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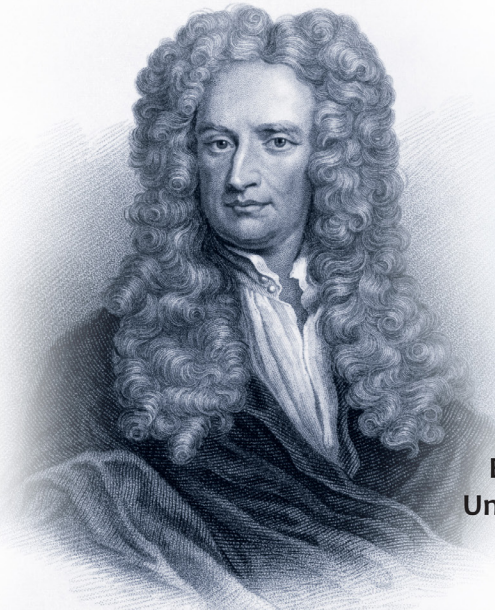

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CONTENTS

INTELLECTUAL CAPITAL IN THE CONDITIONS OF FORMATION AND DEVELOPMENT OF INNOVATIVE ECONOMY OF RUSSIA

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Abstract. The relevance of the proposed study is determined by the fact that the use of intellectual resources as a factor of production is complementary and leads to a decrease in the consumption of other factors of production. At the same time, there is a transition from the traditional industrial economy on the basis of tangible property objects as the basic source of added property to intangible objects that form the “knowledge economy” (or “neo-economy”). It is these processes that the domestic economy should characterize today, which determines the relevance of developing a single concept for the formation and use of intellectual capital in an innovative economy.

Key words: innovative economy, innovative development, intellectual capital, efficient use, reproductive approach, sources of investment.

The modern economy is characterized by the increasing role of intangible assets in the economic activities of enterprises, the emergence of the need for the constant introduction of innovations to maintain a stable competitive position of companies.

In modern conditions, intellectual capital includes individual intellectual capital, which is formed within the framework of individual production units, the unity of which at the macro level is the total intellectual capital.

From the point of view of the technological aggregate, the intellectual capital of the nation is the creation by society of certain material and technical conditions for the formation and development of the productive abilities of people [1].

The development of the country's total intellectual capital is influenced by such factors as the costs of education, science, culture, healthcare, environmental protection, improving working conditions, investment in production and marketing.

In order to exist, intellectual capital must carry out continuous movement, development.

The growing role of intangible assets and innovations in ensuring the effective functioning of companies leads them to re-create themselves, but already in the role of intelligent and innovative enterprises, i.e. enterprises that create their value and form their competitive advantages on the basis of intellectual capital, on the basis of their intangible assets and knowledge.

Modern companies are markedly different from companies of the past, primarily with the new capital structure.

Today, the capital of an organization is determined not by material resources, not by fixed assets, but by capital, which does not have a material form.

Some elements of intellectual capital (staff qualifications, staff business qualifications, their qualifications and ability to work, communication with consumers, knowledge bases, online work forms, Internet resources) are not reflected in the balance sheets at all.

Unlike tangible assets, where there are depreciation and physical deterioration occur, depreciation of the intellectual capital of a commercial organization, is usually determined by the degree of moral aging.

Human capital, which is an integral part of intellectual capital, depreciates both physically (aging of the human body) and morally (obsolescence of knowledge).

The costs of training, staff training, advertising companies are most often interpreted in accounting as current costs, while they are increasingly acquiring the properties of investments [2].

Another component of intellectual capital - organizational capital depreciates morally, i.e. hardware, software, databases, etc. become obsolete.

Unlike other components, relations capital in the process of use, as a rule, not only does not lose its value, but also (as it is used) increases.

Moreover, when exposed to external factors, it can dramatically lose its value (for example, consumers switch to a competitor).

One of the elements of relationship capital, a trademark, is often interpreted in the financial statements as an intangible asset, which, by analogy with a tangible asset, loses its value in the process of use and transfers it in parts to the manufactured product.

In fact, intangible assets in the process of use not only do not lose their value, but vice versa, they increase it.

Patents, licenses are often taken into account in accounting documents not at their real value, but only in accordance with the costs of their registration. Therefore, it is necessary to change the approach to the costs of intellectual capital and present them as investments.

Investing is an important prerequisite for the production of an intellectual product.

The content of the investment process is not just an investment of funds and resources, but a conscious and focused activity of the owner of these funds and resources in the name of achieving the goal.

