaching individual vocals is to develop among students the qualified knowledge, skills and abilities of academic and pop solo singing.

Comprehensive complementary goals include:

– introducing students to the achievements of world art culture, their development as participants in the cultural process;

– the formation of a system of aesthetic ideas and values in children based on the study of samples of classical musical art;

– the accumulation by students of the experience of methodologically rational development of the studied material with its possible implementation in other areas of humanitarian knowledge;

– the development of personal communication skills in the process of public concert activity in order to exclude further problematic socialization of children;

– a comprehensive solution to pedagogical problems that reflect ethical, aesthetic, technological, communicative, representative and perspective aspects of learning.

Achieving advanced goals is accomplished by solving a number of tasks. The most important of them is the acquisition and improvement by students of knowledge, skills in the specialty in the process of both everyday work and active creative concert-competitive activity. Another task is the harmonious development of students' abilities, the disclosure of their individuality on the basis of both proven and innovative forms and methods of educational activity, gleaned from specialized literature and direct exchange of experience with colleagues. Of utmost importance is the education of students of aesthetic criteria for understanding and evaluating the phenomena of professional musical culture and modern musical production, which can be realized in their future professional activity, and become one of the foundations for educating a qualified viewer and listener. In some cases, in the learning process, the formation of professional motivation to continue learning, prospects for admission to professional creative and specialized musical educational institutions of the middle and higher echelons.

The holistic implementation of the individual vocal training program takes place in three stages, corresponding to the age groups of students - younger, middle and oldest. In view of the procedural nature of educational activities and the age-related heterogeneity of the student population, the introduction of the program is characterized by a multi-level structure and a fundamental absence of deadlines.

As a result of training in the studio of individual vocals, students acquire and improve knowledge, skills in the actual specialty. The presence of high creative activity, social motivation for learning, the ability to implement these prerequisites in a specific activity contributes to the development of a proactive, positive personality aimed at self-development and development of the world. One of the learning outcomes is also the formation of positive ethical and aesthetic ideas in children, good artistic taste, and proper cultural landmarks. The steady interest of pupils in the subject is largely due to the vocational orientation of training, the high intensity of concert and competitive activity, in which individual students

achieve significant achievements.

Achieving results is stimulated by the creation of a motivation system that includes the values of early professional orientation, the disclosure of new communicative opportunities, the social significance of the chosen type of activity, and a positive life perspective. Additional motives of students are the possibilities of self-realization in concert performances. In children of an older age group, one of the main motives may be preparation for admission to professional educational institutions. These factors of interest are reinforced by the motivations of the parents: the harmonious development of the child's abilities, the disclosure of his personality in concert and competition activities.

Training material is selected based on the individual characteristics of students and the effectiveness of the implementation of the creative concept of technology authors, goals and objectives. The determining factors in the selection of educational material are the tasks of constant development of a new repertoire with equal appeal to music of different styles and directions, as well as the use of technological developments, ideas and experience of Italian vocal pedagogy. The learning process is aimed at an authentic interpretation of the material being mastered and its public performance.

The specifics of teaching children individual vocals is due to the impossibility of building an end-to-end sequence of basic topics throughout the training. This is due to the different level of data and the general musical development of students, the uneven pace of their progress, as well as the very different age of the students, even at the initial stage of classes. The most important factor determining the specifics of teaching this type is its creative nature, as well as the fact that the human voice becomes a subject of pedagogical influence - a unique natural phenomenon that cannot be standardized. Moreover, the use of "universal" methods in this area, as a rule, leads to negative results - from the loss of vocal personality to physiological disorders, occupational diseases and complete loss of singing abilities. Thus, the creation of universal thematic plans that precede and determine the educational work in the individual vocal class seems impractical and even dangerous, given the specifics of the learning object.

However, it must be pointed out that at all stages of training a single complex of fundamental problems is solved, the solution of which occurs in the process of mastering specific works.

The most important task of a technical nature is the setting of singing breathing based on the diaphragm and the correct, pure intonation associated with overcoming both intonation and positional falsity. It is accompanied by work on diction in Russian-language works, as well as work on meaningful and phonetically literate pronunciation of texts of works in foreign languages [2, p. 132-137].

The development of a sense of rhythm is based on the development of the

metro-rhythmic basis and the rhythmic pattern of the studied works. A difficult task for children's consciousness is to achieve an understanding of pauses as one of the most important means of artistic expression.

Reproduction of a logically clear, justified author's phrasing, on the one hand, is to some extent provided by the verbal text itself, on the other hand, is one of the most important components of general musical and even intellectual development. This task is accompanied by building a dynamic relief of the work. Finally, in the process of preparing for performances, the culture of stage behavior is discussed and developed along with the development of artistic emotionality.

Due to the creative, procedural nature of training, a high degree of individual differences between students by age, preliminary preparedness, general emotional and intellectual development, uneven state of the types of musical abilities, it does not seem advisable to use formal unified criteria for assessing student achievements.

In the educational process, exclusively practical and independent forms of work are used, such as: individual lessons with students in the classroom (2-3 times a week) involving extensive illustrative material aimed at mastering specific musical works in parallel with the study of musical literacy; independent homework of students associated with the completion of tasks set by the teacher. The selection and predominance of these forms is explained by their greatest effectiveness.

Game forms do not seem appropriate, based on the tasks of pre-vocational training. For all their external effectiveness, game techniques do not give the same significant and high-quality results that are achieved through painstaking continuous work. The achievement of high learning outcomes is also facilitated by the practice of working in a recording studio; visiting concerts of classical music and children's groups, opera and drama theaters.

Learning activities of students are organized in the form of a system of individual lessons, which is due to the specifics of the subject. Along with this, small-group classes (2-3 people) are practiced in connection with the need to create a sense of camaraderie in the classroom, setting more complex tasks (singing for several voices in an ensemble), and expanding the range of artistic solutions to performed works. Classes are taught simultaneously by two teachers - a professional singer specializing in the field of singing technology, and a pianist who combines the functions of an art director, a music styles teacher and accompanist.

The management of educational and cognitive activity is carried out in accordance with the ways of solving the tasks, taking into account the age and personality characteristics of young singers.

The didactic equipment of the educational process includes musical materials,

educational literature on the elementary theory of music.

The technical equipment of classes is determined by a number of requirements. In connection with the specifics of the subject, teaching aids include musical instruments (piano, synthesizer), sound-reproducing and amplifying equipment (computer, mixer with reverb, microphones, etc.), music library. A prerequisite is the availability of appropriate skills in owning these funds not only among teachers, but also among students. In the process of training, the technical base is constantly improved, the potential of electronic musical instruments is more fully revealed, phonograms are recorded, musical instruments are maintained in working condition. Students must be provided with concert costumes by their parents and school administrators. To expand the activities of the vocal studio, active advertising (video and audio recordings), promotion of achievements in the media (social networks, electronic publications, television) are required.

Summing up the results for each topic or section of the educational program is carried out in the form of concert and competitive performances of students.

The composition of the individual vocal studio includes children aged 6 to 14 years. The stability of the student collective is ensured by a serious attitude to the educational process and the tasks set, the goals of vocational guidance that dominate the concept of this subject, and the creative and productive atmosphere of classes. The process of adaptation of newly enrolled children takes place in an extremely short time, due to both the careful selection of students and the individual nature of the classes and the related close attention to the personality characteristics of each child. A feature of working with constantly engaged children is the continuous increase in the complexity of the repertoire.

An important condition for the stability of the collective is a set of traditions, including periodic meetings of pupils with graduates of past years, with famous musicians with the goal of concretizing the orientation of professional and creative landmarks and enriching artistic impressions; constant concert and competitive performances; cooperation with various groups - choreographic, vocal - contributing to the expansion of the horizons and creative opportunities of children.

During the educational process, various forms of contact with the parents of students are necessary, such as: periodic (once a week) conversations on problems arising in the learning process; involvement of parents in the educational process, their monitoring of homework; providing children with conditions for classes.

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# 影响十八世纪至十九世纪圣彼得堡省夏季小屋发展活跃区域的因素
# FACTORS AFFECTING THE FORMATION OF ZONES OF ACTIVE SUMMER COTTAGE DEVELOPMENT OF THE ST. PETERSBURG PROVINCE XVIII-XIX-BEGINNING XX CENTURY

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抽象。 研究了在圣彼得堡省（现为列宁格勒州）领土上十八世纪至二十世纪初的夏季别墅分布区域形成的主要因素。

关键词：俄罗斯避暑别墅，避暑别墅建设，避暑别墅的形成区域，扩散避暑别墅发展的方式，“山寨”。

***Abstract.*** *The main factors that influenced the formation of the distribution areas of summer cottages in the XVIII – early XX centuries in the territory of St. Petersburg province (now the Leningrad Oblast) are studied.*

***Keywords:*** *Russian summer cottage, summer cottage construction, areas of formation of summer cottages, ways of spreading summer cottage development, "cottage settlement".*

In Russia, the tradition of suburban recreation has developed in three main versions: a) in the residences of a suburban courtyard; b) in country estates; c) at the "dachas" - the most popular and democratic kind and type of recreation [1, p. 187].

Country movement in Russia as a type of recreation arose in St. Petersburg from the very beginning of the founding of this city on the Neva River in 1703. The author explored the topic "Summer cottage construction of the St. Petersburg province" for many years. The result was the defense of a dissertation on the topic [2, p.1-25]. And to this day in Russia, the social significance of the "summer lifestyle" is preserved - rest in a personal or rented summer cottage. It is especially important to relax in the “country house” today - during the spread of the "COVID-19" coronavirus infection, when it is undesirable to leave the country for the purpose of recreation.

In this article, the author considers a group of conditions that determined the development of areas of country construction, which are an integral part of the recreation area in the vicinity of St. Petersburg in Russia for two and a half centuries. The questions studied allowed us to determine the nature of the impact of various factors on the placement of vacation spots in the St. Petersburg province: 1) Change in the boundaries of the city, 2) Growth of the industrial zone, 3) The availability of convenient transport links, 4) The existing system of resettlement and border boundaries of land holdings, 5) Town-planning dominants, 6) Natural conditions (type of landscape and proximity to water). Let us consider in more detail each named factor.

Change in the boundaries of the city entailed the shift of recreation areas in the direction of removing the radius of accessibility of cottages from the city center. Petersburg "country settlement" began in the immediate suburban surroundings. The spread of "summer cottage" construction took place over time with a gradual increase in the radius of recreational areas (in accordance with the growth and expansion of the city). In addition to St. Petersburg, the centers of summer cottage construction have become large suburban estates and royal suburban residences.

Growth of the industrial zone, The city of St. Petersburg, which surrounded the capital of the province with a tight ring, influenced the choice of vacation spots in areas more remote from the city. As early as 1801, the first industrial enterprise appeared on the Peterhof road ... and since 1868 the Putilov factory expanded, enterprises were also being built in the Yekaterinhof area. This section of the Peterhof road closest to the city by the end of the XIX century turned into an industrial area. Industrial zones, which were formed mainly at the beginning of the XX century along the external borders of the city, predetermined the further development of the city in the South direction and the spontaneous development of residential quarters along new transport routes. Changing the territory of the city throughout its historical development entailed the expansion of the boundaries of the recreation zone (that is, the "green recreation zone"). The construction of cottages has moved beyond the "industrial belt" (zone of enterprises, factories and facilities). The growth of land rent and the search for cheap labor prompted the owners to place industrial enterprises outside the territory of St. Petersburg, that is, in the county towns of the province. By the number of large enterprises among the counties, in the first place were: Petersburg, followed by Tsarskoye Selo, then Shlisselburg and Petergof counties. Industrial development in the province influenced summer cottage construction in two ways. On the one hand, part of the traditional holiday destinations were gradually supplanted and turned into industrial zones; and, on the other hand, the formation of transport highways made more remote corners of the territory accessible for summer holidays.

The availability of convenient transport links had a significant impact on the placement of vacation spots. A feature of the "country lifestyle" has always been a constant connection with the city. The need for quick and convenient communication with it is the reason for the spread of country development along the main transport links (water and land). Moreover, the development of railway transport played the most significant role.

The appearance of “summer residences” on the urban islands, along the Neva River and the coast of the Gulf of Finland, depended in many respects on the development of the shipping company. Rivers and canals were the main connections of suburban transportation at the earliest stages of country construction in the vicinity of St. Petersburg. Steamship communication was established: on Aptekarsky Island, Black River, New Village, on the Stone and Krestovsky Islands, in Polyustrovo, in Lakhta, in Peterhof and Kronstadt. This is evidenced by reports of out-of-town trips and excursions in the ancient "Country Guidebooks" [3], [4], [5], [6], [7]. The ship’s marinas were located at several points in the city: by the Summer Garden, on the rivers: Bolshaya and Malaya Nevka, from Liteiny Bridge, from 14 and 17 Lines (streets) of Vasilievsky Island [8, p. 25]. Despite the great importance of waterways, in the middle of the XIX century they could no longer satisfy the needs of the population and land routes (roads of various ranks) began to bear the main burden of transporting summer residents. The highway between Shosseyny was saturated between: Petersburg, Gatchina, Ropsha, Oranienbaum, Peterhof, Krasny and Tsarskoye Selo, and Pavlovsky. Country roads were: Warsaw and Primorsky highway, as well as tracts: Vyborg, Moscow, Narva, Pargolovsky, Shlisselburg.

In the last quarter of the XIX century, a decrease in the importance of waterways and highways in the economic and suburban relations of the province was noted. The development of railways, they became the main city-forming factor for new construction, including country. Country life developed along almost all railways. But the most active summer cottage construction took place along two roads: the Warsaw Railway (to the SOUTH) and Finland (in the NORTH).

The existing system of resettlement and border boundaries of land holdings noticeably affected the location of summer cottages. The distribution of summer cottage construction on the lands of noble estates, landowners and monastic estates, as well as near existing settlements, testifies to the invariability of the principles of choosing a place for a summer residence (despite its temporary nature). The private land use system influenced the geometry of allotments of land (owned by someone else), the placement of summer cottage construction. Socio-economic and political conditions for the development of Russia in the XVIII-XIX centuries determined the distribution of valuable agricultural land mainly among the nobility. The lands belonging to the wealthy metropolitan nobility were very large. “The

average size of noble land ownership in the province amounted to 1170 acres" [9, p. 131]. The largest number of landowner park complexes are located in Volkhovsky (79) and Luga regions (72), in Volosovsky (60), Vyborg (36), Gatchinsky and Tosnensky districts, 32 park manor complexes each.

In the second half of the XIX century the process of disintegration of large estates began, including villages with their lands. After the transfer of these lands to the ownership of peasants, the "regulation" of the landscape and its arrangement ceased here. The process of fragmentation of the province's land holdings led to the fact that the former large estates broke up into separate economic units belonging to different owners. Thus, a lot of small estates were formed around Petersburg, the lands of which were leased or sold over time for the construction of summer cottages.

The Stolypin agrarian reform of 1906 (the active transfer of land to private property - the redemption of land from the state and communities) significantly changed the nature of construction. In addition, during the agrarian unrest of the First Russian Revolution (1905-1907), many manor houses and buildings of the XVIII century burned down. The land of estates was sold to random people, entrepreneurs, rebuilt and divided, cut into summer cottages (construction of cottages). The suburban construction of the province at the turn of the XIX-XX centuries was concentrated in the hands of entrepreneurs or companies buying up the land of the previous owners in the estates of Shuvalov, in Thais, in Kartashevskaya, in Vyritsa, in Siverskaya (whose lands previously belonged to Baron V.V. Frederiks, Prince P. H. Wittgenstein, P.N. Zinoviev, V.F. Nagel, Novinsky, Nogin and others).

Selling land or renting out under dachas brought significantly greater benefits than agricultural production. Some owners had several summer houses (fully furnished) and rented or sold them. Many new landowners turned their estates into summer cottages, such as: "Tanino" in Kuokkale [10], "Bohumilovka" near Oranienbaum [11], "Vaivara" in Merrekül [12], the estate of Von der Flit in Iljo [ 13], the Ligovo estate on the Baltic Railway [14]. Country settlements are diverse, their typology is the subject of an article by the author [15].

Town-planning dominants, traditionally occupying a prominent place in landscapes, were of no small importance when choosing places for summer cottage construction. The role of dominants from ancient times was played by churches. As you know, they were placed on hills and served as a means of visual connections: external (as landmarks) and internal (within the settlement). Since the majority of summer cottages (Belogorka, Vyritsa, Siverskaya, Kartashevskaya, Lesnoy, Olgino, Pargolovo, Thais, Udelnaya, Chesma, Shuvalovo and many others) had religious buildings on their territory, it is legitimate to say that churches were an integral element of the cottages places In those cases, if the cottage settlement arose in previously undeveloped areas, then the construction of a church or chapel necessarily began there.

Natural conditions (type of landscape and proximity to water) were one of the most significant conditions for the emergence and development of summer cottages. Analysis of the location of summer cottages in the province according to the natural landscape characteristics revealed two types of settlement of summer cottages: 1) settlements on the watersheds and 2) settlements near the water. The first group is the smallest, since most summer cottages were formed nevertheless, near water bodies. The second group is numerous, many suburban areas and suburban settlements were located near the water (rivers, lakes, sea coasts). The study of the architecture of summer cottages on the shores of the Gulf of Finland is devoted to an article by S. S. Levoshko [16]. According to the results of the study, it was found that the listed types of this group are widespread in the province and make up about 90 percent in relation to the total number.

The considered range of issues allows us to conclude that the development of the areas of active summer cottage development was determined by the factors of the natural, natural-historical environment. The main elements of the landscape: rivers, road network, settlements, architectural dominants had a significant impact on the location of the "bushes" (ranges) of historically developed country settlements. Crucial was the relief, one of the most stable elements of the landscape. As the analysis of anthropogenic landscapes has shown: in the conditions of the already established system of rural settlement, holiday villages occupied the most interesting places in the artistic sense. I.e, summer development of territories coincides with zones of the most valuable landscape.

In 1881 and 1889, interesting materials were published on the study of microclimatic characteristics of various regions of the province [17, p. 106]. The mere fact that such work was carried out at that time speaks quite convincingly for itself. Zones unsuitable for country rest and vice versa were identified: the places most attractive for this type of vacation were identified. The near and remote neighborhoods of the city were examined in the following directions: Vyborg tract; Finland Railway; Northeast coast of the Gulf of Finland; Narva tract and the Southwest coast; Polyustrovsky site; Moscow highway; Shlisselburg tract and the banks of the Neva River. It is these areas of distribution of summer cottage construction (the main directions, paths and zones of summer cottage recreation of Petersburgers) and later, at the beginning of the XX century, were also places of summer cottage construction. The boundaries of the study of the author of this article were determined in 1917 (a revolution took place in Russia and the historical and economic situation changed dramatically).

The significance that was attached to the beauty of the place is evidenced by visual acquaintance with the summer cottages of the region. For example, in beautiful scenic areas: Borovoye, Volna, Zaozerye, Ilzho, Kuokkala (now Repino), Fruit, Preobrazhenskaya, Siversky, Skachki, Syabero (by the name of the lake) and many

others. To date, the criteria for assessing the aesthetic categories of the landscape have not yet been sufficiently developed (although "aesthetic therapy" is considered as an element of rehabilitation treatment and relaxation), but our predecessors knew well the healing power of the beautiful landscape.

If several directions are quite clearly distinguished in the general settlement system of St. Petersburg province (now the Leningrad region), then in the system of cottage development of territories by the beginning of the XX century two directions were clearly distinguished: Northern and Southern. The general picture of the Petersburg summer cottage construction is presented in the author's article (periodization, typology of settlements, classification) [18].