Investments in intellectual capital have a number of features that distinguish them from other types of investment:

1. The return on investment in intellectual capital depends directly on the length of the working period of its carrier. The sooner investments are made in a person, the faster they begin to give returns. But you need to keep in mind that better and longer-term investments bring a higher and more lasting effect.

2. Intellectual capital is subject not only to physical and moral depreciation, but also able to accumulate and multiply itself. Depreciation of intellectual capital is determined, firstly, by the degree of natural depreciation (aging) of the human body and its inherent psycho-physical functions, and secondly, by the degree of moral depreciation (obsolescence) of knowledge. The accumulation of intellectual capital is carried out in the process of accumulating employee production experience. If this process is carried out continuously, then, as intellectual capital is used, its qualitative and quantitative (quality, volume, value) characteristics improve and increase.

3. As intellectual capital accumulates, its profitability rises to a certain limit, limited by the upper limit of active labor activity (active working age), and then sharply decreases.

4. Not all investments in a person can be recognized as investments in intellectual capital, but only those that are socially expedient and cost-effective.

5. The nature and types of investments in a person are determined by historical, national, cultural features and traditions.

6. Compared with investments in other various forms of capital, investments in intellectual capital are the most profitable both from the point of view of one person and the point of view of the whole society.

There are three types of investment in the company's intellectual capital:

- investments in human capital,
- investments in organizational (structural) capital,
- investments in consumer (client) capital.

Investments in each type of intellectual capital have their own characteristics, namely:

- the return on investment in human capital depends on the length of the working period of its carrier. The earlier investments are made in a person, the greater is the return that occurs in the process of his entire working life;

- depreciation of human capital is determined, firstly, by the degree of natural depreciation (aging) of the human body and its inherent psychophysical functions, and secondly, by the degree of moral depreciation (obsolescence) of knowledge;

- an increase in human capital occurs in the process of accumulation of production experience by an employee. If this process is carried out continuously, then, as intellectual capital is used, its qualitative and quantitative characteristics (quality, volume, value), respectively, improve and increase. As intellectual capital accumulates, its profitability rises to a certain limit, limited by the upper limit of active labor, and then decreases sharply [3].

Investments that form and increase human capital include the costs of general and special education, health, geographic mobility, information retrieval, and scientific research in the field of labor (its organization, conditions and payment). The latter increase national intellectual capital (an increase in scientific knowledge) and the individual human capital of specialists (accumulation of elite knowledge and production experience).

Features of investing in organizational capital stem from the features of this type of intellectual capital.

One of the tasks of organizational capital is to encode a body of knowledge to preserve "company" secrets that might otherwise be lost. Moreover, the criterion for evaluating investments in organizational capital may be the ability of this capital to reduce transaction costs.

Just like in workers and in information systems, companies must invest in their consumers (customers).

Investments are made not so much in the clients themselves as in relations with these clients.

Consumers do not belong to the company, but investing in relations with them can provide future profits: the newly created values will equally belong to shareholders and consumers.

Methods of investing in consumer capital - the development together with the consumer of market innovations, giving consumers more than usual rights, an individual approach to the consumer, various types of partnerships with the consumer.

The investment attractiveness of intellectual capital increases if traditionally allocated human, organizational, and consumer capital are considered not as single-order parts of intellectual capital, but as stages of its circulation.

Thus, the knowledge and abilities of employees are embodied in organizational processes and relationships with business partners, which, in turn, create the basis for sustainable relationships with customers; cooperation with partners and customers contributes to the accumulation of experience, the development of knowledge and abilities of employees [4].

If we approach the separation of intellectual capital by participation in the production process, it makes sense to highlight the features of investing in current and main intellectual capital.

Current intellectual capital is formed on the basis of the realized choice of one or another variant of the manufactured product or service, the main intellectual capital is formed on the basis of the realized choice of one or another technological structure of production.

The value of current intellectual capital may increase due to the following reasons:

1) investment in new products that meet modern consumer requirements, improving the quality of products / services, which leads to an increase in the value of current intellectual capital. Moreover, the innovative result in these cases may be:

- customer base growth;
- reducing the cost of a new product (creating a competitive advantage in terms of cost also increases the value of current intellectual capital);
- the appearance of price advantages in relation to a new product (if the company is able to set a higher price (compared with the industry average price) for a new product, for example, due to the creation of an effective brand of a new product, then the value of current intellectual capital also increases);

2) investments in expanding the range of products and services that contribute to the growth of the total value of the current intellectual capital of the company;

3) investments in the preservation, expansion and creation of sales markets, which leads to an increase in sales volumes, to an improvement in client capital indicators, which is accompanied by an increase in the value of current intellectual capital.

In turn, the cost of fixed intellectual capital depends on the used technologies, and may change due to investments in the modernization or introduction of new technologies that may be associated with:

- expansion of the range of products, services;
- ensuring compliance with modern rules and standards;
- increasing the flexibility of production and the internal commercial process associated with changes in the production and technological structure of production.

When investing in fixed assets, it must be taken into account that often it can only be bought or sold as part of an organization, business (only some elements can be liquid in parts), in contrast to physical capital, which can be bought or sold in parts.

Human capital, which is an integral part of intellectual capital, has limited liquidity due to the fact that the organization is only an employer of labor, and the person himself/herself is the owner of human capital, i.e. the employee sells only his/her skills, knowledge, skills, etc. And in the case of the purchase of an organization or business, succession is transferred under employment contracts with people at the time of acquisition of the enterprise as a property complex [5].

Certain elements of organizational capital (patents, copyright, licenses, production secrets, know-how) are liquid, they can be realized as independent assets.

Non-liquid elements include corporate culture, organizational structure (they can be implemented only with the organization).

Some elements of relationship capital (business reputation, strong relationships with regular customers) in the form of independent assets cannot be sold or bought because they do not belong to the organization on the basis of ownership. In some cases, you can exercise the right to use a trademark (as part of a franchising agreement), a brand and distribution channels.

However, there is a danger of excessive investment in intellectual capital. An overabundance of information, excessive enthusiasm for it, storage of it “to keep on the safe side” - all these phenomena, as well as blockages of material resources, paralyze the activities of the company. “Overstocking” of knowledge can be resisted using practical techniques, including:

1) activation of knowledge through specialization - the efforts of many people are saved by increasing the knowledge of a few;

2) simplification and automation - due to the rationalization of computer networks, unnecessary information is eliminated;

3) stock management - the provision of knowledge "on demand".

The key factors in the scale of investment in intellectual capital are the balance, increased risk and the complexity of evaluating effectiveness. Moreover, individual elements of intellectual capital do not possess the property of additivity. They interact with each other, and the joint effect is clearly synergistic.

Investments in the company's intellectual capital are subject to increased balance requirements: it is important to correlate investments in marketing, information systems, R&D, staff training and public relations in such a way that together they would give a significant positive effect.

Success in building intellectual capital is associated with solving the problem of effective management:

1. the creation and augmentation of the intellectual potential of organizations;

2. the use of intellectual capital in creating innovative products;

3. the process of investing the entire cycle of transformations of intellectual capital.

To solve this problem, it is advisable to consider the intellectual capital of an organization as one of the constituent parts of its accumulated benefits and, therefore, as part of its total capital. In this case, intellectual capital also participates in the cycle of capital transformations, passing through the following three stages of capital transformations.

At the same time, at the first stage, the conversion of money form into intellectual elements of productive capital:

- the hiring of a manpower engaged in managerial, engineering, scientific and other types of intellectual activity with their knowledge, experience and skills in applying this knowledge is made;

- using knowledge and skills as a result of intellectual work, innovative ideas are developed and objects of intellectual work are created - objects of intellectual property (at this stage the rights to use these objects owned by third-party organizations may be acquired).

In addition, money is used for:

- increase in the created intellectual potential;
- training and retraining of specialists, as a result of which the volume of knowledge of specialists increases, the quality of this knowledge increases, and skills are improved;
- improving the corporate culture of the organization, improving the technology of teamwork;
- motivating intellectual work, increasing creative activity, improving business technologies, etc.

At the second stage of transformations, the intellectual elements of capital ensure the creation of the intellectual component of innovative products. The objects of intellectual labor invested in innovative products determine the quality of products.

In this process, intellectual capital acts as intellectual tools (tools of intellectual work) and at the same time is the subject of intellectual work (objects of intellectual property that are created and implemented in innovative products through intellectual tools).

Intellectual capital is introduced into products at all stages of its creation: in the materials from which products are manufactured, in compo-

nents, in machines, equipment and tools that are used in the production cycle, in packaging, etc.

The intellectual capital invested in the second stage of transformations creates value, and the higher the level of achieved quality, the greater the value created.

At the third stage of the capital cycle, production becomes a commodity and capital is converted from a commodity form into a monetary form.