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# 化妆品填充剂的超声波识别：文献综述
# ULTRASONIC IDENTIFICATION OF COSMETIC FILLERS: LITERATURE REVIEW

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抽象。 当前，化妆品填充剂被广泛用于填充皱纹，纠正与年龄有关的皮肤变化的美学目的。 同时，很难从患者那里获得有关填充剂注射史的足够的记忆记录信息，与此相关的是，使用这些药物时出现并发症的病例数量正在增加。 与其他成像方法不同，近几十年来，超声诊断技术已成功用于检测和识别常见类型的化妆品填充剂，并且已成为可视化皮肤表层以对抗这些并发症的方法。

关键字：化妆品填充剂； 皮肤超声检查； 皮肤科超声检查，皮肤超声检查。

***Abstract.*** *Currently cosmetic fillers are widely used for the aesthetic purpose of filling wrinkles, correcting age-related skin changes. At the same time, obtaining adequate anamnestic information about the history of filler injections from patients is often difficult, in connection with this, the number of cases of complications when using these drugs is growing. Unlike other imaging methods, ultrasound diagnostics in recent decades has been successfully used to detect and identify common types of cosmetic fillers and has become a method of visualizing the surface layers of the skin to combat these complications.*

***Keywords:*** *cosmetic fillers; ultrasound examination of the skin; Ultrasound in dermatology, ultrasound of the skin.*

**Introduction**

**Purpose of the work -** conduct a review of the most common cosmetic fillers that are used in clinical practice. Highlight the main ultrasonic characteristics of the most common cosmetic fillers. Give an idea of the reasons for conducting an ultrasound examination.

**Materials and methods.** A search was carried out for scientific and medical literature on the keywords “cosmetic fillers”, “ultrasound examination of the skin”, “ultrasound in dermatology”, “ultrasound of the skin”, “skin fillers” in the Medline, E-Library, PubMed, Science Direct databases. Depth of search — from 1997 to 2016.

**Discussion**

Fillers – are injection drugs that are used in cosmetology as filling for the correction of cosmetic defects with a slight lack of tissue. Fillers are used to reduce the depth of wrinkles, nasolabial folds and folds in the corners of the mouth, as well as to give additional volume to the face in the lips, cheekbones, cheeks and chin.

Cosmetic fillers are mixtures of exogenous deposits. They are composed of nanoparticles or microspheres. Fillers are used for the aesthetic purpose of filling wrinkles and correcting age-related skin changes [1] According to the American Society of Aesthetic and Plastic Surgery [2] in 2013, an increase in the number of cosmetic procedures was noted by 279% compared with 1997. Among them, filler introduction procedures increased by 521%, and only in 2013 9.5 million procedures were performed. Injections with hyaluronic acid (HA) are the second most popular non-surgical cosmetic procedure, and in 2013 more than 1.8 million procedures were performed, which is 31.5% more compared to the previous year. I would like to note that the total income from injectable drugs (i.e. all types of cosmetic fillers and botulinum toxin) increased to 21% by 2013. Over the past five years, the trend towards an increase in the use of cosmetic fillers has continued. From 2013 to 2015, revenues from these procedures amount to 50 billion dollars per year, while there was an increase of 15%, and by 2016 this figure increased by 22% and amounted to 61 billion dollars per year. In the future, further growth of income from cosmetic procedures is expected [3].

In the Russian Federation, injections of hyaluronic acid are also very popular. The number of procedures performed from 2000 to 2010 increased by 20 times and amounted to 40% of all injection procedures. According to the BusinesStat from the report “Analysis of the market for cosmetic procedures”, its growth in recent years is significant. So, for example, in 2014–2015 it amounted to 21% (160 million rubles), and in 2015–2016 there was an increase of another 1.5%. [4]. It is noted that 57% of these procedures are performed in offices that are not licensed for these procedures [3].

A tremendous increase in the use of these excipients occurs as a result of a sociological phenomenon that consists in finding ways to avoid the devastating effects of aging. Skin and especially the face are critical for most people, both psychologically and socially.

Ultrasound examination is an effective method for detecting and identifying the most common fillers that are used in clinical practice [5-8]. Ultrasound may also be useful for the diagnosis of concomitant complications and facilitate the treatment of these patients [1.9].

**Types of cosmetic fillers**

Fillers can be divided into biodegradable and inert (non-degradable) gels.

Biodegradable fillers have the ability to naturally absorb over time. Representatives of biodegradable gels are fillers based on hyaluronic acid. But now there are some new forms of HA, such as high density HA. This is a more viscous and durable filler due to its combination with some hydrophilic and synthetic molecules, which can turn usually easily degradable HA into a long-term semi-synthetic component [10]. Hyaluronic acid is also often mixed with lidocaine for pain relief.

Non-degradable fillers do not undergo natural decay in the skin, even after a long time [1.11]. The most common synthetic non-degradable fillers are silicone in its pure or oily forms, such as polymethylmethacrylate (PMMK), and polyacrylamide gel (PAG). Another representative of non-degradable fillers is calcium hydroxyapatite (CHA). Silicone oil is not approved by the U.S.A. Food and Drug Administration for use in cosmetics. However, its use is approved in some countries, and in other countries there is a well-known black market for silicone oil preparations for cosmetic injections. In the Russian Federation, the use of silicone oil preparations is officially prohibited, but there is still an illegal import of these drugs from other countries, which leads to annual cases of complications after the placement of silicone oil preparations. Polymethyl methacrylate is most often used in small quantities to increase the volume of soft tissues in some orthopedic, plastic surgeries or cosmetic procedures. There are countries in which there are non-standard uses of very large volumes of polymethyl methacrylate [5]. The advantage of this type of drug is its long-term presence in the tissues, in this regard, the drug is used in patients with facial lipodystrophy, which is very common in people with immunodeficiency virus. These drugs are used for modeling and remodeling the surface of the zygomatic, submolar, preauricular and infraorbital regions. [12,13]

Due to the large growth and demand for “beauty injections”, the number of reports of complications has increased sharply in recent years. Using fillers may have some difficulties. Today, there are a large number of different commercial products for cosmetic procedures. In this regard, patients with dubious injection histories are often found. They perform filler injection procedures with different specialists (dermatologists, plastic surgeons, maxillofacial surgeons, cosmetologists) in various medical centers, and sometimes in different cities or countries.

Therefore, this information, anamnestically obtained from these patients, may not be reliable. In addition, some patients are shy for various reasons to talk about the experience of filler injection. Other patients simply do not remember which drugs they were given. This factor may be critical in cases of late side effects from filler injections. In this regard, the observed clinical symptoms may indicate complications after the introduction of fillers, but may also be a manifestation of dermatological diseases.

The main side effects of gel injections are palpable densities and tubercles, erythema, swelling of the skin, and focal scleroderma, Quincke's edema. More rare side effects: fistulas, skin necrosis due to intra-vascular filler injection, thrombosis of large vessels, impaired microcirculation [1,14,15]. These side effects are often observed when a patient is injected with degradable and non-degradable drugs at the same skin site at different times [16]. With silicone oil, these side effects can be very late in their appearance, can appear 8-10 years after injection and can lead to severe disfigurement of the face, like an autoimmune reaction to a foreign body. Any complications after the introduction of fillers have a very important psychological aspect for patients, since the most common area of filler administration is the skin and soft tissues of the face.

**Hardware settings for filler visualization**

Ultrasound can detect and identify the most common types of cosmetic fillers. To identify these components, multichannel ultrasonic machines that work with high-frequency sensors (from 8 to 18 MHz) are usually used. A large amount of gel is applied to the skin, then a careful focus is made on the zone of interest. The following ultrasonic modalities are used to identify fillers: B-mode (gray scale), color or energy doppler, spectral doppler. Panoramic studies and three-dimensional reconstruction with a capture duration of 5 to 8 seconds are used to optimally demonstrate skin structures. The ultrasound settings include very low pulse repetition frequency (PRF) and very low wall filter (WF) values. It is also recommended to use low values of Doppler color gain, below the noise threshold [17].

Terminological issues are actively discussed in the scientific literature. It is indicated that the term "dermal fillers" is incorrect because most of the component is actually deposited in the hypodermis. Apparently, this is partly due to the length of the needles, which are usually in the kit with injectable drugs. In this regard, the term cosmetic fillers is preferred [1]

**Ultrasonic characteristic of fillers.**

In an ultrasound scan, pure HA is a small hypoechoic pseudocystic structure that gradually decreases in size over a period of 3 to 6 months [5–8, 18]. Hyal-

uronic acid mixed with lidocaine is usually represented by internal echogenic inclusion within the pseudocystic structures. It can be detected in the skin from 3 to 6 months. HA of high density, which is often used to restore the shape of the cheeks and hands, looks like anechogenic pseudocystic structures of small and medium size, which are localized in the deep layers of the hypodermis or close to the periosteum. HA of high density decrease in size slowly and retain their effect for more than 2 years. Often, oval hypoechoic solid nodules can be detected near the injection site of high density HA due to the development of granulomatous local inflammation.

Pure silicone looks like oval anechoic lacunar areas that do not change in shape or size over time. Silicone oil looks like hyperechoic deposits that cause posterior acoustic artifact [5,8,18]. This blurry white silicone oil pattern is called the "blizzard". Sometimes mixed formulations of pure and oily silicone can be followed by ultrasound. Polymethylmethacrylate looks sonographically in the form of hyperechoic points with a posterior comet tail artifact. Calcium hydroxyapatite is visualized by ultrasound in the form of hyperechoic deposits with an artifact of the posterior acoustic shadow due to the presence of calcium. [7.20].

Poly-L-lactic acid is another synthetic product that is used in some countries. It is a biostimulant that enhances collagen production. It is used for introduction into subcutaneous fatty tissue or superperiosteal tissue to increase the volume of soft tissues. This component dissolves in water during injection, but water is rapidly reabsorbed, usually in the first 2 weeks [18,21]. Sonogrophic there is increased echogenicity and thickening of the injection site. However, often no focal deposits within the area of increased echogenicity can be detected [18].

In color Doppler studies, there is an increase in vascularization with slow blood flow. Thin arterial vessels may be visible near the filler deposits, especially due to the attachment of an inflammatory reaction [22].

**Other methods of visualization of cosmetic fillers**

Other imaging methods were used to study the excipients, such as magnetic resonance imaging (MRI) and positron emission tomography, computed tomography (CT). However, only silicone shows a specific MRI picture that allows it to be identified in tissues. This discovery was made during studies of pure silicone present in breast implants and complications after rupture of these implants [23]. These studies make it possible to differentiate water, fat, and silicone [24.25]. Other authors have reported using MRI to study poly-L-lactic acid and calcium hydroxyapatite deposits. But still, not one research method can fully identify fillers in the skin and subcutaneous fat.

**Conclusions**

Ultrasound is currently a first-line imaging technique for working with cosmetic fillers. The method allows you to detect, identify and evaluate the echographic picture of a wide range of world famous cosmetic fillers. This visualization method can be used to map skin areas before the procedure, which can be useful for assessing the presence of previously introduced cosmetic fillers and their identification. Injection of cosmetic fillers should be a technique based on ultrasound monitoring before, during and after the procedure. In the scientific and practical aspect, ultrasound can be used to test the durability and safety of cosmetic fillers. It should be borne in mind that histological analysis may be limited due to the usually deep hypodermal, and sometimes periosteal, location of the drugs. Finally, the use of ultrasound is of paramount importance in the diagnosis of complications arising from the injection of cosmetic fillers, which can mimic other dermatological diseases.

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# 妇女在妊娠中使用益生菌罗伊氏乳杆菌和形成婴儿的食物耐受性
# THE USE OF THE PROBIOTIC *LACTOBACILLUS REUTERI PROTECTIS* BY WOMEN DURING GESTATION AND THE FORMATION OF FOOD TOLERANCE IN INFANTS

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抽象。儿童及其母亲的口腔耐受能力的发展与胃肠道（GIT）的状态及其屏障功能密切相关。

在监督下有248对母子。孕妇的随访时间为妊娠的最后三个月和出生后1个月内。主要人群包括148名孕妇，分别接受了4个月的低变应原（HA）饮食和1个月的益生菌罗伊氏乳杆菌保护菌。对照组由100名未接受益生菌并食用常规饮食的孕妇组成。在主要组中，根据食用的HA饮食确定了三个亚组。出生的孩子以及他们的母亲被分为主要组（148个婴儿）和比较组（100个孩子）。观察儿童的时间为1–12个月。

为了定量测定儿童母乳和辅酶原物中牛乳蛋白和山羊奶的变应原特异性IgE和IgG抗体，使用了非竞争性酶联免疫吸附法。肠道菌群进行了定量研究。为了表征孕妇肠道菌群的代谢活性，研究了共脯氨酸中的单羧酸脂肪酸。

在孕妇的最后妊娠阶段使用HA饮食并添加益生菌罗伊氏乳杆菌保护菌，可改善孕妇肠道菌群的代谢活性，降低其所生子女对牛乳和山羊乳致敏的频率和程度。

关键词：孕妇，母亲，儿童，肠道菌群，一元脂肪酸，口服耐受性

***Abstract.*** *The development of oral tolerance in children is closely related to the state of the gastrointestinal tract (GIT) and its barrier functions, both in the child and his mother.*

*Under supervision were 248 pairs of mother-child. The duration of follow-up for pregnant women was the last three months of gestation and within 1 month after birth. The main group consisted of 148 pregnant women who received a hypoallergenic (HA) diet for 4 months and the probiotic Lactobacillus reuteri Protectis for 1 month. The comparison group consisted of 100 pregnant women who did not receive probiotics and consumed the usual diet for pregnant women. In the main group, three subgroups were identified depending on the consumed HA diet. The children born, as well as their mothers, were divided into the main (148 infants) and comparison groups (100 children). The duration of observation of children ranged from 1-12 months.*

*For the quantitative determination of allergen-specific IgE and IgG antibodies to cow's milk protein and goat's milk in breast milk and coprofiltrates of children, a non-competitive enzyme-linked immunosorbent assay was used. Intestinal microflora was studied quantitatively. To characterize the metabolic activity of intestinal microflora in pregnant women, monocarboxylic fatty acids in coprofiltrates were studied.*

*The use of HA diets with the inclusion of the probiotic Lactobacillus reuteri Protectis in women at the last gestational stages improved the metabolic activity of the intestinal microflora of pregnant women, reduced the frequency and degree of sensitization to cow and goat milk in children born to them.*

***Keywords:*** *pregnant women, mothers, children, intestinal microbiota, monocarboxylic fatty acids, oral tolerance.*

One of the causes of food allergies (FA) is a violation of the formation of oral tolerance in children predisposed to atopy [1, 2, 3]. The development of oral tolerance is closely related to the state of GIT and its barrier functions.

The lack of sensitization in healthy children to food allergens is probably due to the impossibility of their access to immunocompetent cells and other immune defense factors through the intestinal wall due to the destruction of the native protein by digestive enzymes, the inability to overcome intestinal epithelium and mucous layer by antigens, as a result of which there is no contact with antigen-presenting cells and, as a result, oral tolerance develops [4]. Factors of mucosal and systemic immunity are involved in the formation of oral tolerance [5]. After the birth of a baby, the differentiation of intestinal-associated lymphoid tissue predominated by food antigens and bioxenogens of T-naive cells is probably carried out with the participation of IgA and growth transformation factors secreted by maternal mammary epithelial cells [6, 7].

In recent years, the role of intestinal microflora in the induction and maintenance of oral tolerance, confirmed in experimental models, has been discussed. In the process of colonization of the intestines of a child, such microflora becomes

dominant due to the increased ability of secretory cells of the intestinal mucosa to stimulate the synthesis of mucin complementary to it. On the other hand, bifidobacteria and lactobacilli inhibit the growth and adhesion of pathogenic intestinal microflora, stimulate the synthesis of secretory IgA, reducing the risk of inflammatory processes in the GIT mucosa in the first months of a child's life [8, 9, 10, 11]. It is likely that numerous components of the membranes of milk fat globule membranes, nucleotides, pro- and prebiotics, mucins and IgA synthesized by the cells of the mammary gland of the mother, presented by microflora from the oral mucosa, nose and conjunctiva, as well as from the surface of the skin of the baby's face, allow for the immune selection of microflora that colonize the intestines of the baby during breastfeeding [12-21]. During the period of natural and mixed feeding, due to the immunoglobulins and allogens supplied to breast milk, the maturation and differentiation of naive B cells and T cells under priming conditions with nutrogens is oriented to the acquisition by mature cells of a phenotype that allows inducing and maintaining oral tolerance to allergens presented by commensal microflora. Due to the presence of growth transformation factor (TGF-β) in breast-fed breast milk, immunoregulatory $Th_3$ cells, which produce immunoregulatory cytokines that switch B1 cell synthesis to IgA synthesis, functioning as one of the leading moderators, become information carriers induction of oral tolerance in the first months of an infant's life [6, 22]. The production of TGF-β in the intestine is largely stimulated by aerobic flora, mainly bifidobacteria and lactobacilli. At the same time, colonization of the intestine with lactic acid bacteria begins only from the third day after birth in children who are breast-fed, and they become the dominant microflora only by 4-7 days. Deficiency of TGF-β, caused by the absence or low content of bifidobacteria and lactobacilli in the first days of a newborn's life, is compensated by its high level in colostrum compared with mature human milk [18, 21, 23]. Mucins and IgA secreted by mammary gland epithelial cells to immunogens presented by aerobic microflora of the mother's intestines create a protective barrier for strains of bifidobacteria and lactobacilli in the baby's intestines, which become the dominant microflora [24]. On the contrary, IgA produced in the mother's body to antigens presented by *Escherichia Coli* and other gram-negative bacteria inhibits the adhesion of these microorganisms to the intestinal mucosa of the baby, which is of great importance in the first three days after birth, when such microflora dominates in the newborn. It is also known that one of the main proteins associated with the membranes of milk fat globules, lactadherin binds and neutralizes viruses, reduces mucosal inflammation, normalizes permeability, and participates in the restoration of damaged intestinal epithelium [25, 26, 27]. The direct interaction of the surface of the membranes of the fat globules of milk with the intestinal microbiota through the glycoproteins in their composition has been established. The result of this interaction is the selective prevention of the

binding of microorganisms to the mucosal layer of the intestine. The interaction of *Lactobacillus reuteri* with the membrane components of milk fat globules in dairy products is currently being studied [28]. Breast milk contains a large number of complex oligosaccharides, which act as natural prebiotics to enrich the beneficial microflora. It was shown, that Bifidobacterium longum subsp. infantis, Bacteroides fragilis, and *Bacteroides vulgatus* can both efficiently metabolize human milk oligosaccharides and slow down or inhibit the growth of *Enterococcus, Streptococcus, Veillonella, Eubacterium, Clostridium,* and *Escherichia Coli* [29].

It was found that *Bifidobacterium lactis* and *Lactobacillus johnsonii* can induce oral tolerance associated with humoral immunity, while *Lactobacillus paracasei* induces and maintains a cellular immune response. *Lactobacillus paracasei* NCC 2461 *in vitro* stimulates regulatory T cells to produce the transforming growth factor TGF-β, IL-10 and cytokines involved in the induction of oral tolerance. When using *Lactobacillus paracasei*, less actively colonizing the intestines, oral tolerance was more pronouncedly induced and maintained. Numerous studies have shown the positive effect of probiotics containing bifidobacteria on the intestinal microflora and the immune system of children. It is believed that the combination of probiotics and membrane components of milk fat globules in infant formula promotes the development of mutually complementary defense mechanisms, which is extremely important for the normal growth and development of the child, as well as the formation of his health (Patent № CN10266528 A. Infant formula with probiotics and milk fat globule membrane components. 2009). In addition, the preventive effect of *Lactobacillus reuteri Protectis* was established in women in late gestation and lactation, as well as in children of the first six months of life [30].