The goods sold have a market value, which is determined by the material and intellectual components. Through the intellectual component of the cost of production, intellectual capital is realized, turning into a monetary form.

Intellectual capital is also involved in the formation of a commodity form of capital with marketing assets, and above all with the image of the company and its trademark, which also provides value creation. The more well-known the company and the wider its customer base and connections, the greater the value can be realized in the product. When a consumer purchases goods on the market, he/she pays not only for their quality, but also for the assurance that the declared required quality of the goods is achieved in the process of product creation.

At this stage, intellectual property can be realized through both the conclusion of licensing agreements for the production of created brands and the direct sale of rights to own intellectual property. With the proceeds of money (with proper business organization), intellectual capital is multiplied with the transition again to the first stage of capital conversion [6].

Intellectual capital management should ensure its constant movement and transformation according to the closed circuit considered. The absence of one of the components of this cycle leads to the cessation of the development of the intellectual potential of any organization. Once created and unrealized in the future, intellectual capital becomes a dead weight, the ballast of unjustified expenses and unsuccessful investments.

In the ideal case, part of the income received at the third stage of the transformation of intellectual capital should be used to build up, increase the intellectual potential of the organization in order to ensure the constant movement and transformation of intellectual capital.

Since the indicator of the efficiency of using intellectual capital is a function of two variables - the market value of the product and the sum of all the costs of creating and selling a unit of production, investments in the intellectual capital of the organization will be more profitable where it is produced:

- more expensive products, such as aviation and space, weapons of all kinds, radio electronics, etc.;

- products for which the costs of production and sales are insignificant relative to its market value, for example, information technology (the cost of manufacturing and selling storage media is significantly lower than the cost of those software products that are recorded on them);

- products with large sales volumes, for example, many household appliances, modern medical equipment, communication systems, etc.;

However, the interaction of the individual elements of intellectual capital is non-linear, and only the integrated investment efficiency is evaluated. In this case, the general assessment approach will be as follows.

Two values are correlated: X (the difference between the capitalization of the organization and the replacement price of its real assets, net of liabilities) and Y (investment in intangible assets).

The coefficient of efficiency of investments in intellectual capital is calculated as the ratio of the difference in the value of X at the beginning and at the end of the period and the value of investment Y during this period. Moreover, all values are taken in a discounted form, taking into account inflation.

The result is a coefficient of investment efficiency in the intellectual capital of commercial organizations, i.e. the following formula is calculated:

$$Z = \frac{X_2 - X_1}{Y} \quad (1),$$

where Z - investment efficiency ratio;

X_2 - the amount of intellectual capital at the end of the period;

X_1 - the amount of intellectual capital at the beginning of the period;

Y - investment in the intellectual capital of the organization.

To calculate the value of Y, it is recommended to consider the following components:

• research and development costs (research and technological development);

• costs of education, advanced training, improving the health of workers, social investments;

• costs of information technology, information, technical and software, on the formation and development of the brand;

• to create a corporate portal, website; for marketing;

• for the acquisition, distribution, storage of information;

• on the development of distribution;

• on the development of corporate culture;

• for the acquisition of know-how, patents, other types of intellectual property.

Thus, the complexity of assessing the effectiveness of investments in intellectual capital stems from the nonlinear nature of the interaction of certain types of intellectual capital.

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FINANCIAL ACCESSIBILITY AS A WAY TO PREVENT SMALL BUSINESS BANKRUPTCY

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Annotation. Small business implements a whole range of sustainable development tasks. However, it is small business that is experiencing increased bankruptcy risks due to limited access to finance. Financial accessibility has the tools to expand the participation of small businesses in achieving the goals of the 2030 Agenda. The article discusses these tools.

Keywords: bankruptcy, financial affordability, small business, sustainable development, risk, financing.

Accessibility has become a key factor in achieving sustainable development in accordance with the 2030 Agenda for Sustainable Development. Today, it plays a key role as a financial sector development goal along with more «traditional» development goals. In addition, there is growing evidence that financial inclusion has a positive impact on development, providing access to financial services for the poor (at the enterprise and household levels), and also contributing to sustainable development at the macro level (financial sector). Ultimately, an inclusive financial system supports the global goals of the financial sector in terms of stability, integrity and consumer protection. Financial accessibility is recognized by all world powers at the UN Summit in Seoul as one of the main pillars of the Global Agenda, and is also included in the financial sector development program. Thus, the GPFI was officially launched on December 10, 2010 in Seoul [4].

Financial accessibility means that all adults of working age (people aged 15 years and older) have effective and high-quality access and use - at affordable for consumers and acceptable for suppliers cost - finan-

cial services provided by official institutions. «Effective access» means the convenient and responsible provision of services that meet the needs of customers who are deprived of financial assistance and insufficiently served, at affordable prices for consumers and sustainable for suppliers. A demonstration of effective access is use. The fact that a client can access the services offered by an official financial services provider does not mean that he or she is «financially included». For this, the conditions of «effective access» must be met [2].

Despite a 20 percent increase from 2011 to 2014, the number of adults with access to official financial services worldwide, still 2 billion people (more than half of the adult population) and 200 million businesses are excluded from the official financial system [5]. The continuing gap in the access and use of official financial services requires vigorous international action.

Thus, affordability has a multiplier effect on the growth of overall economic production and helps reduce poverty and income inequality at the national level. The goal of developing financial inclusion is embodied in the Global Partnership for Financial Integration (GPFI), which is guided by the G20 Financial Integration Action Plan (FIAP).

The adoption of the 2030 Agenda in 2015 gave new impetus to the role of financial services in inclusive development. Based on the principles of universality «don't leave anyone behind», as well as on the interdependent and mutually reinforcing nature of the Sustainable Development Goals (SDGs), the 2030 Agenda has given impetus to the transformative collaboration needed to advance development. In this context, financial accessibility is aimed at development from a universal point of view, when access to financial services is important for all countries, developing or developed, and provides benefits for all social and economic sectors [5]. Increasing access to financial services contributes to all aspects of the 2030 Agenda (people, planet, prosperity, peace and partnership) and can have a significant impact on the SDGs. In addition to the 2030 Agenda, the Addis Ababa Action Agenda - the main international agreement on financing for sustainable development - emphasizes that the goal will continue to be the pursuit of full and equal access to formal financial services for all, emphasizing marginalized and vulnerable people, and also stating the inclusion of financial inclusion as a policy goal in financial regulation.

In the framework of ensuring financial accessibility and achieving the goals of the global development agenda, financing of small and medium-sized businesses (SMEs) plays a special role. This is underlined by the fact that SMEs play crucial role in providing employment, job creation,

investment, innovation and economic growth worldwide. They accumulate about 90% of enterprises and more than 50% of jobs worldwide, and therefore are crucial for the restoration of the global economy. Given this important role, it is crucial that SMEs have access to the loans they need to expand [2].

By endorsing the G20 SME Financing Action Plan in 2015, the G20 agreed and encouraged non-G20 countries, fully develop credit infrastructure for SMEs, improve the financial capabilities of SMEs.

Small business structures in any country with a developed market play a great role in the processes of forming a stable market structure and developing the economic sector as a whole. In addition, small business implements a number of important socio-economic tasks, including creating new jobs, increasing the level of competition, which, as a rule, leads to lower unemployment and lower prices. It should be noted that it is small business that generates and develops lending to small businesses, stimulates a decrease in the level of interest rates on loans for businesses in general and an improvement in the quality of banking services.

Small business can be characterized as entrepreneurial activity carried out by subjects of a market economic system under certain, regulated by national legislation, government bodies or other representative organizations criteria that define the essence of this concept.

Following examples from world practice, among the main indicators on the basis of which business structures of various organizational and legal forms are classified as small businesses, the average number of employees who were employed in the reporting period in the enterprise is, in the first place. According to some researchers, small business should be understood as entrepreneurial activity, which is carried out by a small a group of people, or an enterprise that is managed by one person - its owner.

Summarizing all the criteria for classifying an enterprise as a small business, we can say that in most cases it is:

- the number of employees of the enterprise (number of employees);
- amount of authorized capital;
- the value of assets;
- the volume of turnover (profit, income).

The limiting factor in the development of small business, and at the same time a factor of bankruptcy risk (insolvency risk) is the lack of financial resources. This is an extremely serious deterrent for small and medium-sized businesses due to the lack of a serious credit history and a reliable collateral base.

Thus, lack of reliable credit infrastructure is one of the main problems in the credit market for small businesses. Therefore, credit infrastructure development will help reduce cross-country information asymmetries and legal uncertainties that increase risk to lenders and limit financing to small businesses.

The priority measures for the development of credit infrastructure are:

- Improving the structure of credit reporting for small businesses;
- Reforms allowing banks and non-banking institutions to lend to small business secured by movable property;
- Reforms in the field of insolvency (bankruptcy) [1].