However, the question of the effect of various HA diets and the administration of probiotics in pregnant women on the formation of food tolerance in children born has not been fully studied. Therefore, the aim of this work was to study the effect of various HA diets and the probiotic *Lactobacillus reuteri Protectis* used by pregnant women on the microbial landscape of the intestine and the formation of nutritional tolerance to milk proteins in children born to them.

**Materials and methods:**

The study included 248 pregnant and lactating women aged 21 to 42 years. In 193 (77.8%) women, the pregnancy was first, in 55 (22.2%) - repeated.

*Criteria for inclusion of pregnant women in the study:*

- Remission of chronic diseases and the absence of exacerbations
- Lack of acute allergic reactions/diseases
- Lack of taking biological products (primadofilus, normoflorins, acipol, linex, bifidumbacterin),
- Lack of goat milk and products based on it in the diet of pregnant women

- Signed informed consent

The duration of follow-up of pregnant women was the last three months of gestation and within 1 month after birth. A comparative analysis of pregnant women with first and second pregnancies showed that pathology of pregnancy occurred in almost all women (from 43% to 62% of cases). A high frequency of allergic diseases in women with repeated pregnancy was noted (64.0% versus 41.2%). More than 60% of pregnant women had allergic and digestive diseases. Only 1/3 of women with a first and second pregnancy were healthy. Intolerance to milk and dairy products in women was noted in 27.7% and 26.0% of cases, respectively. Given the high frequency of gastroduodenal pathology and allergic diseases in the observed pregnant women, hypoallergenic (HA) diets were offered to women [31, 32], taking into account their somatic health. Analysis of the consumed average daily food intake in pregnant women observed before HA diets showed that the content of milk and dairy products in the diet of pregnant women did not exceed the recommended intake. However, there was an increased consumption of cottage cheese and cheese.

The study identified two groups of pregnant women. The first group (main) consisted of 148 women who received a hypoallergenic diet (HA) in combination with the probiotic Lactobacillus reuteri Protectis. An HA diet was proposed for pregnant women in this group, with the exception of foods with a high sensitizing potential (nuts, citrus fruits, honey, eggs, seafood) and individually intolerable foods. The comparison group consisted of 100 pregnant women who received the usual diet for pregnant women [32] and did not receive the probiotic Lactobacillus reuteri Protectis. In the main group of pregnant women, three subgroups were distinguished: the first subgroup consisted of 37 women who followed the HA diet with the exception of products belonging to the group of obligate allergens. The second subgroup included 29 mothers who followed the HA diet and took the probiotic Lactobacillus reuteri Protectis. The third subgroup included 82 women who followed the HA diet with the replacement of whole cow's milk with whole goat's milk and took the probiotic Lactobacillus reuteri Protectis. Consumption of essential nutrients and energy was in line with the recommended standards for pregnant women [32]. The probiotic was well tolerated by pregnant women; no side effects and complications were observed.

Follow-up observation was conducted for 248 pairs of mother - child. In women of the main group, 103 (69.5%) boys and 45 (30.5%) girls were born, in the comparison group of boys there were 76 (76%), girls - 24 (24%). Newborns were divided into 2 groups - the main 148 infants and a comparison group of 100 children. The duration of observation of children ranged from 1-12 months. All newborns underwent general clinical observation, assessment of physical development, study of intestinal microflora in the first month of life, and determination of allergen-specific IgE and IgG antibodies to cow and goat milk proteins in coprofiltrates.

In 61 nursing mothers of the main group and 64 women in the comparison group, allergen-specific IgE antibodies to cow and goat milk proteins were determined on the 20th day of lactation.

Allergen-specific IgE and IgG antibodies to cow and goat milk proteins in breast milk and coprofiltrates of children were determined using non-competitive enzyme-linked immunosorbent assay [33].

The study of intestinal microflora was carried out according to the standard technique [34]. Evaluation of the results was carried out using standards approved by the industry standard 91500.110004-2003 of the Ministry of Health of Russia.

To characterize the state of metabolic activity of anaerobic intestinal microflora in pregnant women, monocarboxylic fatty acids (MFA) were determined in coprofiltrates [35, 36]. Assessment of MFA indicators was carried out in pregnant women before and against various HA diets with and without the use of the probiotic Lactobacillus reuteri Protectis, as well as depending on the presence of somatic pathology.

Processing of the results of the study was carried out on a personal computer using the STATISTICA software package from Stat SoftInc. (USA). The mean values of the sign (M), standard errors of the mean sign (m), and standard deviations ($\sigma$) were calculated. Using the Student criterion, the significance of differences (t) was evaluated at probability values $p < 0.05$. Data in the groups were regarded as statistically significant at $p < 0.05$ or statistically highly significant at $p < 0.01$. The Gehan – Wilcoxon criterion was calculated — this is a nonparametric analogue of the paired Student t-test (t-test for dependent samples) for comparing the "before and after" indicators [37]. Also, to assess the significance of differences between two independent samples by the level of the characteristic quantified, a non-parametric Mann-Whitney criterion was calculated, which makes it possible to identify differences in the parameter value between small samples regardless of the nature of their distribution. Data in the groups were regarded as statistically significant at $p < 0.05$. When analyzing contingency tables, the Pearson criterion $\chi^2$ was applied to assess the statistical significance of differences between the two relative indicators.

**Results and discussion:**

Analysis of the activity indicators of monocarboxylic fatty acids in pregnant women with GIT pathology in three subgroups and the comparison group showed a decrease in the concentration of acetic acid in coprofiltrates in all pregnant women, indicating a decrease in the metabolic activity of lactic acid flora (bifidobacteria and lactobacilli). The lowest indicators of acetic, propionic acid, and total VFA were observed in women in the comparison group (Table 1).

Against the background of diet therapy and taking Lactobacillus reuteri Protectis in pregnant women of the second subgroup, there was a tendency to

increase, and in the third subgroup of women, a significant increase in the concentration of acetic acid ($p < 0.01$). A significant increase in the concentration of propionic acid and the general level of MFA with a tendency to increase the performance of butyric acid in coprofiltrates in pregnant women in the third subgroup was found.

The results showed an increase in the metabolic activity of the lactic acid flora of the intestine, an improvement in the utilization of these acids by colonocytes, a change in the composition of the anaerobic-aerobic populations of microorganisms, leading to an improvement in the redox potential of the intestinal environment in pregnant women who received Lactobacillus reuteri Protectis and HA diet with the inclusion of whole goat milk.

The dynamics of MFA values in coprofiltrates in pregnant women with allergies against the background of observing the HA diet and taking Lactobacillus reuteri Protectis are presented in (Table 2). It was noted that the best dynamics of MFA indicators was observed in the second and third subgroups of pregnant women with allergic diseases on the background of the HA diet and taking Lactobacillus reuteri Protectis. The lowest indicators of acetic, propionic acid, the general level of MFA was observed in women in the comparison group.

Thus, the presence of GIT pathology and allergic diseases in pregnant women has a negative effect on the metabolic activity of anaerobic intestinal microflora. Compliance with the HA diet, intake of Lactobacillus reuteri Protectis and replacement of whole cow's milk with whole goat's milk had a positive effect on the functional activity of fermented milk intestinal microflora, thereby improving the structure of intestinal microbiocenosis.

Considering the literature data on the effect of the intestinal microflora of the mother, her diseases on the state of the child's health, and the formation of oral tolerance [38–42], follow-up observation of 248 children born to pregnant women was carried out. Observation of children was carried out from 28 days to 1 year. There are 3 subgroups of children. The first subgroup consisted of 37 children whose mothers followed the HA diet in the last stages of gestation. Of the 37 children in this subgroup, 46% had an aggravated allergic history on the part of the mother, 29.7% on the father, and other relatives were sick in 24.3% of infants. The second subgroup included 29 children, whose mothers were on the last gestational HA diet and took the probiotic Lactobacillus reuteri Protectis. In this subgroup, on the part of the mother, hereditary allergy burden was observed in 31%, on the father in 34.5%, and other relatives in 10.3% of children were ill. The third subgroup consisted of 82 mothers who, on the last gestational dates, followed the HA diet with whole goat milk and Lactobacillus reuteri Protectis. The comparison group consisted of 100 children whose mothers did not adhere to dietary recommendations during pregnancy.

The study of allergen-specific IgE antibodies to milk proteins in breast milk of women who received the HA diet and Lactobacillus reuteri Protectis showed that the detection rate of allergen-specific IgE antibodies to cow's milk (66.6%) and goat's milk (65.6%) in the main group and comparison group (60.9%) and (61%) was approximately the same. Moreover, the concentration of allergen-specific IgE antibodies to goat milk was significantly lower ($p < 0.05$). compared with similar indicators of IgE antibodies to cow's milk protein in all subgroups of mothers with allergies and in the comparison group (Table 3).

*Characterization of the health status of children born in the neonatal period*

In 248 born children of the main and comparison groups, physical development was assessed using centile tables. There were no significant differences in physical development indicators at birth in the main and control groups, however, in the third subgroup there was a significant ($p < 0.05$) high percentage of children in the 25-75 centile corridor, the lowest percentage of children in the 25-75 centile, was in children from the comparison group (Table 4).

A study of the intestinal microflora in newborns from mothers of the three subgroups and the comparison group is presented in table 5. Analysis of the data obtained showed that in 27% of the children from the first, 24% from the second, 23.1% from the third subgroup 26% of infants from the comparison group showed deviations in the composition of the intestinal microflora. Significantly more often, a decrease in the number of bifidobacteria and lactobacilli was observed in children from the comparison group (19% and 26% of cases, respectively, $p < 0.05$), compared with children in the main group. In infants from the comparison group, an increased amount of conditionally pathogenic microflora (CPM) was observed: Klebsiella, Enterococcus, Candida albicans and Staphylococcus aureus ($p < 0.05$). In three subgroups of children, an increased content of E. coli strains with weakly enzymatic properties was more often observed (24.3%, 20.6%, and 21.9%, respectively). In children from the third subgroup, whose mothers received the probiotic Lactobacillus reuteri Protectis and HA diet with goat milk on the last gestational dates, the normal amount of bifidobacteria and lactobacilli ($p < 0.05$) and low CPM content ($p < 0.05$) were more often observed (Table 5).

Allergen-specific IgE and IgG4 antibodies to BKM and KM in coprofiltrates were studied in all observed children. By the end of the first month of life on natural feeding in infants of the main group, the frequency of latent sensitization according to allergen-specific IgE antibodies to BKM was significantly less frequent ($p < 0.05$) than in children from the comparison group (12.8% and 16% of cases, respectively ), as well as the frequency of occurrence of elevated IgG4 antibodies to BKM (14.86% and 28% of cases, respectively). The same tendency was observed in relation to the frequency of increased rates of allergen-specific IgE (main group 10.1%, comparison group 13%) and IgG4 antibodies (main group 20.27%, comparison group 30%) to goat milk in children from both groups.

The highest concentration of allergen-specific IgE and IgG4 antibodies to BKM and KM within +2 ($p < 0.05$) was in children of the first subgroup, whose mothers received only HA diet without the probiotic Lactobacillus reuteri Protectis in the last gestation periods, and in infants from comparison groups whose mothers did not follow dietary recommendations during gestation and did not receive a probiotic (Table 6).

Thus, the use of the HA diet and the probiotic of lactobacillus reuteri Protectis in mothers during the last stages of gestation improved the microbial landscape of the intestine, reduced the frequency and degree of sensitization to cow and goat milk in their children.

**Conclusion:**

1. The presence of pathology from GIT and allergic diseases in pregnant women has a negative effect on the metabolic activity of anaerobic intestinal microflora.

2. Adherence to a hypoallergenic diet with the inclusion of whole goat milk and the use of the probiotic Lactobacillus reuteri Protectis had a positive effect on the metabolic activity of intestinal microflora in pregnant women, which was expressed by a significant increase in the concentration of acetic acid, the total content of MFA, anaerobic index. In addition, there was a lower detection rate of allergen-specific IgE antibodies to cow and goat milk proteins in breast milk in these mothers.

3. A significantly low frequency of latent sensitization to cow's and goat's milk protein ($p < 0.05$) was observed in infants born to mothers who followed the HA diet with whole goat's milk and took the probiotic Lactobacillus reuteri Protectis at the last gestation, which indicated better formation of oral tolerance in their children.

**Funding and conflict of interest:** the authors of the article confirmed the lack of financial support for the study, which must be reported, and declare that there is no conflict of interest.

***Table 1.*** *The dynamics of MFA in coprofiltrates of pregnant women with GIT pathology before and against the background of diet therapy (M±m)*

| Monocarboxylic Fatty Acids /normative indicators/[36] | The main group/subgroups of pregnant, n=40 | | | | | | Comparison group n=32 |
|---|---|---|---|---|---|---|---|
| | First subgroup, n=14 | | Second subgroup, n=5 | | Third subgroup, n=21 | | |
| | Before | Against the background | Before | Against the background | Before | Against the background | |
| Acetic/4.66 mg/g | 2,89±0,81 | 2,13±0,59 | 1,41±0,63 | 1,91±0,85 | 2,02±0,14 | 2,74±0,29* | 1,93±0,86 |
| Propionic/ 0.84 mg/g | 0,73±0,2 | 0,79±0,21 | 0,57±0,25 | 0,57±0,26 | 0,68±0,05 | 0,84±0,01* | 0,76±0,31 |
| Oily/0.9 mg/g | 1,11±0,31 | 0,75±0,21 | 0,51±0,23 | 0,65±0,29 | 0,71±0,16 | 0,89±0,18 | 0,81±0,17 |
| Isoacids / 0,62 mg/g | 0,33±0,09 | 0,39±0,11 | 0,39±0,18 | 0,32±0,14 | 0,39±0,09 | 0,36±0,08 | 0,41±0,63 |
| Acetic rel./0.61 un. | 0,61±0,17 | 0,59±0,16 | 0,56±0,25 | 0,61±0,27 | 0,59±0,13 | 0,63±0,14 | 0,58±0,26 |
| Propionic rel/0.178 un. | 0,16±0,05 | 0,2±0,06 | 0,23±0,11 | 0,19±0,08 | 0,19±0,04 | 0,19±0,04 | 0,18±0,07 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Oil. rel./0.165 un. | 0,22±0,06 | 0,21±0,06 | 0,2±0,09 | 0,21±0,09 | 0,19±0,04 | 0,18±0,03 | 0,17±0,03 |
| Iso Cn. rel/ 0.044 un. | 0,07±0,02 | 0,11±0,03 | 0,14±0,06 | 0,09±0,04 | 0,12±0,03 | 0,08±0,02 | 0,09±0,03 |
| Iso Cn/Cn/ 0,29 un. | 0,33±0,09 | 0,46±0,13 | 0,64±0,29 | 0,46±0,2 | 2,11±0,46 | 0,35±0,08* | 0,35±0,09 |
| Total content Σ(S2+…S6)/8,01 mg/g | 5,31±1,47 | 4,22±1,17 | 3,07±1,38 | 3,59±1,61 | 3,91±0,85 | 5,95±0,09* | 4,17±1,15 |
| Anaerobic index/ minus 0,68 | minus 0,33±0,09 | minus 0,72±0,19 | minus 0,79±0,36 | minus 0,66±0,29 | minus 3,92±0,85 | minus 4,95±0,81 | minus 0,48±0,19 |

**Note:** differences before and against the background of diet therapy are significant, p<0,03

Cn – MFA, IsoCn – isoacids, IsoC4 - iso-oil, isoC5 - iso-valerian, isoC6 - iso-kapron, IsoCn/Cn – ratio of iso acids to MFA

***Table 2**. Dynamics of monocarboxylic fatty acids in coprofiltrates of pregnant women with allergies before and during diet therapy (M+m)*

| **Monocarboxylic Fatty Acids /normative indicators [36]** | **The main group/subgroups of pregnant, n=61** | | | | | | **Comparison group n=64** |
|---|---|---|---|---|---|---|---|
| | **First subgroup, n=17** | | **Second subgroup, n=9** | | **Third subgroup, n=35** | | |
| | **Before** | **Against the background** | **Before** | **Against the background** | **Before** | **Against the background** | |
| Acetic / 4,66 mg/g | 2,18±0,53 | 2,41±0,8 | 1,32±0,14 | 1,79±0,04* | 1,83±0,3 | 3,17±0,55* | 2,15±0,52 |
| Propionic / 0,84 mg/g | 0,67±0,16 | 0,77±0,26 | 0,43±0,14 | 0,68±0,28 | 0,59±0,1 | 2,94±0,69* | 0,48±0,15 |
| Oily / 0,9 mg/g | 0,77±0,19 | 0,63±0,21 | 0,46±0,15 | 0,66±0,27 | 0,58±0,09 | 3,51±0,84 | 0,68±0,29 |
| Isoacids / 0,62 mg/g | 0,31±0,07 | 0,35±0,12 | 0,19±0,07 | 0,45±0,19 | 0,28±0,05 | 1,96±0,47 | 0,34±0,08 |
| Acetic rel./ 0,61 un. | 0,62±0,15 | 0,65±0,21 | 0,61±0,2 | 0,62±0,26 | 0,62±0,1 | 0,65±0,15 | 0,60±0,2 |
| Propionic. rel./ 0,178 un. | 0,19±0,05 | 0,19±0,07 | 0,2±0,07 | 0,21±0,09 | 0,19±0,03 | 0,18±0,04 | 0,17±0,03 |
| Oily rel./ 0,165 un. | 0,19±0,05 | 0,15±0,05 | 0,19±0,06 | 0,17±0,07 | 0,19±0,03 | 0,17±0,04 | 0,16±0,06 |
| Iso Cn. rel./ 0,044 un. | 0,09±0,02 | 0,08±0,03 | 0,09±0,03 | 0,12±0,05 | 0,1±0,02 | 0,07±0,02* | 0,08±0,03 |
| Iso Cn/Cn/ 0,29 un. | 0,54±0,13 | 2,18±0,72 | 0,61±0,2 | 0,71±0,29 | 0,55±0,09 | 0,45±0,1 | 0,43±0,1 |
| Total content Σ(S2+…S6)/ 8,01 mg/g | 4,11±1,01 | 4,3±1,43 | 2,48±0,82 | 3,75±1,56 | 3,43±0,58 | 6,17±1,17* | 3,78±1,55 |
| Anaerobic index / minus 0,68 | minus 0,49±0,12 | minus 0,58±0,19 | minus 0,69±0,22 | minus 0,66±0,28 | minus 0,42±0,07 | minus 0,57±0,14 | minus 0,56±0,14 |

**Note:** differences before and against the background of diet therapy are significant, p<0,03

***Table 3**. Indicators of allergen-specific IgE antibodies to milk proteins in breast milk of mothers with allergies (M±m)*

| Allergen-specific IgE antibodies | Main group/subgroups of mothers, n=41 | | | Comparison group n=39 |
|---|---|---|---|---|
| | First subgroup | Second subgroup | Third subgroup | |
| Cow milk protein | 5,07±0,89 n=8 | 0,97±0,13 n=9 | 2,93±0,88 n=24 | 5,42±1,19 n=39 |
| Goat milk protein | 2,23±0,39*n=10 | 0,69±0,02*n=9 | 0,95±0,34*n=21 | 2,58±0,48n=39 |

**Note:** differences in subgroups and comparison group are significant, p<0,05

***Table 4.** Indicators of physical development at birth in newborns*

| Physical development indicator in centiles | Main group/Subgroups of children | | | | | | Comparison group n=100 | |
|---|---|---|---|---|---|---|---|---|
| | First subgroup n=37 | | Second subgroup n=29 | | Third subgroup n=82 | | | |
| | Abs. | % | Abs. | % | Abs | % | Abs | % |
| Less than 3 | - | - | - | - | 1 | 1,2 | 2 | 2 |
| 3-10 | - | | 1 | 3,4 | 2 | 2,4 | 7 | 7 |
| 10-25 | 4 | 10,8 | 3 | 10,3 | 2 | 2,4 | 15 | 15 |
| 25-75 | 24 | 64,8 | 15 | 51,7 | 53 | 64,6* | 49 | 49 |
| 75-90 | 5 | 13,5 | 6 | 20,6 | 19 | 23,1 | 19 | 19 |
| 90-97 | 3 | 8,1 | 3 | 10,3 | 2 | 2,4 | 6 | 6 |
| More than 90 | 1 | 2,7 | 1 | 3,4 | 3 | 3,6 | 2 | 2 |
| Total | 37 | | 29 | | 82 | | 100 | 100 |

**Note:** *- Pearson's criterion $\chi^2$, the differences are significant at p<0,05

***Table 5.** The composition of the intestinal microflora of children born*

| Type of microorganism | Main group/subgroups of children | | | Comparison group n=100 |
|---|---|---|---|---|
| | First subgroup n=37 | Second subgroup n=29 | Third subgroup n=82 | |
| | Abs/% | Abs/% | Abs/% | Abs/% |
| E.Coli, reduced | 7 / 18,9 | 7 / 24 | 19 / 23,1 | 12 / 12%* |
| E.Coli SF, heightened | 9 / 24,3 | 6 / 20,6 | 18 / 21,9 | 8 / 8%* |
| E.Colihem, heightened | 8 / 21,6 | 6 / 20,6 | 14 / 17% | 17 / 17% |
| E.Colilac, heightened | 10 / 27 | 7 / 24 | 19 / 23,1% | 12 / 12%* |
| Bifidobacteria, reduced | 7 / 18,9 | 4 / 13,7 | 7 / 8,5% | 19 / 19%* |
| Lactobacilli, reduced | 8 / 21,6 | 5 / 17,2 | 12 / 14,6% | 26 / 26%* |

| | | | | |
|---|---|---|---|---|
| Staphylococcusaureus, heightened | 6 / 16,2 | 3 / 10,3 | 7 / 8,5% | 17 / 17%* |
| Klebsiellapnemonia, heightened | 6 / 16,2 | 5 / 17,2 | 13 / 15,8% | 18 / 18% |
| Enterococcus, heightened | 8 / 21,6 | 6 / 20,6 | 14 / 17% | 25 / 25% |
| Candidalbicans, heightened | 4 / 10,8 | 3 / 10,3 | 5 / 6% | 13 / 13% |

**Note:** *- Pearson's criterion $\chi 2$, the differences are significant at $p<0,05$

***Table 6.*** *The concentration of allergen-specific IgE and IgG4 antibodies to BKM and KM in caprofiltrates in children born (M+m)*

| Allergen-specific antibodies | Main group / Subgroups of children | | | Comparison group |
|---|---|---|---|---|
| | First | Second n=18 | Third | |
| IgE to cow milk protein | 1,73± 0,32 n=7 | 0,9±0,15* n=7 | 0,46±0,11* n=5 | 1,86± 0,73 n=16 |
| IgE to goat milk protein | 0,96±0,16 n=3 | 0,68±0,26 n=5 | 0,25±0,06* n=7 | 0,92±0,14 n=13 |
| IgG4 to cow milk protein | 6,16±1,54 n=7 | 4,71±1,76 n=6 | 5,02±0,84 n=9 | 7,18±1,63 n=28 |
| IgG4 to goat milk protein | 5,28±1,51 n=7 | 1,86±0,46* n=10* | 2,66±0,44* n=13 | 5,78±2,34 n=30 |

**Note:** differences in subgroups and comparison group are significant, $p<0,05$

for allergen-specific IgE antibodies the value (Un/ml):

0–0,2 – lack of allergies (+0); 0,3–0,6 – low allergy (+1); 0,7–3,5 – moderate allergies (+2); 3,6–17,0 – high allergies (+3).

For specific IgG4 antibodies the IgG4 value (μg/ml):

0–1,0 – lack of allergies (+0); 1,1–3,0 – low allergy (+1); 3,1–10,0 – moderate allergies (+2); 10,1–30,0 – high allergies (+3).

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膀胱癌的三峰疗法，使用前景

# TRIMODAL THERAPY FOR BLADDER CANCER, PROSPECTS FOR USE

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抽象。 膀胱癌在现代世界仍然是一个未解决的问题。 其发病率稳步上升。寻找药物和放射疗法的新机会以及改善外科治疗方法的方法将不断引入。 这导致了诸如三峰疗法之类的方法的出现，该方法同时包括三种治疗方法。 这种疗法可让您维持患者的生活质量并从根本上影响肿瘤。

关键字。 膀胱癌经尿道切除术。 放射治疗。 化学疗法。 三峰疗法。

***Abstract.*** *Bladder cancer remains an unresolved problem in the modern world. Its incidence is steadily increasing. The search for new opportunities in drug and radiation therapy and the improvement of surgical treatment methods will be constantly introduced. This led to the emergence of such an approach as trimodal therapy, which includes three treatment methods at once. This therapy allows you to maintain the patient's quality of life and radically affect the tumor.*

***Keywords.*** *Bladder cancer Transurethral resection. Radiation therapy. Chemotherapy. Trimodal therapy.*

Introduction. One of the modern approaches to the treatment of bladder cancer (BC), which is part of widespread practice, is trimodal therapy. This method has many advantages compared to standard approaches, however, it is necessary to strictly consider the criteria for selecting patients for this type of treatment.

Trimodal therapy (TMT) of bladder cancer is a series of sequential treatment methods: the first stage is the maximum transurethral resection (TUR) of the bladder, the second and third stages are chemotherapy and radiation therapy. After

completion of the first course of treatment, all patients undergo cystoscopy with an assessment of the effectiveness of the therapy. With a full clinical response, when there are no signs of the disease or the residual tumor is minimal, patients continue to receive chemoradiotherapy, if a continuation of the disease or its progression is detected, patients undergo urgent cystectomy.

For chemotherapy, drugs such as 5-fluorouracil, cisplatin, paclitaxel, gemcitabine are used, which are capable of sensitizing malignant cells to radiation exposure.

Patient selection criteria. At the moment, it is believed that the ideal patient for this method is a patient whose degree of invasion is T2 (muscle layer), there are no signs of hydronephrosis, there is no CIS, maximum TUR, a unifocal tumor, good function and capacity of the bladder are possible. Absolute contraindications are the depth of T4b invasion associated with tumor hydronephrosis, contraindications for chemotherapy, invasion of prostate tissue. Relative contraindications are T3b-T4a invasion, diffuse CIS, metastatic lymph node damage. Those. the criteria for selecting patients for this type of therapy are the factors associated with the patient and the tumor, which predict the outcome after TMT. [1]

The surgical stage of treatment. In many of the studies presented, the visually maximum (full) TUR of the bladder is ideal, i.e. the full clinical response rate in such patients reached 79%. A recent pooled analysis of 314 patients treated in six RTOG studies showed that visually complete TUR was associated with a significantly higher frequency of complete response to TMT in a multivariate analysis. [2]

The inability to perform maximum (full) TUR is not an absolute contraindication to TMT BC, since the response rate of this category of patients is quite high.

Most TMT studies include patients with T2 to T4a invasion, but analysis of the results shows that the depth of the invasion does not predict the frequency of the full clinical response. This factor only affects the reduction of 5-year survival. In RTOG 85-12, RTOG 88-02, RTOG 97-06, and the Erlangen series, the tumor stage was not significantly associated with the speed of the complete response for TMT in multivariate analysis. [3, 4 - 6]

Tumor-associated hydronephrosis has become an exclusion criterion, as many clinical studies have revealed that its presence significantly reduces the frequency of complete clinical responses. For the later stages, the presence of hydronephrosis is a prognostic factor, with its presence, survival is significantly reduced. In RTOG 89-03, the 5-year overall survival rate for patients with and without hydronephrosis was 33% versus 54%, respectively [7].

Multiple tumors or multifocal lesions of the bladder have been proposed as a prognostic factor for assessing the frequency of a complete clinical response during TMT. Multifocality may not always lead to a lack of a complete response to

therapy, however, we must not forget that such a lesion has a higher risk of local relapse. Similarly, the presence of extensive CIS before therapy was associated with lower rates of complete clinical response for TMT, as well as higher rates of relapse after TMT. A group convened by the International Society of Urology suggested that the presence of extensive CIS should be considered as a relative rather than an absolute contraindication to TMT, since the presence of CIS affects only the risk of relapse after TMT, and not on overall survival rates [8].

The rationale for the use of conservative bladder therapy is that patients should have a high quality of life, due to the normally functioning preserved bladder. The best results are achieved in those patients who initially have good enough bladder functionality.

Most studies of TMT at the chemoradiotherapy stage used cisplatin-based regimens. However, some patients had a number of concomitant pathologies, in which the introduction of this drug is absolutely contraindicated. Therefore, there is no single scheme or drug used in this type of therapy yet.

Radiation therapy is an important component of TMT. In the treatment of bladder cancer, different dose ranges, fractionation schemes, treatment sequences and treatment volumes are used. Attempts to improve radiation therapy are aimed at maintaining a normally functioning bladder while minimizing the toxicity of therapy. Recently, new technologies have been introduced into the clinic, such as intensity-modulated radiotherapy (IMRT) and Image-guided radiation therapy (IGRT).

The goals and objectives of the study. To evaluate trimodal therapy for bladder cancer in patients who are not subject to radical surgical treatment or who refuse cystectomy.

Materials and methods. The study group included 25 patients, 15 patients with a degree of T1 invasion by multifocal lesion, but no more than 5 cm in diameter, 10 patients with a T2 invasion degree (muscle layer), and a unifocal tumor. All patients showed no signs of hydronephrosis, no CIS, maximum TUR was possible, the initial function and capacity of the bladder was at a good level. At the first stage, all patients underwent surgical treatment, visually maximum (full) TUR of the bladder. Then, patients underwent chemoradiotherapy using the GC regimen (gemcitabine, cisplatin). Conformal remote radiation therapy was administered to the bladder region and regional pathways of lymph outflow to a total focal dose (TFD) of 50 Gy, after which a control cystoscopy was performed. Upon receipt of a complete response, irradiation of the bladder continued until TFD 66Gy was reached [9].

Results. Patients who received this type of treatment transferred it satisfactorily, expressed reactions that could lead to the abolition of therapy were not detected. In 30% of patients, various gastrointestinal reactions were observed, not

exceeding 2 degrees, hematological toxicity in 50% of cases of 1 degree, dysuric phenomena of varying severity were observed in 70%. A complete response according to the results of cystoscopy was obtained in 75% of patients. At the moment, the follow-up period is 24 months, relapse has been identified in 2 cases, and patients are continuing to sign up.

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分散试样的有效磁性能（以球填充为例）

# EFFECTIVE MAGNETIC PROPERTIES OF DISPERSE SPECIMENS (EXEMPLIFIED BY BALLS FILLING)

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抽象。 利用“长”和“短”（具有消磁因子）磁体的关键磁参数之间的基本物理关系，可以分析分散（球填充）样品中感应强度的场依存关系，其长度与直径的比率为L / D 在场强为25-163 kA / m时= 1-22.5，以及在此基础上获得的磁导率，磁化率和磁化强度的场依赖性。 结果表明，在L / D≥10-12时，此类样品的磁性能与其材料的性能（准连续）相对应，没有磁饱和的迹象。

关键词：球填充，相对长度，退磁系数，感应，磁导率，磁化率，磁化强度。

***Abstract.*** *Using basic physical relationships between the key magnetic parameters of the “long” and “short” (with demagnetizing factor) magnets, the field dependences of induction in dispersed (balls filling) samples are analyzed with a ratio of their length to diameter L/D = 1-22.5 in the field intensity of 25-163 kA/m, as well as field dependences of magnetic permeability, susceptibility, magnetization obtained on their basis. It was shown that the magnetic properties of such samples correspond to the properties of their material (quasi-continuous) at L/D ≥ 10-12, with no signs of their magnetic saturation.*

***Keywords:*** *balls filling, relative length, demagnetizing factor, induction, permeability, susceptibility, magnetization.*

## Introduction

In science and technology, heterogeneous magnets are widely used as working elements of various electromagnetic systems and technological devices, in particular, ferromagnetic granules or grains fillings [1-8]. Such magnets, which for a certain range of physical and technical problems can be considered quasisolid bodies (within the framework of the so-called effective medium model [8]) are usually “short”, i.e. have relatively comparable dimensions along three

characteristic axes: within the same order. Therefore, like a continuous short sample (body), a quasi-continuous short sample has a demagnetizing factor [1, 9-12], often called the demagnetization coefficient. It is capable of substantially suppressing the potential magnetic properties of a sample [1, 10] (in comparison with the properties of a "quasicontinuous material" of this sample, that is, properties of the same sample, but "long" or having, as is customary, classical toroidal form).

Information on the magnetic properties of a given sample can be obtained by measuring the average (effective) magnetic induction by a ballistic method, depending on the strength of the applied magnetic field *H*, and also, importantly, on the relative length of the sample, for example, a cylindrical shape. A characteristic self-sufficient parameter of this geometry is the *L/D* ratio [3, 9, 10, 13] of a sample of length *L* and diameter *D*. Having the field dependences of the induction in the sample, other information on the magnetic properties of the samples under study becomes available, in particular, field dependences of magnetic permeability, susceptibility, magnetization.

**Induction in a sample, its permeability, susceptibility, magnetization**

The key relationships between the parameters of a magnet (solid, quasi-solid) are quite fully discussed in scientific and educational literature, but traditionally - only mainly for the material (substance) of a magnet. In practice, one usually has to deal with magnets of certain sizes and shapes, i.e. bodies for which a demagnetizing factor always appears (to a greater or lesser extent). However, a clear specification of which of the objects (body, material) is discussed in the interpretation of a particular magnetic parameter is often not paid enough attention. In addition, when presenting relevant information, the authors do not always follow the physically justified relationships between the studied parameters. This can be partially explained by the limited information required. Therefore, it makes sense, based on the corresponding physical concepts, to fill these gaps briefly dwell on these issues [14].

When a magnetic field of intensity *H* acts on a sample (toroidal or sufficiently long), then magnetic induction in it (in the absence of a demagnetization factor) is

$$B = \mu_0 \mu H , \qquad (1)$$

where $\mu_0 = 4\pi \cdot 10^{-7}$ H/m – magnetic constant, μ – magnetic permeability of the sample material.

If a sample of certain sizes and shapes (for example, a cylindrical length *L* and diameter *D*) is exposed to a field of intensity *H*, for which a demagnetizing factor is inherent, then the expression for induction in the sample $B_s$ (hereinafter, the index "*s*" means that one or another parameter characterizes exactly the *sample* itself) can be written in two ways.

So, due to the action of the demagnetizing field inevitable here with intensity $H_s$ (i.e., the field created by the sample itself), the resultant (internal) field with intensity $H - H_s = H_r$ will play the role of the actual magnetization field of the sample (the index "*r*" means *resultant field* here). Hence, the expression for $B_s$ has the form:

$$B_s = \mu_0 \mu H_r . \quad (2)$$

At the same time, it is convenient to assume that the reason for the decrease in the induction in the sample to the value $B_s < B$ was not the really decreased field strength of its magnetization (to the value $H_r < H$), but its worsened magnetic permeability - to the value $\mu_s < \mu$ (at the external field strength *H*). Then, alternatively (2), the expression for $B_s$ takes the form:

$$B_s = \mu_0 \mu_s H . \quad (3)$$

From (2) and (3) the expected connection follows:

$$\mu_s = \mu H_r / H \text{ or } \mu_s / \mu = H_r / H , \quad (4)$$

indicating that the ratio of the magnetic permeability of the sample and its material corresponds to the ratio of the field strength in the sample and the external field.

If we use further the expression for the strength resultant (internal) field: $H_r = H - N \cdot M_s$ (*N* – is the demagnetizing factor of the sample) and the relation

$$M_s = \chi H_r , \quad (5)$$

where $M_s$ – magnetization of the sample (in its real, in this case internal, resultant field with the intensity $H_r$), $\chi$ – magnetic susceptibility of the sample material, the expression for $H_r$ can be written in a slightly open form:

$$H_r = H - N \cdot \chi \cdot H_r . \quad (6)$$

Solving (6) with respect to $H_r$, we obtain:

$$H_r = \frac{H}{1 + N \cdot \chi} = \frac{H}{1 + N(\mu - 1)} , \quad (7)$$

including taking into account the classical relationship between the magnetic susceptibility $\chi$ and the magnetic permeability $\mu$ of the material:

$$\chi = \mu - 1 . \quad (8)$$

Substituting (7) in (4), we find the relationship:

$$\mu_s = \frac{\mu}{1 + N(\mu - 1)} , \quad (9)$$

whence follows the expression for the demagnetizing factor *N* (in particular, for its calculation for various experimental values of the permeability of the sample $\mu_s$ and its material $\mu$):

$$N = \frac{\mu - \mu_s}{\mu_s (\mu - 1)} = \frac{(\mu / \mu_s) - 1}{\mu - 1} \text{ or}$$

$$N = \frac{B - B_s}{B_s\left(B/[\mu_0 H] - 1\right)} = \frac{\left(B/B_s\right) - 1}{\left(B/[\mu_0 H]\right) - 1}, \tag{10}$$

including taking into account (1) and (3), which makes it possible to calculate both the values of $\mu_s$ and $\mu$ and the direct experimental data $B_s$, $B$, and $H$ when calculating $N$. The induction data $B_s$ and $B$ are taken from the family of magnetization curves of one or another "short" sample and a "long" sample (cylindrical) for the corresponding values of $H$. In this case, we note that in the resulting family of field dependences $B_s$ (for various values of the relative length of the sample $L/D$), the field dependence $B$ (for the case when $L>>D$) is essentially limiting.

Along with the concepts of magnetic permeability of a material and a sample, i.e. $\mu$ and $\mu_s$, the concepts of the magnetic susceptibility of a material and a sample are equally important, i.e. $\chi$ and $\chi_s$. However, in contrast to the classical relation (8), which is inherent in a material that is similar in appearance (obvious at first glance), the relation between $\chi_s$ and $\mu_s$ (for the sample) does not actually exist: $\chi_s \neq \mu_s - 1$. This relationship between $\chi_s$ and $\mu_s$ can be established if, taking into account (8), transform (10) to the form:

$$N = \frac{\mu/\mu_s}{\mu - 1} - \frac{1}{\mu - 1} = \frac{\mu/\mu_s}{\chi} - \frac{1}{\chi}. \tag{11}$$

Then, by comparing the first term in the right-hand side of expression (11) with the corresponding member of the well-known expression for the demagnetizing factor $N$, namely:

$$N = 1/\chi_s - 1/\chi, \tag{12}$$

the desired relation will follow:

$$\chi_s = \frac{\chi}{\mu/\mu_s} = \frac{\mu - 1}{\mu/\mu_s} \text{ or } \frac{\chi_s}{\chi} = \frac{\mu_s}{\mu}. \tag{13}$$

Note that this relationship indicates that the magnetic susceptibility of the body is so many times less than the susceptibility of its material, how many times the magnetic permeability of the body is less than the permeability of its material.