One of the most powerful financial inclusion tools is digital financial technology. Digital financial innovations associated with a sound regulatory framework, improved infrastructure and capacity building can provide an opportunity to expand the pace of development of financial services. Technologically driven changes open up unprecedented opportunities for access to financial resources, accelerating access to hard-to-reach regions and offering individuals affordable and convenient ways to save, receive and send money transfers, make payments, access to loans and get insurance.

Another tool of financial accessibility that enhances the participation of small businesses in achieving sustainable development goals is the management of the bankruptcy regime. This tool is being implemented through the creation of an appropriate infrastructure based on the blockchain system. The creation of effective insolvency regimes contributes not only to the rescue of viable enterprises, but also accelerates the withdrawal of non-viable enterprises from the market. This, in turn, allows the use of realized assets for more productive firms. This is especially important in freeing up production resources in order for lenders and potential investors were more protected if the business fails.

A number of studies show that the positive results of developing effective and efficient insolvency systems can be extended to the entire economy. Insolvency Reform in Accordance with International Best Practices associated with a lower cost of credit, increased access to credit, enhanced job retention, promotion of entrepreneurship and other benefits for small businesses.

Reforms of insolvency regimes also increase financial affordability and thereby contribute to overall economic stability. Thus, the debt and insolvency approach strengthens the investment climate and fosters economic growth.

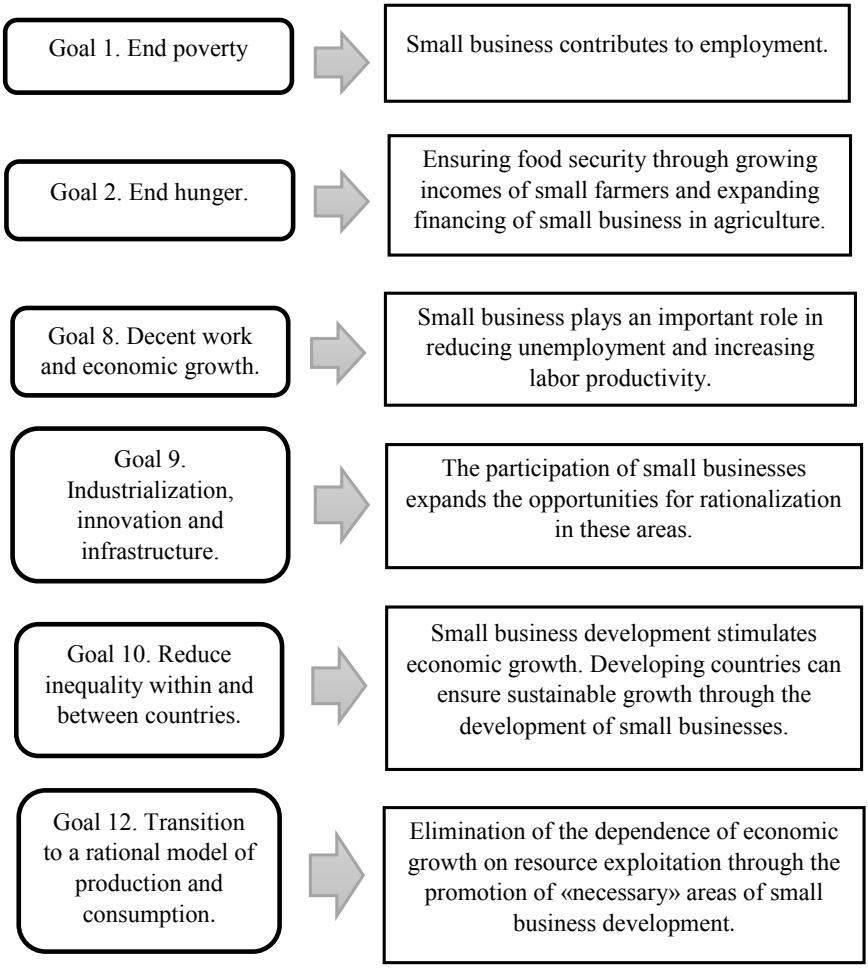

Figure 1. Small business participation in achieving sustainable development goals

Thus, in accordance with the generally accepted understanding, the 2030 Agenda does not include a separate SDG on financial accessibility, but considers financial accessibility as a key factor in achieving sustainable development around the world. The participation of small businesses in implementing the goals of the 2030 Agenda is one of the main driving forces [3]. Using financial accessibility tools to reduce the risks of bankruptcy of small businesses will expand its participation in the implementation of the following goals (Fig.1).

The G20 SME Financing Action Plan defined the development of credit infrastructure for SMEs, including improving the insolvency system as a key priority. Economic analysis shows that SMEs in countries with stricter laws and registries on secured transactions have better access to credit, which means that the financial system has higher stability ratings and fewer toxic assets. The end result is increased productivity and growth [2].

In this regard, the G20 Small and Medium Business Financing Action Plan for the development of credit infrastructure for SMEs, including the improvement of transaction security systems, was identified as a key priority. Regarding secured transactions, the difference between the G20 countries is the largest. For example, some G20 countries still use documentary registration, which requires delivery and writing of a contract and, possibly, other documentation for inclusion in the register, instead of a modern notification registration system. Other countries do not have a central registry or a single register of all types of movable assets.

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CALCULATION AND PLOTTING 3D FIGURES OF VARIABLE X4SU FOR PARAMETER Ssu

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Abstract. Here is reviewed a practical issue of making calculations to obtain a value of the X4su variable, to which end are used X1, X2, X3 variables and the Ssu parameter. The values of the X4su variable obtained allow to identify limits within which they can exist.

Keywords: X4su calculated variable, GDP-defining Ssu parameter, 3D graphs, Excel.

The author had previously carried out calculations of the volume of the economic shell S, described in the older articles. The article below shows how the values of three variables X1, X2 and X3 and of the parameter Ssu (GDP) affect calculations of the variable X4su and plotting of 3D graphs. In this case, the values of the variables may remain constant, increase or decrease by a factor of 10. That is to say the changes of X4su = f(X1, X2, X3, Ssu) are being evaluated.

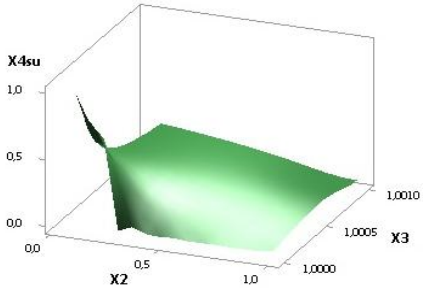

Fig. 1. X4su = f(X1, X2, X3, Ssu)
X1 = X3 = Ssu = 1, X2 = 1...0,1

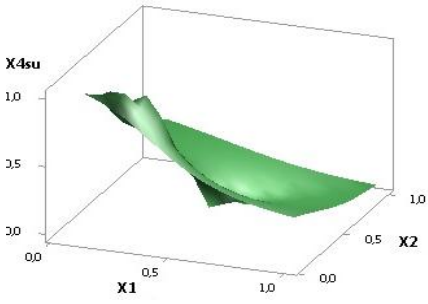

Fig. 2. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = 1...0,1, X3 = Ssu = 1

Thus, Figure 1 shows a 3D graph of the X4su dependence, with the variables having the following values X1 = X3 = Ssu = 1, X2 = 1...1. As seen in this figure, the X4su values increase by a factor of 1.2. The next Figure 2 shows a 3D graph for X4su, which increases by a factor of 2.7 with the following variables X1 = X2 = 1...0,1, X3 = Ssu = 1.

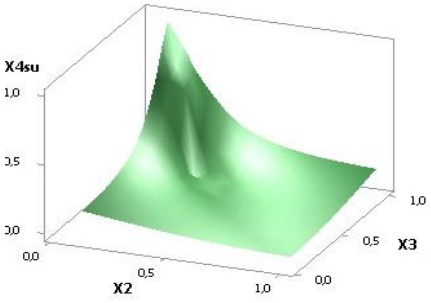

Fig. 3. X4su = f(X1, X2, X3, Ssu)
X1 = 1, X2 = X3 = Ssu = 0,1...1

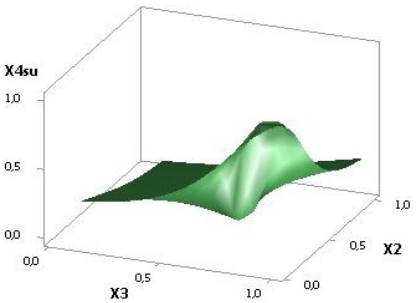

Fig. 4. X4su = f(X1, X2, X3, Ssu)
X1=X2=1...0,1,X3= Ssu= 0,1...1

The following Figures 3 and 4 represent two 3D graphs for X4su, with the variables being X1 = 1, X2 = X3 = Ssu = 0,1...1 and X1 = X2 = 1...0,1, X3 = Ssu = 0,1...1 respectively. As seen in Figure 3, the plotted X4su dependence increases by a factor of 1.4. In its turn, 3D graph in Figure 4 increases by a factor of 1.26.