As for expression (12) (here postulated as well-known), it is also not difficult to obtain it, in particular, on the basis of the expression for the magnetization of a magnet. So, if the expression for the magnetization of the material has the following known form:

$$M = \chi H = B/\mu_0 - H, \tag{14}$$

then with respect to a sample (body) of this material, two alternative expressions for magnetization are valid, one of which - this (5), and the second - this:

$$M_s = \chi_s H, \tag{15}$$

moreover, expressions (5) and (15) are similar in form (and to a certain extent in meaning) with expressions (2) and (3). Then from (5) and (15) the connection follows:

$$\chi_s / \chi = H_r / H , \quad (16)$$

substituting expression (8) into which, we come to precisely this, which follows here from the corresponding physical concepts (earlier it was postulated here), expression (15).

Connection (16) also gives an additional understanding of the peculiarities of the pragmatically introduced concept of magnetic susceptibility of a sample (body). Thus, according to (16), the ratio of the susceptibility of a sample to the susceptibility of its material is the ratio of the strength of the resultant field to the strength of the applied (external) field. Or, in other words: the magnetic susceptibility of the sample is as many times less than the susceptibility of its material, as many times the resultant field is less than the applied field.

Fig. 1a shows a family of magnetization curves of cylindrical samples of bearing balls filling with a diameter of 6 mm [1] for various values of the relative length: from $L/D$ = 1.02 to $L/D$ = 22.5 in the field strength range: from $H$ = 25 kA/m to $H$ = 163 kA/m. The mutual arrangement of these curves and the corresponding induction data in the samples shows (Fig. 1a) that with increasing $L/D$, the magnetic properties of the sample increase, but this increase, starting from the transition value $L/D = [L/D]$ = 10-12, stops, because the limit magnetization curve is reached here. The fact that with respect to such a dispersed sample the transitional value of its relative length corresponds to the indicated one is very clearly demonstrated by the results of Fig. 1a, the dependences of induction on $L/D$ shown in Fig. 1b. For $L/D \geq [L/D]$, i.e. when the self-similar region of induction is observed (Fig. 1b), the sample can be considered quite "long", reflecting the magnetic properties of its material (quasi-continuous).

It should be noted that such a value $[L/D]$ (transient) is a feature of dispersed samples. So, it is much less than the transition value $L/D = [L/D] \approx 50$ specified in [15], which is valid for a solid, steel specimen (by the way, not as clear as here): when, according to [15], its demagnetizing factor practically disappears and the magnetic properties of the sample become equivalent to the magnetic properties of the material of this sample.

Since it makes sense to use such concepts as a "long" sample ($L/D \geq [L/D]$) and a "short" sample ($L/D < [L/D]$), then in the first case we can use the induction symbol $B$ (i.e. justifiably - as for the sample material), and in the second case - the induction symbol $B_s$ already used above (with the index "$s$" - for the body sample); this symbolism appears in Fig. 1. For the same reason, it is justified to use conventionally separate symbols of other magnetic parameters: magnetic permeability $\mu$ and $\mu_s$, magnetic susceptibility $\chi$ and $\chi_s$, magnetization $M$ and $M_s$, respectively for "long" and "short" samples.

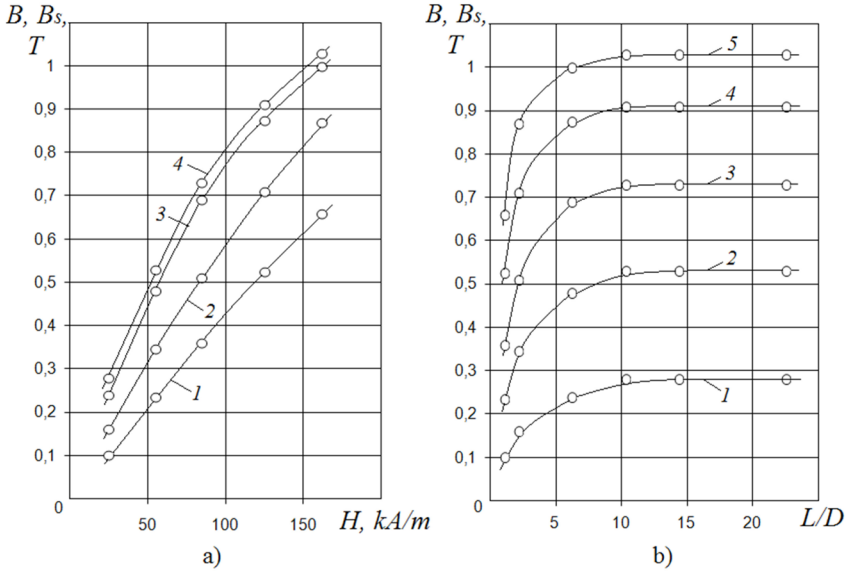


***Fig. 1.*** *Magnetic induction in samples (balls filling): a) depending on H for different L/D (1 – L/D = 1,02; 2 – 2,04; 3 – 6,12; 4 – 10,2 and more); b) depending on L/D for different H (1 – H = 25 kA/m, 2 – 55, 3 – 85, 4 – 125, 5 – 163). For L/D ≥ 10-12, i.e. for "long" samples, the induction data is referred to as B, and for L/D <10-12, i.e. for "short" samples - like* $B_s$.

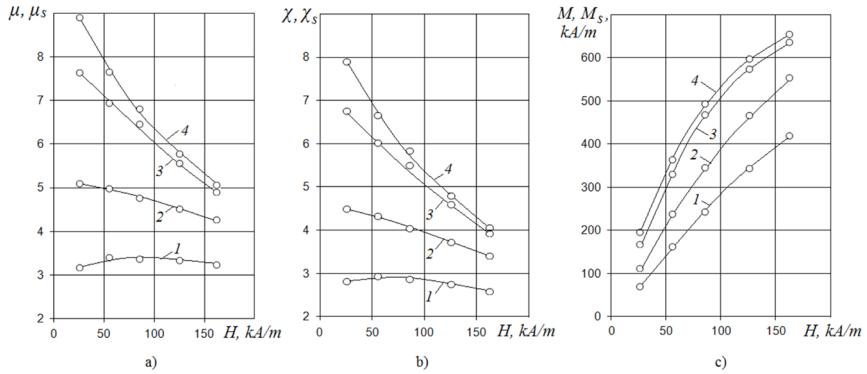


***Fig. 2.*** *Field dependences of magnetic permeability (a), susceptibility (b), magnetization (c) of samples (balls filling) – taking into account the relations (1), (3), (8), (13), (14), (15); designations - as in Fig. 1. For L/D ≥ 10-12, the data are referred to as μ, χ and M, and for L/D <10-12, they are referred to as* $\mu_s$, $\chi_s$ *and* $M_s$.

Fig2 shows the family of field dependences of magnetic permeability (Fig. 2a), magnetic susceptibility (Fig. 2b), and magnetization (Fig. 2c) of the same samples. To obtain permeability data μ and $\mu_s$, we used the induction data $B$ (for $L/D \geq [L/D]$) and $B_s$ (for $L/D < [L/D]$) in Fig. 1, and the calculations were performed in accordance with (1) and (3). To obtain the susceptibility data χ and $\chi_s$, we used the permeability data μ and $\mu_s$ in Fig. 2a, and the calculations were performed in accordance with (8) and (13). To obtain the magnetization data $M$ and $M_s$, we used the susceptibility data χ and $\chi_s$ in Fig. 2b, and the calculations were performed in accordance with (14) and (15).

Judging by presented in Fig. 1a and Fig. 2c data of induction in the sample and the data of their magnetization, here, in contrast to the known results of magnetization of solid (in particular, steel) samples, it is not necessary to talk about the possibility of achieving magnetic saturation of the sample, in any case, in the accepted range of field strength $H$. This is already well demonstrated by the very form of the indicated dependences (Fig. 1a and Fig. 2c), especially by the field dependences of the magnetization (Fig. 2c). Indeed, here is the region of stable (self-similar) magnetization values, i.e. the region that usually indicates the achievement of magnetic saturation is absent even at $H \geq 160$ kA/m.

**Conclusion.** From the standpoint of physical ideas about the relationship between the magnetic parameters of "long" and "short" magnets, the experimental field dependences of induction in cylindrical dispersed samples (balls filling) and the field dependences of magnetic permeability, susceptibility and magnetization obtained on their basis are analyzed: in the ranges of relative lengths of samples $L/D$ = 1-22.5 and field strengths 25-163 kA/m. It is shown that a dispersed sample can be considered quite "long" - one in which the magnetic parameters inherent in the "material" (quasi-continuous) of these samples are achieved at $L/D \geq$ 10-12 (much smaller than for solid magnets). The absence (in contrast to solid magnets) of the signs of magnetic saturation of such magnets, even in a field of relatively high and high intensity, was noted.

*The study was carried out with the financial support of the Ministry of Education and Science of the Russian Federation in the framework of the State Assignment in the field of science – project № 0706-2020-0024.*

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改进磁性控制食品中铁杂质含量的方法

# IMPROVING THE METHOD OF MAGNETIC CONTROL OF THE CONTENT OF FERROIMPURITIES IN FOODSTUFFS

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描述了一种控制食品中铁杂质含量的改进方法，该方法基于磁杂质从样品中进行磁操作多操作分离的方法–通过测量杂质的工作质量，建立最终依赖性的功能形式及其分析推断， 这样可以确定铁杂质的总质量（包括残留量）。 当通过有限次数的操作数据判断结果时，可以估算出可以防止的控制错误。 连同按尺寸划分的铁颗粒分布的定量分数直方图，它们的体积分数直方图被说明为最充分地反映了一种或另一种（包括增加的）尺寸的铁颗粒的份额。

关键词：食品，铁杂质，磁泳的操作依赖性，尺寸分布直方图。

*An improved method for controlling the content of ferro-impurities in food products is described, based on the magnetophoretic polyoperational separation of these impurities from a sample — by measuring their operating masses, establishing the functional form of the resulting dependence, and its analytical extrapolation, which allows determining the total (including residual) mass of ferroimpurities. The prevented error of control is estimated for cases when the result is judged by data from a limited number of operations. Along with quantitative-fractional histograms of the distribution of ferroparticles by size, their volume-fractional histograms are illustrated as the most fully reflecting the share of the fraction of ferroparticles of one or another (including increased) size.*

***Keywords:*** *food products, ferroimpurities, operational dependence of magnetophoresis, size distribution histograms.*

One of the factors negatively affecting the quality and safety of food products is the presence in them of specific (in terms of their inherent ferro- and/or ferrimagnetic properties) impurities called ferroimpurities or metallomagnetic impurities. In addition, these impurities (from small to relatively large ferroparticles formed as a result

of equipment wear and tear, corrosion, as well as metal processing, heat treatment and welding during equipment repair and maintenance) can also seriously destabilize the process and the operation of equipment. So, getting on the technologically mating surfaces of the equipment, they intensify wear even more and lead to damage.

Reliable and up-to-date information on the content of ferroimpurities is extremely important, including for the development of magnetic treatment apparatus (separators) based on the principle of magnetophoresis, which is increasingly being used to solve various technical, biological, and environmental problems [1-6].

To determine the content of ferro-impurities in samples of food (and non-food) media, preference is often given to the laboratory method of magnetophoretic extraction of ferro-impurities (for example, using a permanent magnet) with the accumulation and measurement of their mass, since other methods, in particular atomic absorption, atomic emission, etc., despite the high instrumental accuracy of determining iron, unfortunately, do not answer the fundamentally important (due to the need for the use of magnetic separators) question about the content of magnetically active particles. For example, judging by the presence of iron, particles from ferrous steel, magnetite $Fe_3O_4$ are magnetically active, and from non-ferromagnetic stainless steel, hematite $\alpha$-$Fe_2O_3$ is almost nonexistent.

For a more complete extraction of ferroimpurities from the analyzed sample, such laboratory magnetophoresis operations are carried out repeatedly, additively determining the total mass of recovered ferroimpurities, which makes it possible to estimate their concentration (mass fraction) by dividing this mass by the volume (or mass) of the analyzed sample.

However, when implementing this method, attention is usually not paid to the very dependence (accessible to the operator) of the operating mass *m* of recoverable ferroparticles on the number n of operations. Meanwhile, this dependence can serve as a basis for improving this method to the level of precision.

For this, it is not necessary to pursue unpromising goals of a significant increase in *n* or the creation of “super modes” of magnetophoresis (as if capable of guaranteeing complete, even one-time, extraction of ferroparticles). So, after the implementation of one or another, including an increased, number *n* of magnetophoresis operations, the sample still contains the residual (not extracted) mass of ferroimpurities. As *n* increases, the magnitude of this mass, although it decreases, asymptotically approaches zero only with an unlimited number of operations.

The essence of the proposed approach to improving the control method is as follows. It is necessary to fix the obtained experimental operating masses *m* and legalize them in the form of a corresponding (for clarity - graphic) decreasing dependence of *m* on *n*. Adapting it to a particular physical model, it is necessary to establish the functional form of the obtained dependence. This will give the opportunity for its objective extrapolation to an arbitrarily large value of *n*.

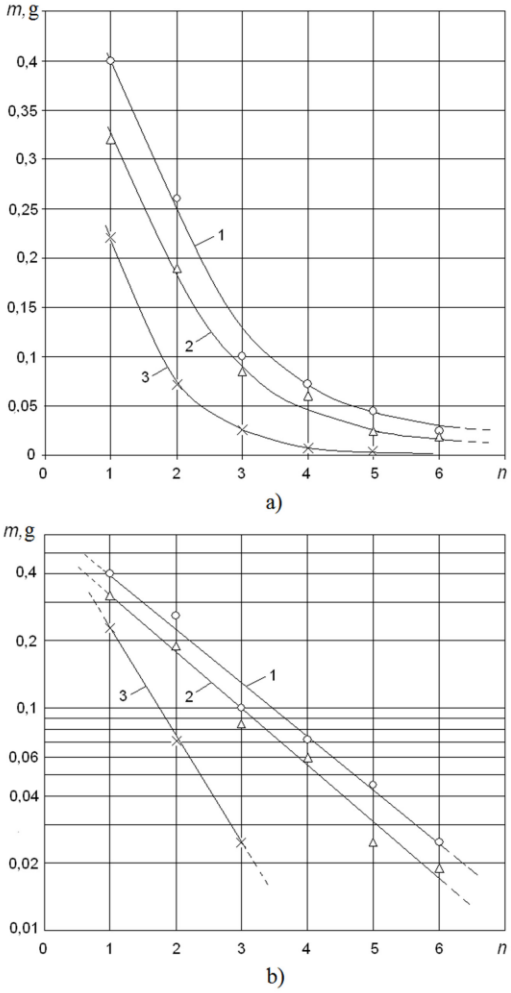


***Fig. 1.*** *Masses of recovered ferroimpurities after each magnetophoresis operation (a), including in semi-logarithmic coordinates (b); 1 and 2 – wheat and rye flour, 3 – sugar.*

Fig. 1 shows the operational dependences of the mass of ferroimpurities extracted by magnetophoresis from enlarged samples of wheat and rye flour, sugar [7, 8]. It can be seen that even after an increased number of operations, the fraction of the residual mass of ferroimpurities (the "tail" parts of the dependences *m* on *n* that are outside the actual experiment), judging by the "creeping" course of these

dependencies, is significant and must be taken into account. And this, of course, becomes possible after the establishment of the functional form of the obtained dependences of $m$ on $n$, which is responsible for the objective extrapolation of these dependencies, recommended here.

It was shown in [7, 8] that the solution to such a problem is facilitated if the dependences of $m$ on $n$ (Fig. 1*a*) are presented in semilogarithmic coordinates (Fig. 1*b*), in which they are fairly well "linearized". Hence, these dependencies - exponential types:

$$m = A \cdot \exp(-k \cdot n) \tag{1}$$

In addition to obtaining the result in the program, parameter $A$ included in (1) is conveniently found graphically as the fictitious starting ($n$=0) ordinate of the dependence of $m$ on $n$ (Fig. 1*b*), and the parameter $k$ is the inverse counting for an arbitrary taken from Fig. 1 pair of $n$ and $m$=$m_n$ values, i.e. $k$=[-ln($m_n$/$A$)]/$n$.

A feature of this kind of dependence is that, being discrete in this case, it is a quantitative series in the form of a decreasing geometric progression, the first term of which is $m_1 = A \cdot \exp(-k \cdot 1)$, and the denominator is $q = \exp(-k)$. Therefore, the total mass of ferroimpurities in the sample of the analyzed medium, including taking into account the residual mass (the one that remains in the sample after performing $n$ actual extraction operations and for the complete extraction of which theoretically it is necessary to perform an unlimited number of operations), can be determined by finding the sum of an unlimited number terms of this discrete dependence (1). Under $n \to \infty$ this total mass: $m_{1...\infty} = m_1/(1-q)$, i.e.

$$m_{1...\infty} = \frac{A}{\exp k - 1}, \tag{2}$$

and the true mass fraction of ferroimpurities (in a sample of the analyzed medium of mass $M$): $c$=$m_{1...\infty}$/$M$.

With the implementation of this essentially - precision control method, it becomes possible to calculate the prevented measurement error, i.e. the error that would have occurred if the total mass obtained as a result of a limited number of magnetophoretic extraction of the ferroimpurities was taken as the actual mass of all ferroimpurities. To do this, it is necessary to find the total (formally valid) mass $m_{1...n}$ of impurities extracted during the actual number $n$ of operations, and calculate the averted error as the relative difference between the obtained values $m_{1...\infty}$ and $m_{1...n}$.

In the case of a limited number of ($n$) operations, the mass of magneto-impurities extracted from a sample of ferroimpurities $m_{1...n}$ (except for a simple summation of experimentally determined masses) can be found almost in the same way - as the sum of a limited number of members of the same progression: $m_{1...n}$=($m_1$- $m_n \cdot q$)/(1-$q$), i.e.

$$m_{1...n} = A\frac{1-\exp(-k\cdot n)}{\exp k-1}. \quad (3)$$

Then the prevented (eliminated) error $\varepsilon_{1...n}=(m_{1...\infty}-m_{1...n})/m_{1...\infty}$ (x100%) taking into account (2) and (3) is estimated by the following expression:

$$\varepsilon_{1...n} = \exp(-k\cdot n)\,(\text{x}100\%),, \quad (4)$$

that is, as already stated, this is the error that could have occurred if the aggregate value $m_{1...n}$ (purely by the results of magnetophoresis control) was taken into account, and not the value $m_{1...\infty}$ (taking into account the residual, " tail "post-experimental part of the dependence of $m$ on $n$).

In particular, with the numbe $n$=3 operations, this prevented error in determining the content of ferroimpurities in wheat and rye flour (Fig. 1) according to (4) is $\varepsilon_{1...3}$=18%, $\varepsilon_{1...3}$=17% And if one ($n$=1), is performed, it seems to be - "thorough", the prevented measurement error would be $\varepsilon_1$=57% and $\varepsilon_1$=55%, respectively, which indicates the inadmissibility of such a simplification in the implementation of magnetophoretic control of the content of ferroimpurities.

When implementing magnetic control of the content of ferroimpurities in food products (and the subsequent use of these data in the technique and technology of magnetic separation), it is important to have detailed information on the sizes of $\delta$ ferroimpurities. So, when observing under a microscope the extracted (through laboratory magnetophoresis) ferroparticles, the following actions should be performed:

1) select the area of observation for a statistically significant number of ferroparticles (in the field of view of the microscope), determine and fix the average sizes of each of the ferroparticles in this region, as well as their total number $N$;

2) divide the entire range of size variability into equal size intervals and calculate the fractional number of $N_i$ particles, i.e. the number of particles that fall into a particular interval;

3) the received (and tabulated) data should be presented in graphical form, i.e. in the form of quantitative (values of $N_i$) and/or quantitatively proportional (values of $N_i/\Sigma N_i=N_i/N$) histograms of the distribution of particles over the intervals of particle sizes $\delta$ (each of the intervals is characterized by an average size $\delta_i$);

4) convert quantitative histograms into volumetric (volume values $V_i\sim\delta_i^3\cdot N_i$) and / or volume-fractional ($V_i/\Sigma V_i$ values) – as the most reliable characterization of the "contribution" of a particular fraction of ferroimpurities to the total volume (mass, concentration) of these particles. In this case, it is convenient to compare real particles, in particular, spherical particles with an equivalent diameter $\delta_i$ (equal to the abscissa of the middle of each interval of traditional histograms), you should find the average volume of one particle as $\pi\,\delta_i^3/6$. Then, after multiplying it by the corresponding number of $N_i$ particles (in each of these intervals), there is

the total volume of particles included in a certain interval (of the converted histogram): $V_i = N_i \cdot \pi \delta_i^3/6$. Dividing this total (for the interval) volume of particles $V_i$ by the total volume $V=\Sigma V_i$ of all the particles measured, the corresponding volume (mass, concentration) fraction of ferroparticles of one size or another is found.

As an example, Fig. 2 shows the quantitative-fractional and volume-fractional histograms of the distribution of ferroimpurities of wheat and rye flour by size $\delta$.

Of course, traditional quantitative-fractional histograms (Fig. 2*a*) provide, in this illustrated manner, certain information about the representation of ferroimpurities of one size or another. However, according to this information only, oversized particles have a relatively small "representation" in the samples.

If these histograms are transformed into volumetric (volume-fractional) histograms (Fig. 2*b*), then the "tolerant" attitude towards the representation of higher and higher ferroimpurities based on the quantitative-fractional histograms (Fig. 2*a*) will change significantly. According to exactly this information (Fig. 2*b*), the representation of oversized particles in the samples (note that we are talking about the same particles) should additionally motivate appropriate hardware and parametric decisions regarding the use of appropriate magnetic separators.

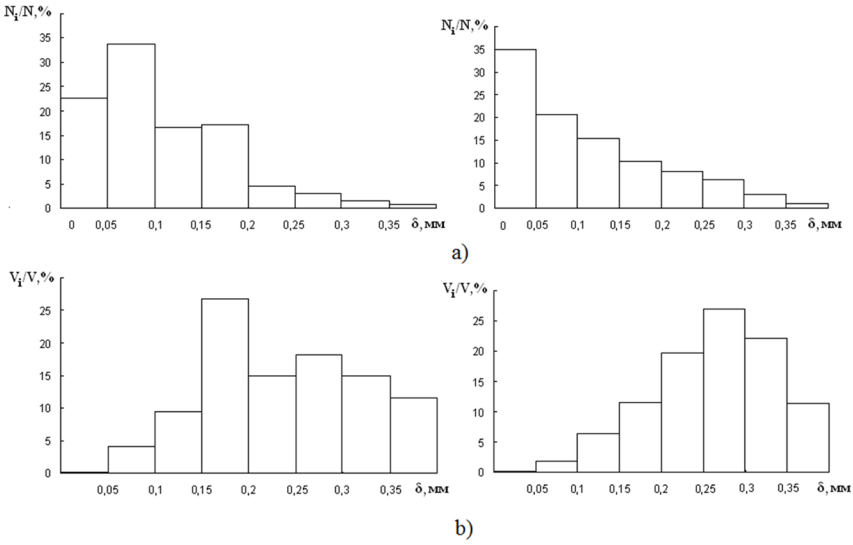


***Fig. 2.*** *Quantitative-fractional (a) and volume-fractional (b) histograms of the distribution of ferroimpurities of wheat flour (left) and rye flour (right) in size.*

Thus, the implementation of the approaches (which, by the way, do not require special operator training) to the analysis of the content and size of ferroimpurities in food products help to obtain more informative results. This means that the numerous tasks of ensuring the quality and safety of products, the safety of their production can be solved (including with the targeted use of magnetic separators) in a more qualified manner.

*The study was supported by a grant of the President of the Russian Federation for the state support of young scientists - project MK-807.2020.8; Ministry of Education and Science of the Russian Federation in the framework of the State Assignment in the field of science - project № 0706-2020-0024.*

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使用递归神经网络解决最优市场研究问题

# SOLVING THE PROBLEMS OF OPTIMAL MARKET RESEARCH USING RECURRENT NEURAL NETWORKS

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抽象。 本文讨论了用于最佳市场研究的神经网络算法。 该算法基于递归神经网络的使用和“胜者为王”的原则。

关键字：递归神经网络，优化，多准则任务，风险，决策。

***Abstract.*** *This article discusses neural network algorithms for optimal market research. The algorithm is based on the use of a recurrent neural network and the principle of "Winner takes all".*

***Keywords:*** *Recurrent neural networks, optimization, multi-criteria task, risk, decision making.*

The market research team needs to get data from *n* different places. They have *n* days at their disposal, and they expect to spend one day in each place, having carried out $a_j$ polls, $j = \overline{1,n}$. The probability of a successful survey in each place is given by the matrix *P*. The element of the matrix $p_{ij}$ characterizes the probability of a successful survey during the $i$ - th day in the $j$ - th place, $i = \overline{1,n};\ j = \overline{1,n}$.

Determine the time of the polls at which the total number of polls is maximum.

We reduce this problem to the assignment problem.

We introduce the value $r_{ij} = p_{ij}a_j$, which shows the number of successful polls in the $j$ - th place during the $i$ - th day.

$$x_{ij} = \begin{vmatrix} 1, \textit{если } i-\textit{й день опрос проводится в } j-\textit{м месте}; \\ 0, \textit{в противном случае}. \end{vmatrix}$$

The mathematical model of the problem has the following form:

$$R = \sum_{i=1}^{n}\sum_{j=1}^{n} r_{ij}x_{ij} \to \max. \tag{1}$$

$$\begin{cases} \sum_{j=1}^{n} x_{ij} = 1,\ i = \overline{1,n}; \\ \sum_{i=1}^{n} x_{ij} = 1,\ j = \overline{1,n}; \\ x_{ij} \in \{0;1\},\ i = \overline{1,n} \quad j = \overline{1,n}. \end{cases} \tag{2}$$

Function $R$ characterizes the total number of polls. It needs to be maximized. The first and second restrictions correspond to the fact that for one day you can only be in one place. To calculate the model with recurrent neural networks, we need to go to the opposite function

$$R = -\sum_{i=1}^{n}\sum_{j=1}^{n} r_{ij}x_{ij},$$

and in the corresponding table write the values of $r_{ij}$ with the opposite sign.

When a vector is fed to the input of the network, the states of the neurons are determined, but then, due to the fact that the outputs of the neurons have feedbacks, a new vector comes to their inputs again, and the states change again. The notion of stability is associated with recurrent networks. A network is considered stable if, after a finite number of iterations, neurons assume states that do not change further. When a vector is supplied to the input of stable recurrent networks, the output signals of neurons are generated, which then again go to the inputs, again generating a new state vector, but, as the number of iterations increases, the number of changes in the state of nodes decreases until the network is established in its final state. Non-feedback networks are always stable, since when a single vector is input, network nodes can only change their state once, due to the constancy of the inputs of neurons.

A lot of works [1] are devoted to solving combinatorial optimization problems by neural networks. The most popular in this regard are Hopfield networks, but their application is limited by high computational complexity.

One of the largest researchers of neural networks is Hopfield, who proposed a special kind of networks, which are called Hopfield networks [2]. At the input of each neuron, in addition to the corresponding component of the input vector X, the output signals from other neurons through the distribution neurons of the first layer are received.

A neural network having n binary-valued outputs can be in $2^n$ states. Each of these states represents one of the vertices of a hypercube in n-dimensional space, if the values of the levels of neuron activity are postponed along the coordinate axes. When the input vector is applied, the network goes from state to state, i.e. moves along the vertices of the hypercube until it reaches the final state. Stable states correspond to certain values of input vectors, weighting factors and thresholds.

To solve problem (1) - (2), a recurrent neural network [3] is proposed, which is described by the differential equation

$$\frac{\partial u_{ij}(t)}{\partial t} = -\eta\left(\sum_{k=1}^{n} x_{ik}(t) + \sum_{l=1}^{n} x_{lj}(t) - 2\right) + \lambda r_{ij} \exp\left(-\frac{t}{\tau}\right), \quad (3)$$

where $x_{ij} = f(u_{ij}(t)), \quad f(u) = \frac{1}{1+\exp(-\beta u)}$. As in the Hopfield network, a matrix of neurons of size $n \times n$, is used here, but neurons interact not according to the “each with each” principle, but along rows and columns.

The difference version of this equation has the form

$$u_{ij}^{t+1} = u_{ij}^{t} - \Delta t \cdot \left[\eta\left(\sum_{k=1}^{n} x_{ik}(t) + \sum_{l=1}^{n} x_{lj}(t) - 2\right) - \lambda r_{ij} \exp\left(-\frac{t}{\tau}\right)\right], \quad (4)$$

where $\Delta t$ - time step. Parameters $\Delta t, \mathsf{h}, \mathsf{l}, \mathsf{t}, \mathsf{b}$ are selected experimentally and significantly affect the speed of achieving the solution of the problem and the quality of this solution.

To speed up the solution of the system of equations (4), the principle "Winner takes all" is proposed:

1. A matrix $\left\|x_{ij}^{0}\right\|$ of random values of $x_{ij}^{0} \in [0,1]$. is generated. Iteration (4) continues until the following inequality holds:

$$\sum_{k=1}^{n} x_{ik}(t) + \sum_{l=1}^{n} x_{lj}(t) - 2 \le \varepsilon,$$

where $\mathsf{e}$ - specified accuracy of constraints (2).

2. The resulting matrix of solution $\left\|x_{ij}\right\|$ is transformed:

2.1. $i = 1$.

2.2. In the i-th row of the matrix, the maximum element $x_{i,j_{\max}}$ is found, $j_{\max}$ - is the number of the column with the maximum element.

2.3. Transform $x_{i,j_{\max}} = 1$ is performed. All other elements of the first row and column become zero:

$$x_{ij} = 0, \ j \neq j_{\max},$$

$$x_{k,j_{\max}} = 0, \ k \neq i.$$

After this, there is a transition to a line $j_{\max}$ .

Actions 2.2. and 2.3 are repeated until a return to the first line occurs, which will mean completion of the loop

3. If the return to row 1 occurred earlier than the value 1 in the matrix $\|x_{ij}\|$ received n elements, then this means that the length of the constructed cycle is less than n. In this case, steps 1 and 2 are repeated.

One of the main properties of artificial neural networks is the parallelism of information processing in networks [4]. Each of the neurons is a separate computing device working in parallel with a group of other elements. Each neuron brings its share of computation in the development of the final vector of the network output signals. This determines the high speed of neural computing when implemented on parallel hardware.

To solve equation (4) in parallel, the elements of the matrix *R, u,* and *x* are distributed line by line among the machines of the system. At each iteration, the following actions are performed:

1. The sums $s_i^{(1)} = \sum_{k=1}^{n} x_{ik}$ are calculated in parallel.

2. The calculation of the sums of $s_j^{(2)} = \sum_{l=1}^{n} x_{lj}$ is done on a splendid spanning root tree, followed by distribution on a descending tree.

3. All other actions in accordance with formula (4) are performed in parallel.

Reliability of neural network models is another valuable feature. Here reliability can be understood in two ways. On the one hand, when a noisy or incomplete image arrives at the network input, the network can behave as if the original version of the image were received. On the other hand, when a connection or even a whole neuron fails, the quality of the network's behavior decreases only slightly. This property may allow the construction of applied neural network systems for areas where high reliability is required.

An equally important quality is the learning ability of neural networks.

Due to this property, they can not only recognize the images arriving at their input, but, with the help of appropriate procedures, can be configured in such a way as to make the most correct recognition possible. Thus, neural networks can operate in two modes or phases: in training mode and recognition mode.

When creating a neural network, its weighting coefficients and threshold values are set randomly. In this initial state, the network is not yet capable of recognizing. To provide such an opportunity, one or another training procedure is applied, depending on the nature of the task. Training requires a significant amount of computer time to reach the network in a state where it becomes possible to conduct recognition with an acceptable level of accuracy. During this procedure, the modification of the parameters of the neural network (weights, thresholds, and in some algorithms the structure of the network itself) occurs in order to ensure the required recognition accuracy. Sometimes this process does not lead to the desired result. In these cases, it is necessary to re-apply the selected training procedure with other initial values of the weight coefficients and, possibly, with changed values of the parameters of the procedure itself.

The network is not only capable of fulfilling the functions of an automaton by displaying many input vectors, but also modifying its parameters (structure, weighting factors) in such a way as to adapt its behavior to the requirements of a particular task. For example, in supervisor algorithms, it is required to provide a mapping of multiple input vectors to multiple output vectors. In this case, the network parameters are selected accordingly, depending on the specific algorithm. This quality allows you to calculate network parameters without having significant knowledge of the subject area. For example, when building neural expert systems, there is no need for a laborious process of working with experts (those who are familiar with the problems of building expert systems know that acquiring knowledge is the most difficult stage in their development), provided that there is sufficient statistical material.

The ability of neural networks to generalize - is also a very important property. Due to this property, networks are able not only to reproduce the mappings specified during training, but also to build new ones. This increases the "competence" of systems based on neural networks.

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# 解决参数设置中结构性决策不佳的问题
# SOLVING PROBLEMS OF POORLY STRUCTURED DECISIONS IN PARAMETRIC SETTING

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抽象。 考虑了解决在参数化表达的模糊性条件下做出结构不良决策的问题的方法，该方法被简化为解决参数化编程问题。
关键字：模糊集，优化，多准则任务，风险，决策。

***Abstract.*** *Methods of solving the problem of making poorly structured decisions under conditions of fuzziness in a parametric formulation are considered, which is reduced to solving a parametric programming problem.*
***Keywords:*** *Fuzzy set, optimization, multi-criteria task, risk, decision making.*

The problem of making poorly structured decisions in the face of fuzziness in the parametric formulation is reduced to the problem of parametric programming.

The model of a parametric programming task with S independent fuzzy-defined parameters $T = \{t_i\}, i = \overline{1,s}$ or S-parameter parametric programming in matrix form is written as follows:

$$F = (\bar{a}_0 + t'\bar{b})x + \bar{e}t \to extr;$$
$$(\bar{a} + \bar{c}t)x \subset K; \qquad (1)$$
$$t \in R^s.$$

Here: x - alternatives, $K=\{y \mid y \in R^n, y \le a_0 + pt\}$ - given convex subset of space $R^n$, $\bar{a}_0, \bar{a}, \bar{b}, \bar{c}, \bar{e}$ - coefficients, which are fuzzy quantities, usually represented in the form of fuzzy sets with given membership functions $\mu_{\bar{a}_0}(a_0)$

($\bar{a}_0 \subset A_0$), $\mu_{\bar{b}}(b)$ ($\bar{b} \subset B$), $\mu_{\bar{e}}(e)$ ($\bar{e} \subset E$), $\mu_{\bar{a}}(a)$ ($\bar{a} \subset A$), $\mu_{\bar{c}}(c)$ $\mu_{\bar{c}}(c)$ ($\bar{c} \subset C$) and $\mu_{\bar{p}}(p)$ ($\bar{p} \subset P$). Using various defuzzification operations on fuzzy sets $a_0$, a, b, c, e, p [1] (integration, summation, averaging, etc.) it is possible to obtain specific values of the coefficients $a_0$, a, b, c, e, p [1]. Then, introducing them in (1) instead of fuzzy coefficients and writing down the constraint in the form of the corresponding inequalities, we reduce the original problem to the following form

$$F = (a_0 + t'b)x + et \to extr;$$
$$(a + ct)x \le a_0 + pt; \qquad (2)$$
$$t \in R^s.$$

Note that due to the fuzzy description of the coefficients $\bar{a}_0$ and $\bar{b}$ the estimate of any alternative $x(t) \in X$ (and, accordingly, the value of the function *F* (t) for x=x(t)) is a fuzzy subset of the numerical axis of the base set X [2].

Consider the problem of making poorly structured decisions in which the fuzzy function F(t) should be "fuzzily maximized." In this case, we represent the function F(t) as a fuzzy target function of the form $\varphi : X \times R^1 \to [0,1]$.

The solution of this problem is carried out in stages [3,4].

At the first stage of the solution, a mathematical model of problem (1) is formulated in the stated statement (2).

Let $a_0^0, b^0, e^0$ be some numerical values of the coefficients of the function $F(t) = (a_0 + t'b)x + et$; the degrees of their belonging to given fuzzy sets are equal, respectively, $\mu_{\bar{a}_0}(a_0^0)$, $\bar{a}_0 \subset A_0$, $\mu_{\bar{b}}(b^0)$, $\bar{b} \subset B$, $\mu_{\bar{e}}(e^0)$, $\bar{e} \subset E$; $\mathbf{j}^0$ - the minimum value of the function $\mathbf{j}$ for the values of the coefficients $a_0^0, b^0, e^0$ and $\tilde{x} \in \tilde{X}$ - some alternative to which $\mathbf{j}^0$ corresponds. It is natural to assume that the value of $\mathbf{j}$ belongs to a fuzzy estimate of alternative $\tilde{x}$ with a degree not less than $\mathbf{j}^0$. This implies that the desired fuzzy function of the target $\mathbf{j}$ has the form $\varphi(x, r(t)) = \sup(\mu_{\bar{a}_0}(a_0), \mu_{\bar{b}}(b), \mu_{\bar{e}}(e))$. Here we use the mapping $F(t) \to r(t)$, where $r(t) \to [0,1]$ characterizes the degree to which F(t) belongs to the set of values of the objective function.

Finally, we get that the original problem with fuzzy described parameters is formulated in the form of the following general fuzzy mathematical programming problem: “maximize” the fuzzy goal function

$$\varphi(x,r(t)) = \sup(\mu_{\bar{a}_0}(a_0), \mu_{\bar{b}}(b), \mu_{\bar{e}}(e)) \quad (3)$$

on a fuzzy set of admissible alternatives of the form

$$\mu_{\tilde{X}}(x) = \sup \nu(t) .$$

The resulting model for setting problem (3) is a concretization of the more general problem of making poorly structured decisions formulated in [4].

At the second stage, there are many non-dominated alternatives for problem (3).

We first consider a simpler problem (3) with a fuzzy target function

$$\varphi(x,r(t)) = \sup(\mu_{\bar{a}_0}(a_0), \mu_{\bar{b}}(b), \mu_{\bar{e}}(e))$$

with the usual (clearly described) set of feasible alternatives given by the inequalities

$$\psi(t) = (a + ct)x - (a_{.0} + pt) \le 0 ,$$

and well-known parameter values.

We assume that all the original fuzzy sets $\mu_{\bar{a}_0}(a_0)$, $\mu_{\bar{b}}(b)$, $\mu_{\bar{e}}(e)$ are such that $\sup_{A_0 \in R^1} \mu_{\bar{a}_0}(a_0) \ge \alpha$, $\sup_{B \in R^1} \mu_{\bar{b}}(b) \ge \alpha$ and $\sup_{E \in R^1} \mu_{\bar{e}}(e) \ge \alpha$. It was shown in [1] that in this case the function $\varphi(x,r(t)) = \sup(\mu_{\bar{a}_0}(a_0), \mu_{\bar{b}}(b), \mu_{\bar{e}}(e))$ has property $\sup_{r(t) \in R^1} \varphi(x,r(t)) \ge \alpha$ for any $x \in X$. Therefore, to find alternatives whose degree of dominance is not less than $\alpha$, in the case under consideration, it is sufficient to solve the following problem of fuzzy parametric programming:

$$r(t) \to \max ;$$

$$\varphi(x,r(t)) \ge \alpha ; \quad (4)$$

$$\psi(t) = (a + ct)x - (a_{.0} + pt) \le 0 ;$$

$$r(t) \in R^1, \ x \in X .$$

A computational experiment was carried out to solve the parametric programming problem in the following statement [5].

For the cultivation of selection varieties A – 108-F, B – Tashkent -1 and C – C-4727 three types of fertilizers (raw materials) are used: I – sodium, II – phosphorus and III – potassium. The membership functions of the consumption rate of raw materials $\mu_{\bar{a}}(a)$ ($\bar{a} \subset A$) for the production of a unit of selection variety are given in the table. It also indicates the membership function of the effectiveness $\mu_{\bar{a}_0}(a_0)$ ($\bar{a}_0 \subset A_0$) of the selection variety of each species.

Selection varieties A, B and C can be produced in any ratio. However, production is limited

***Table***

| Type of raw material | Norms of raw material costs per unit of output | | |
|---|---|---|---|
| | **A** | **B** | **C** |
| I | $e^{\frac{-(x-18)^2}{2}}$ | $e^{\frac{-(x-15)^2}{2}}$ | $e^{\frac{-(x-12)^2}{2}}$ |
| II | $e^{\frac{-(x-6)^2}{2}}$ | $e^{\frac{-(x-4)^2}{2}}$ | $e^{\frac{-(x-8)^2}{2}}$ |
| III | $e^{\frac{-(x-5)^2}{2}}$ | $e^{\frac{-(x-3)^2}{2}}$ | $e^{\frac{-(x-3)^2}{2}}$ |
| Efficiency | $e^{\frac{-(x-9)^2}{2}}$ | $e^{\frac{-(x-10)^2}{2}}$ | $e^{\frac{-(x-16)^2}{2}}$ |

by the available raw materials I with the membership function ( $\mu_{\bar{b}}(b), \bar{b} \subset B$ ) in the form of $e^{\frac{-(x-360)^2}{2}}$, II in the form of $e^{\frac{-(x-192)^2}{2}}$ and III in the form of $e^{\frac{-(x-360)^2}{2}}$. We now establish the possible boundaries for changing the effectiveness of each selection variety, within which the optimal solution found does not change. Let's start with A. Suppose that its efficiency is $a_{01} = (9 + t_1)$, where $t_1$ - some parameter. Then it is required to find values of the parameter $t_1$, at which the optimal solution $X^*$ found realizes the maximum value of the function

$$F = (9 + t_1)x_1 + 10x_2 + 16x_3 .$$

The solution to this problem $x(t) \in X$ with the membership function $\mu_{\bar{x}}(x), (e^{\frac{-x^2}{2}}, e^{\frac{-(x-8)^2}{2}}, e^{\frac{-(x-20)^2}{2}})$ is optimal for $t_1 \leq 5$.

We conducted a sensitivity analysis of the optimal solution with a possible change in the effectiveness of each selection variety. Similarly, it is possible to analyze the sensitivity of the optimal solution to this problem while changing the values of several coefficients of the objective function.

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# 改善小型企业的管理流程
# IMPROVING THE PROCESS OF MANAGING SMALL BUSINESSES

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抽象。 为了改善管理农业中小企业活动的过程，提出了一种计划，该计划反映了考虑到风险的合理商业决策的分阶段开发过程。
关键字：模糊集，优化，多准则任务，风险，决策。

***Abstract.*** *In order to improve the process of managing the activities of small business in agriculture, a scheme is proposed that reflects the process of phased development of a reasonable business decision taking into account risk.*
***Keywords:*** *Fuzzy set, optimization, multi-criteria task, risk, decision making.*

The direction of improving the process of managing the development of small business taking into account varieties of risk has been identified based on the phased implementation of the conceptual framework for developing an entrepreneurial solution, including such important functional components as a description of the situation, decomposition of the problem, identification of preferences, selection of criteria, structuring of the problem, building the membership function, mathematical statistical processing of primary information, economic and mathematical formalization of tasks, choice of method, algorithm and solution

options, program development and computational experiments, analysis of reliability, adaptability and risk level of the results. Central to the assessment of entrepreneurial risk is the analysis and forecasting of possible resource losses. From a scientific point of view, risk should be characterized and measured most reasonably as the probability of a certain level of losses.

This scheme allows you to clearly define the task of the entrepreneur. It defines the sequence of the entrepreneurial decision process, indicates the place of the modeling algorithm for calculating the degree of risk, the values of utility functions, excess demand and entrepreneurial profit. It allows you to take into account the risk in economic situations, the features of the application of economic and mathematical methods and a computer in the face of uncertainty, reflect the iterative nature of this process, streamline the actions of the decision maker (DM) and the economic services of the enterprise to prepare and update the decision.

In addition, this scheme includes a special unit for determining additional, especially expertly asked, information to clarify entrepreneurial decisions in case they do not meet the established goal.

Decision-making tasks in such systems are divided into two types: 1) decision-making tasks in risk conditions, when the uncertainty conditions are only probabilistic, stochastic in nature; 2) decision-making tasks in conditions of uncertainty, when the conditions followed are non-stochastic in nature, and also when the necessary reliable statistical material is unknown.

In the tasks of the second type, risks are manifested to a greater extent than in the first. In this case, risk should be considered - as an object, event, phenomenon - as a formal mathematical category in accordance with the following information interpretation: risk is information uncertainty, fuzziness of the system "object-subject-environment" and its individual elements. The measure of this uncertainty determines the measure of danger, possible damage, loss from the implementation of a decision or event.

Planning agricultural production in risky farming areas (in floodplains, in dry lands, on mountain slopes) is an urgent task. At the same time, there is always a more expensive alternative to develop production in protected or irrigated areas. The problem is choosing a reasonable compromise between expensive and reliable technology and cheap, but risky. Let there be only one type of investment, for example, in sowing a certain type of crop. We denote: $x_i$ sown area in the region $i$; $c_i$ – the cost of growing crops per unit area in the region $i$; $q_i$ – crop yield in region $i$ under normal conditions; $l_{ij}$ – expertly determined crop loss in region $i$ under catastrophic scenario $j$; $m_{ij}$ – experimental yield loss coefficient in the region $i$ in the catastrophic scenario $j$; $b_j$ – maximum sown area in the region $i$; $l_j$ – allowable losses in shares of sown area for the scenario $j$; $m_j$ – allowable losses in fractions of the total yield for the scenario $j$; $r$ – risk ratio;

$I -$ total investment. Then the task of investing in crop production is as follows: maximize the function below by $x = \{x_i\}$

$$F(x) = \sum_i \theta_j x_i$$

under limitations

$$F_j(x) = \sum_i m_{ij}\theta_i x_i \le r\mu_j \sum_i \theta_i x_i, \quad j = 1, \dots, m;$$

$$G_j(x) = \sum_i l_{ij} x_i \le r\lambda_j \sum_i x_i, \quad j = 1, \dots, m;$$

$$\sum_i c_i x_i \le I; \quad 0 \le x_i \le b_i, \quad i = 1, \dots, n.$$

The entrepreneur sets the goals of preparing an entrepreneurial decision and sufficiently studies the situation to be solved, and then determines the subject of risk and identifies possible sources of risk. Such risks (losses can be material, labor, financial, loss of time, as well as special types of losses, manifested in the form of damage to the health and life of people, the environment, the prestige of the entrepreneur in the form of social and moral-psychological consequences. The entrepreneur must find out what the real risk is. When conducting a comprehensive analysis of probable losses for risk assessment, it is important to review everything possible so as not to ignore the sources of risk.

Among the applied methods for constructing a risk curve, we single out the statistical, expert, calculation-analytical ones.

*Statistical method* is that the statistics of losses is studied, the frequency of occurrence of certain levels of losses is established.

If the statistical array is representative enough, then the frequency of occurrence of a given level of losses can be equated, to a first approximation, with the probability of their occurrence, and on this basis a loss probability curve can be constructed, which is the desired risk curve.

*Expert method*, known as the method of expert assessments, as applied to risk, it can be realized by processing the opinions of experienced specialists.

It is most desirable that the experts give their estimates of the probabilities of occurrence of certain loss levels, from which then it would be possible to find the average values of expert estimates and use them to construct a probability distribution curve.

*Calculation-analytical method* building a curve of the probability distribution of losses and assessing risk indicators on this basis is based on theoretical concepts.

In conclusion, it can be noted that the methods of analysis and risk assessment in many respects still have to be developed and created.

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# 反应扩散系统自相似解的数值模拟
# ON THE NUMERICAL MODELING OF SELF-SIMILAR SOLUTIONS OF A REACTION-DIFFUSION SYSTEM

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在对自相似解进行分析的基础上，研究了一个Kolmogorov-Fisher型生物种群问题的反应扩散方程非线性系统的解的性质。 提出了用于快速收敛的迭代过程的合适的初始近似。 对各种系统参数值进行了可视化的数值实验。

关键词：生物种群，微分方程非线性系统，初始近似，数值，迭代过程，自相似解。

*Based on an analysis of self-similar solutions, the properties of solutions of a nonlinear system of reaction-diffusion equations of one problem of a biological population of Kolmogorov-Fisher type are investigated. Suitable initial approximations for a rapidly converging iterative process are proposed. Numerical experiments with visualizations were carried out for various values of the system parameters.*

***Keywords:*** *biological population, nonlinear system of differential equations, initial approximation, numerical, iterative process, self-similar solutions.*

## 1. Introduction

Consider models of two competing populations with nonlinear diffusion. The problem of the mathematical description of biological competition has a long history. The most famous attempt to describe the competition of several populations is the Volterra-Lotka system [1-4]. The main statement relating to competing communities is the Gause principle [5]. It states that the result of the competitive interaction of two species occupying the same ecological niche will be the crowding out of the least fit.

In the last decade, due to the growing interest in the problems of structure formation, the study of models of multicomponent competing biological systems in the class of systems of nonlinear reaction-diffusion equations has received a

new impetus [3,7]. The introduction of the assumption of the spatial habitat of competing species allows a different look at the processes and results of competition. Let us consider a spatial analogue of the Volterra-Lotka competition system with a nonlinear power law dependence of the diffusion coefficient on population density. In the case of the simplest Volterra competitive interactions between populations, it is possible to construct numerically, and in some cases analytically, spatially inhomogeneous solutions [7].

**2. Formulation of the problem**

Consider in the domain $Q=\{(t,x): 0< t < \infty,\ x\in R^2\}$ a parabolic system of two quasilinear reaction-diffusion equations for a Kolmogorov-Fisher type biological population problem

$$\begin{cases} \dfrac{\partial u_1}{\partial t} = \dfrac{\partial}{\partial x}\left( D_1 u_1^{\sigma_1} \dfrac{\partial u_1}{\partial x} \right) + k_1(t) u_1 \cdot \left(1 - u_2^{\beta_1}\right), \\ \dfrac{\partial u_2}{\partial t} = \dfrac{\partial}{\partial x}\left( D_2 u_2^{\sigma_2} \dfrac{\partial u_2}{\partial x} \right) - k_2(t) u_2 \cdot \left(1 - u_1^{\beta_2}\right), \end{cases} \tag{1}$$

$$u_1\big|_{t=0} = u_{10}(x),\ \ u_2\big|_{t=0} = u_{20}(x) \tag{2}$$

which describes the process of biological population in a nonlinear two-component medium, the diffusion coefficient of which is equal to $D_1 u_1^{\sigma_1}$ and $D_2 u_2^{\sigma_2}$, $\sigma_1, \sigma_2, \beta_1, \beta_2$ - are positive real numbers, $u_1 = u_1(t,x) \ge 0$, $u_2 = u_2(t,x) \ge 0$ - are the desired solutions.

The Cauchy problem and boundary value problems for system (1) in the one-dimensional and multidimensional cases have been studied by many authors [3-7].

The aim of this work is to study the qualitative properties of solving problem (1), (2) based on self-similar analysis and its numerical solutions using modern computer technologies, to study linearization methods for convergence of the iterative process with further visualization. Estimates of the solutions and the resulting free boundary are found, which makes it possible to choose suitable initial approximations [3] for each value of the numerical parameters.

Let us build a self-similar system of equations for (1) - (2), which is simpler for studying the system of equations.

**3. Building self-similar system equations**

We construct a self-similar system of equations by the method of nonlinear splitting [3].

Replacement in (1)

$$u_1(t,x) = e^{k_1 t} v_1(t,x),$$
$$u_2(t,x) = e^{k_2 t} v_2(t,x)$$

will lead (1) to the form:

$$\begin{cases} \dfrac{\partial v_1}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_1 v_1^{\sigma_1} \dfrac{\partial v_1}{\partial x} \right) - k_1 e^{((\beta_1 k_2 + k_1) - (\sigma_1 + 1)k_1)t} v_1 v_2^{\beta_1} \\ \dfrac{\partial v_2}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_2 v_2^{\sigma_2} \dfrac{\partial v_2}{\partial x} \right) - k_2 e^{((\beta_2 k_1 + k_2) - (\sigma_2 + 1)k_2)t} v_1^{\beta_2} v_2 \end{cases} \quad (3)$$

$$v_1\big|_{t=0} = v_{10}(x), \quad v_2\big|_{t=0} = v_{20}(x),$$

Choosing $\sigma_1 k_1 = \sigma_2 k_2$, we get the following system of equations,

$$\begin{cases} \dfrac{\partial v_1}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_1 v_1^{\sigma_1} \dfrac{\partial v_1}{\partial x} \right) - a_1 \tau^{b_1} v_1 v_2^{\beta_1}, \\ \dfrac{\partial v_2}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_2 v_2^{\sigma_2} \dfrac{\partial v_2}{\partial x} \right) - a_2 \tau^{b_2} v_1^{\beta_2} v_2, \end{cases} \quad (4)$$

where $a_1 = \left(\delta_1 k_1\right)^{b_1}$, $a_2 = \left(\delta_2 k_2\right)^{b_2}$,

$b_1 = [(\beta_1 k_2 + k_1) - (\sigma_1 + 1)k_1] / \sigma_1 k_1$, $b_2 = [(\beta_2 k_1 + k_2) - (\sigma_2 + 1)k_2] / \sigma_2 k_2$.

If $b_i = 0$, $i = 1,2$, i.e. $\beta_1 k_2 + k_1 = (\sigma_1 + 1)k_1$ and $\beta_2 k_1 + k_2 = (\sigma_2 + 1)k_2$, then the system has the form:

$$\begin{cases} \dfrac{\partial v_1}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_1 v_1^{\sigma_1} \dfrac{\partial v_1}{\partial x} \right) - a_1 v_1 v_2^{\beta_1}, \\ \dfrac{\partial v_2}{\partial \tau} = \dfrac{\partial}{\partial x}\left( D_2 v_2^{\sigma_2} \dfrac{\partial v_2}{\partial x} \right) - a_2 v_1^{\beta_2} v_2. \end{cases}$$

Below we describe one of the ways to obtain a self-similar system for the system of equations (4). It consists of the following. First we find a solution to an ordinary system of differential equations

$$\begin{cases} \dfrac{d\overline{v}_1}{d\tau} = -a_1 \overline{v}_1 \overline{v}_2^{\beta_1} \\ \dfrac{d\overline{v}_2}{d\tau} = -a_2 v_1^{\beta_2} v_2 \end{cases}$$

of the form

$$\bar{v}_1(\tau) = c_1(\tau + T_0)^{-\gamma_1},\ \bar{v}_2(\tau) = c_2(\tau + T_0)^{-\gamma_2},\ T_0 > 0,$$

where

$$c_1 = 1,\quad \gamma_1 = \frac{1}{\beta_1},$$

$$c_2 = 1,\quad \gamma_2 = \frac{1}{\beta_2}.$$

And then the solution to system (3) - (4) is sought in the form

$$v_1(t,x) = \bar{v}_1(t)w_1(\tau,x),$$

$$v_2(t,x) = \bar{v}_2(t)w_2(\tau,x),$$

where $\tau = \tau(t)$ is selected as

$$\tau_1(\tau) = \int_0^{\tau} \bar{v}_1^{\sigma_1}(t)dt = \begin{cases} \dfrac{1}{1-\gamma_1\sigma_1}(T+\tau)^{1-\gamma_1\sigma_1}, & если\ \ 1-\gamma_1\sigma_1 \neq 0, \\ \ln(T+\tau), & если\ \ 1-\gamma_1\sigma_1 = 0. \end{cases}$$

Then for $w_i(\tau,x),\ \ i = 1,2$ we obtain the system of equations

$$\begin{cases} \dfrac{\partial w_1}{\partial \tau} = \dfrac{\partial}{\partial x}(D_1 w_1^{\sigma_1}\dfrac{\partial w_1}{\partial x}) + \psi_1(w_1 w_2^{\beta_1} - w_1) \\ \dfrac{\partial w_2}{\partial \tau} = \dfrac{\partial}{\partial x}(D_2 w_2^{\sigma_2}\dfrac{\partial w_2}{\partial x}) + \psi_2(w_2 w_1^{\beta_2} - w_2) \end{cases}, \qquad (5)$$

where

$$\psi_i = \begin{cases} \dfrac{\gamma_i}{(1-\gamma_1\sigma_1)\tau}, & если\ \ 1-\gamma_1\sigma_1 > 0, \\ \gamma_i c_1^{-\sigma_1}, & если\ \ 1-\gamma_1\sigma_1 = 0. \end{cases}$$

At $\tau \to \infty$, $\psi_i \to 0$ and $\begin{cases} \dfrac{\partial w_1}{\partial \tau} = \dfrac{\partial}{\partial x}(D_1 w_1^{\sigma_1}\dfrac{\partial w_1}{\partial x}), \\ \dfrac{\partial w_2}{\partial \tau} = \dfrac{\partial}{\partial x}(D_2 w_2^{\sigma_2}\dfrac{\partial w_2}{\partial x}). \end{cases}$

Suppose $\gamma_1\sigma_1 > 0$, $\gamma_1\sigma_1 = \gamma_2\sigma_2$, $\sigma_2(b_2+1)+\beta_2(b_1+1) = \sigma_1(b_1+1)+\beta_1(b_2+1)$ $c_i > 0$. In this case, assuming in (5)

$$w_i(\tau(t),x) = y_i(\xi), \quad \xi = |x|/\tau_1^{1/2}, \quad i = 1, 2,$$

and given that the equation for $w_i(\tau,x)$ without lower terms is always self-similar in the case of $1-\gamma_1\sigma_1 \neq 0$, we get the system

$$\begin{cases} \xi^{1-N}\dfrac{d}{d\xi}(\xi^{N-1}y_1^{\sigma_1}\dfrac{dy_1}{d\xi}) + \dfrac{\xi}{2}\dfrac{dy_1}{d\xi} + \mu_1(y_1 - y_1\ y_2^{\beta_1}) = 0, \\ \xi^{1-N}\dfrac{d}{d\xi}(\xi^{N-1}y_2^{\sigma_2}\dfrac{dy_2}{d\xi}) + \dfrac{\xi}{2}\dfrac{dy_2}{d\xi} + \mu_2(y_2 - y_2\ y_1^{\beta_2}) = 0, \end{cases}$$

where $\mu_i = \dfrac{1}{\sigma_i}$.

The study of the qualitative properties of system (1) - (2) allowed us to perform a numerical experiment depending on the values included in the system of numerical parameters. For this purpose, the constructed asymptotic solutions were used as an initial approximation. When numerically solving the problem for linearizing system (1) - (2), linearizations were used according to the Newton and Picard methods. To solve the problem of a biological population, a nonlinear splitting method is proposed.

**4. Computational experiment**

To numerically solve problem (1) - (2), we construct a uniform grid

$$\omega_h = \{x_i = ih, \quad h > 0, \ i = 0,1,...,n, \quad hn = l\},$$

and time grid

$$\omega_{h_1} = \{t_j = jh_1, \qquad h_1 > 0, \ j = 0,1,...,n, \quad \tau m = T\}.$$

The main issue for the numerical solution in nonlinear problems is the appropriate choice of the initial approximation and the method of linearizing system (1) - (2).

We replace problem (1) - (2) with an implicit difference scheme and obtain a difference problem with an error $O(h^2 + h_1)$.

We introduce the following notation:

$$v_{10}(t,x) = v_1(t)\cdot\left(a - \frac{\sigma_1}{4}\xi^2\right)_+^{1/\sigma_1},$$

$$v_{20}(t,x) = v_2(t) \cdot \left( a - \frac{\sigma_2}{4} \xi^2 \right)_+^{1/\sigma_2},$$

where $v_1(t) = e^{kt} \overline{v}_1(t)$ and $v_2(t) = e^{kt} \overline{v}_2(t)$ are functions defined above

$$\xi = \frac{x}{[\tau_1(t)]^{1/2}}, \quad \tau_1(t) = \int_0^\tau \overline{v}_1^{\sigma_1}(y) dy .$$

The notation $(a)_+$ means $(a)_+ = \max(0, a)$.

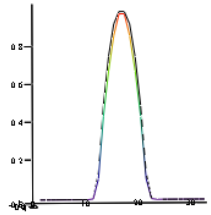
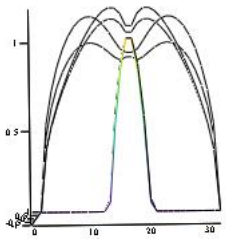
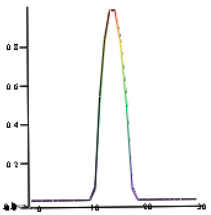
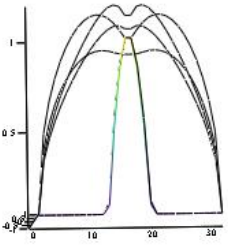
For the numerical solution of problem (1) - (2), the function $v_{i0}(t,x)$, $i = 1,2$, is proposed as an initial approximation.

The program created in the input language MathCad allows you to visually monitor the evolution of the process for various values of parameters and data.

Numerical calculations show that, in the case of arbitrary values $\sigma > 0, \beta > 0$ the qualitative properties of the solutions do not change. Below are the results of numerical experiments for various parameter values.

**5. Conclusion**

The results of numerical experiments showed the effectiveness of the proposed approach. The asymptotes of various solutions of a system of type (1) - (2) made it possible to preserve the properties of the studied reaction-diffusion processes, and to present solutions in the form of visualization with animation.

| **Parameter values** | **Results of a computational experiment at the initial time** | **Results of a computational experiment at a finite point in time** |
|---|---|---|
| $\sigma = 1.1$<br>$\beta_1 = 1, \quad k_1 = 7$<br>$\beta_2 = 2, \quad k_2 = 9$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |
| $\sigma = 1.1$<br>$\beta_1 = 1, \quad k_1 = 7$<br>$\beta_2 = 1, \quad k_2 = 9$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |

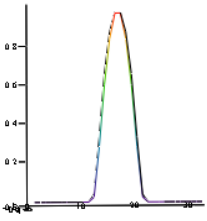
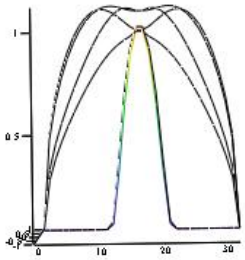
| | | |
|---|---|---|
| $\sigma = 1.3$<br>$\beta_1 = 0.3,\ \ k_1 = 3$<br>$\beta_2 = 0.7,\ \ k_2 = 2$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |

***Fig. 1.*** *Dynamics of the Malthusian and logistic populations*

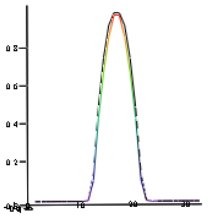
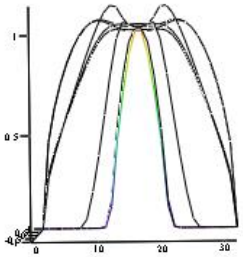
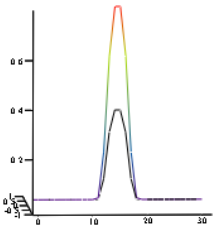
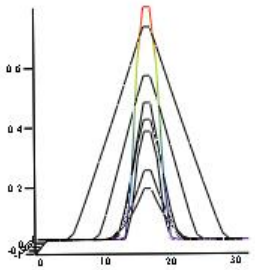
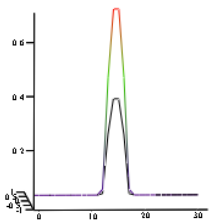
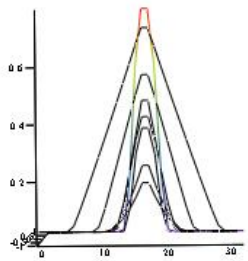
| Parameter values | Results of a computational experiment at the initial time | Results of a computational experiment at a finite point in time |
|---|---|---|
| $\sigma = 1.1$<br>$\beta_1 = 7,\ \ k_1 = 7$<br>$\beta_2 = 9,\ \ k_2 = 5$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |
| $\sigma = 1.1$<br>$\beta_1 = 0.5,\ \ k_1 = 7$<br>$\beta_2 = 0.7,\ \ k_2 = 2$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |
| $\sigma = 1.3$<br>$\beta_1 = 0.3,\ \ k_1 = 3$<br>$\beta_2 = 0.7,\ \ k_2 = 2$<br>$eps = 10^{-3}$ |  <br>time1(FRAME + 1), time2(FRAME + 1) |  |

***Fig. 2.*** *Ollie effect dynamics*

In conclusion, we emphasize the importance of a joint study of migration and demographic processes. To analyze the population dynamics of interacting populations, it is important to jointly study the processes of fertility, mortality, trophic interactions and various migrations. The introduction of nonlinearity in migration flows is the first step towards an adequate description of the spatio-temporal population dynamics.

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# 数字孪生作为学生虚拟智力心理支持系统
# DIGITAL TWIN AS A SYSTEM OF VIRTUAL INTELLECTUAL-PSYCHOLOGICAL SUPPORT OF A STUDENT

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抽象。 本文讨论了通过创建虚拟数字双胞胎系统在大学进行适应和培训期间为学生提供智力，心理和身体支持的必要性。 提出了一种技术，该技术可以基于知识库和先例来监视实际数据，从而在教育活动的框架内提出建议，并模拟培训期间可能出现的各种情况，尤其是严重或冲突的情况 。

关键词：数字孪生，数字社会，虚拟环境，学生，心理支持，信息技术，智力支持。

***Abstract.*** *The article discusses the need for intellectual, psychological and physical support of students during adaptation and training at the university through the creation of a virtual digital twin system. A technology is proposed that allows the monitoring of real data, based on a knowledge base and precedents, to formulate recommendations in the framework of educational activities, as well as to simulate various situations, especially critical or conflict, that may arise during the training period.*

***Keywords:*** *digital twin, digital society, virtual environment, student, psychological support, information technology, intellectual support.*

**Introduction**

Currently, there is a total restructuring of society as a whole at all levels: political, military, social, educational, psychological, spiritual, etc. Human consciousness is undergoing powerful changes, and not everyone is able to successfully pass this stage of life. Many have to make efforts to preserve themselves as a person. But there are those who cannot afford to go this way, and then destruction occurs, both intellectual, physical and energy. How to confront and how to mobilize yourself in a new digital society? This topic is especially relevant for students,

since there was a total restructuring of the education system and the difficulties that arose in the distance education system affected both the quality of transmitted knowledge and the possibility of perceiving this knowledge. The article proposes to consider system models for using them as a basis for creating a digital student model. Based on the information received, using special algorithms it will be possible to predict human behavior, and specifically in our case, the student's development strategy during the training period.

Digitalization of educational activity – solution for virtual presentation of typical characteristics of the educational process (Fig. 1). Such technology allows real-time monitoring to be carried out, based on the knowledge base and precedents, to formulate recommendations within the framework of educational activities.

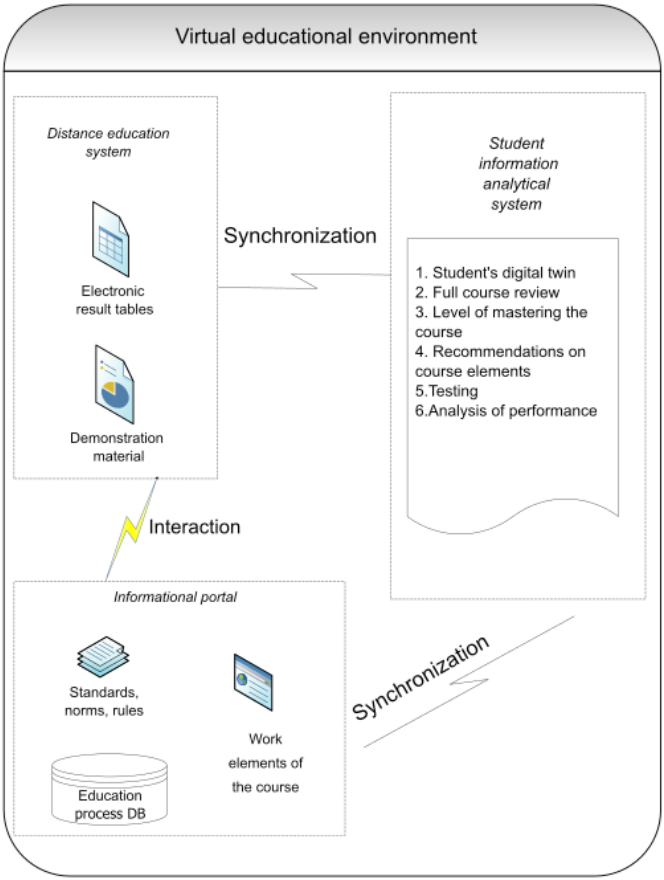


***Figure 1** – Virtual course environment*

Digital twin is a complex information system that is created by combining a variety of data and technologies into a single decision support system [1]. Digital twin is a generalizing technology that includes a set of regulatory guides, prototypes of situations, actions, data being analyzed, recommendations and suggestions on the elements of the course.

**1. Digital twin system**

The topic of digital twins is currently quite promoted, especially in such areas as the oil and gas industry, the petrochemical industry, the transport and construction industries. "Surveys conducted by Gartner analysts show that 13% of organizations implementing IoT projects already use digital twins, and 62% either start their creation or plan to do it. Gartner predicts that by 2021, half of large industrial companies will use digital twins, which will lead to an increase in the efficiency of these organizations by 10%. According to experts, in five years the market for products such as digital twins will reach $ 16 billion. " Irina Peshkova writes about this in her article "How digital twins help Russian industry" [2].

Relying on the definition of what a digital twin is, it is clearly seen that this is a digital copy of a physical object or process that helps optimize business performance. The concept of "digital twin" is designed to help enterprises more quickly detect physical problems, shortcomings and bottlenecks of production, more accurately predict their results and produce better products [3].

We are interested in the human factor, namely the training of specialists who apply new information technologies in industry. The problem today is that students lack a vision of themselves as a specialist, there is no understanding of how, as who and where he will work. And as a result of the lack of prospects for the future, a low level of motivation in the learning process at the university.

Creating a digital twin as a prototype of a virtual student is one of the methods of intellectual and physical support.

**2 Digital twin structure**

Digital twin (DT) is a complex software product that consists of system data, including information on the structure of the educational process for both bachelors and masters, information on the student's research activities, information on his sports achievements and information on psychoemotional condition. The data obtained is constantly updated, analyzed by DT throughout the training process. In turn, the student regularly reviews and makes decisions on feedback, depending on the tasks in space and time.

The proposed program allows to simulate various situations, especially critical or conflict, that may arise during the training period [4, 5]. The task of DT is to track these moments and tell the real object about the occurrence of a problem

situation and predict the development prospects if something goes wrong. As soon as the signal is received, the student analyzes the information and independently makes a decision, or consults with the coach/psychologist. Or the third option, DT offers him its solutions, but here you need to introduce restrictions, for example, DT can give no more than 10% of solutions, otherwise it turns out that it begins to control a person's life.

If we recall the definition of who the student is, then it can be seen that, for example, in ancient Rome, students were called any persons engaged in the process of cognition, or, this is a hard-working person who is engaged in work and study. Our aim is not to implement DT and task it with solving all of the problems, but to ensure that the student is in the process of constantly improving himself in different aspects of his life. At the initial stage, DT will play the role of an assistant, in the future, when a habit develops, the need for such support will disappear. The need for continuous development and improvement of oneself at all levels will become the necessity and need of the individual throughout the life cycle.

It is believed that the error between the operation of the DT and the real facility should not exceed 5%, but this applies to industrial facilities. If we work with a person, then a lot here is determined by his psycho-emotional state, therefore at some period he may lag behind his counterpart in indicators, at some periods be like it or be better than it. In order for a student to adapt to a certain rhythm, it is necessary to gradually prepare him for interaction with DT, which at the initial stage, for example, can track his emotional state or sports achievements (here you can take jogging as the most effective way to relieve stress and tension). The settings can be different, depending on the psychotype of the student. Most importantly, the student, when interacting with DT, can predict situations and take timely measures to prevent complex situations at an early stage.

DT is a way to support the student at the whole stage of training, save his resources, minimizing mistakes and failures, and at the same time learn how to manage the stability of his physical and psycho-emotional state himself.

All of the above can be represented in the form of a system model, which in general terms reflects those elements that will be further incorporated into the DT program (Fig. 2).

At the first level, the student is considered as an object of educational activity, which he plans and optimizes on his personal level.

At the second level of the system model is a coach / psychologist who, together with the student, prepares an individual development program, taking into account the psychological characteristics of the student.

The third level reflects personality characteristics such as physiology, emotions and student intelligence. Physiology reflects both the stamina of the body and stress resistance in critical / conflict situations. As mentioned above, for a

softer adaptation to a new rhythm, it is proposed to include sports skills in the daily routine as a physical support, which can increase his mental energy. The emotional background reflects the attitude towards the learning process, and here it is important to maintain a mood for optimism, for success and in case of a change or loss of strength, to apply the necessary recovery techniques in time. The level of intelligence, which reflects and personal values, allows you to keep tuning to the solution of tasks and goals.

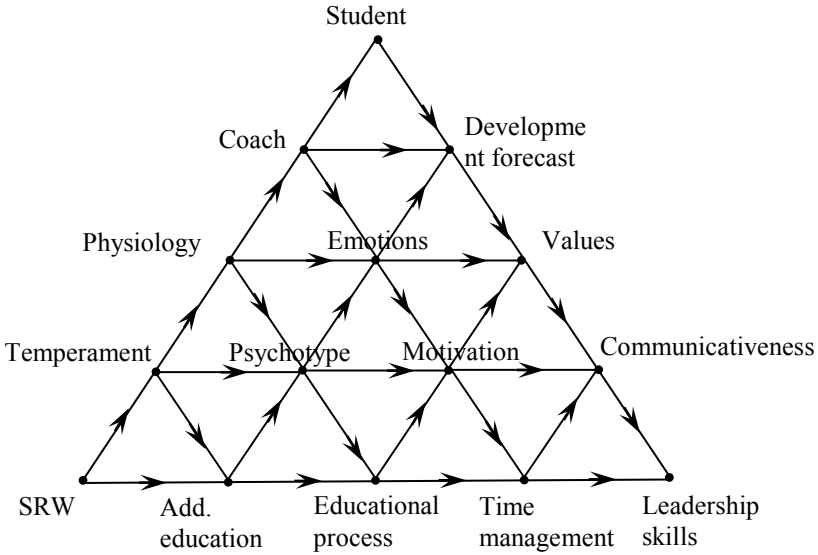


***Figure 2** – A system model of the student's personality structure as an object of activity*

The fourth level reflects the psychological characteristics of the student, his temperament, psychotype, level of motivation and sociability. Since an individual DT program will be compiled depending on them with the aim not to harm, but to help the student reach the optimal level of training, in the future, they can be replaced with other characteristics, depending on their significance and impact on the learning process.

The fifth level reflects the educational process, which includes the student's scientific work both at the Russian level and internationally. It also includes additional education in various forms such as distance, extramural, evening, online education through webinars and seminars, training in programming languages, foreign languages, etc. The educational process itself is presented in semesters, reflecting the whole range of classes in the spatio-temporal aspect. The next ele-

ment of the time management system. It allows the student to clearly track and keep in attention and in time the schedule of work that will certainly affect the development of such qualities as self-organization, responsibility and discipline of the student as an activity. Also in the learning process is the formation of business and leadership skills. To immerse oneself in such a multi-level complex system requires large psycho-emotional costs and not every student can cope with such a load, so at the initial stage it is necessary to conduct testing to weed out those who are not interested and for whom it is not important. Then hold an explanatory conversation for a more informed approach in choosing one level or another so that the student can really see the results of his decision in the near future.

Thus, this system model, implemented as a digital twin, links all parameters that affect the student's performance into a single multi-level system.

**3. Data processing**

Digital twin can be represented in three stages: data processing, decision, action (Fig. 3).

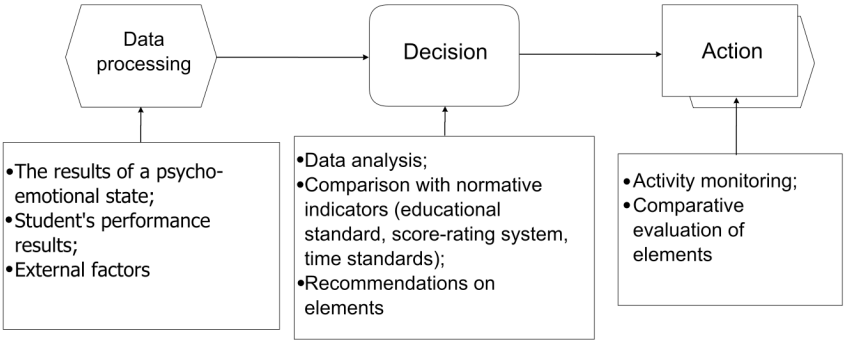


***Figure 3 –*** *Data processing*

At the "data processing" stage, the test results of the psychoemotional state, data on the student's academic performance are studied, the influence of external factors on his interest and motivation to learn.

The next stage is the adoption of a "decision", using a digital twin, the system analyzes the information received and makes a decision that matches the specified parameters and indicators of the "ideal student". Depending on the analysis of the learning elements, the system can form several solutions and options for the implementation of these elements in an ideal scenario.

The implementation of the proposed solutions and scenarios for the implementation of training elements is the stage of "action". At this step, the digital twin is responsible for further elements of the implementation of decisions made - by monitoring the status of each action and the functions of the learning process.

Thus, digital twin technology will allow you to identify deviations from the "ideal student" using the visualization of the prototype in a virtual information environment. When receiving notifications of inconsistencies in the learning process, the information analytical system, like artificial intelligence, within the framework of the digital twin takes appropriate decisions on the optimal actions in the implementation of the elements of the educational process or the intervention of responsible persons.

**Conclusion**

The creation of a student's DT as a virtual intellectual-psychological support is a promising direction in the modern learning process, this is especially significant for remote distance learning, when the student must organize the entire process of obtaining and mastering knowledge.

The proposed digital twin model allows the student to independently evaluate and analyze both his scientific results and his psychophysical state during the training period, which he can either prolong or stop, relying on his individual experience and in the future himself, without external support, manage and make his choice.

**Acknowledgments**

This work was supported by a grant from the RFBR № 18-08-00638.

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编辑A.A.Siliverstova
校正A.I.尼古拉耶夫

2020年6月28日。中国北京。
USL。沸点：98.7。 订单253.流通500份。

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无限出版社