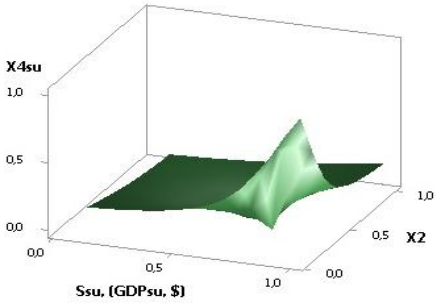

Fig. 5. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = X3 = 1...0,1, Ssu = 0,1...1

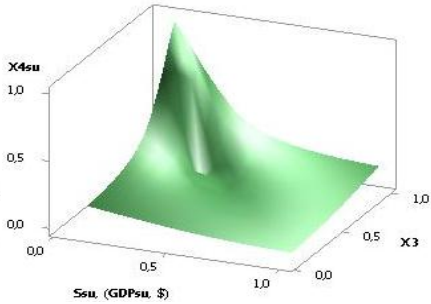

Fig. 6. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = Ssu = 1...0,1, X3 = 0,1...1

The values calculated for the X4su dependence in Figure 5 with variables X1 = X2 = X3 = 1...0,1, Ssu = 0,1...1 increase by a factor of 1.29. The X4su values for a 3D graph in Figure 6 also increase by a factor of 1.29 with X1 = X2 = Ssu = 1...0,1, X3 = 0,1...1.

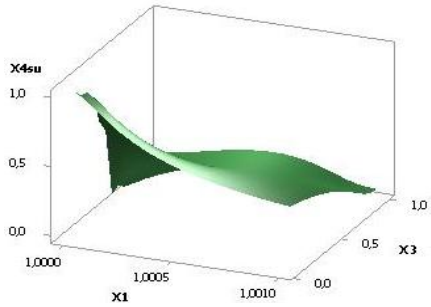

Fig. 7. X4su = f(X1, X2, X3, Ssu)
X1 = 1,X2 = X3 = 1...0,1, Ssu = 1...10

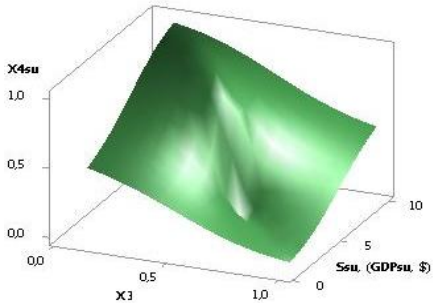

Fig. 8. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = X3 = 1...0,1, Ssu = 1...10

The 3D graphs in Figures 7 and 8 were plotted with X1 = 1, X2 = X3 = 1...0,1, Ssu = 1...10 and X1 = X2 = X3 = 1...0,1, Ssu = 1...10 respectively. Here in Figure 7 the values of the X4su variable increase by a factor of 1.77, while in Figure 8 increase by a factor of 1.26.

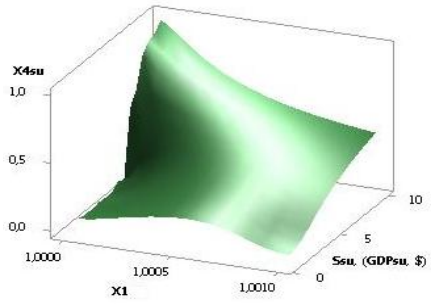

Fig. 9. X4su = f(X1, X2, X3, Ssu)
X1 = 1,X2 = X3 = 1...0,1, Ssu = 1...10

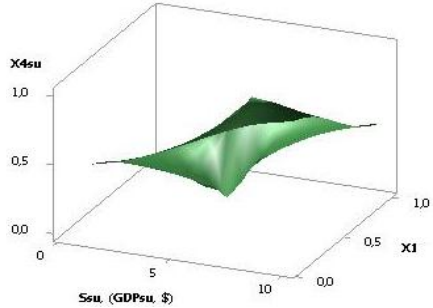

Fig. 10. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = X3 = 1...0,1, Ssu = 1...10

The next 3D graphs in Figures 9 and 10 were plotted with X1 = 1, X2 = X3 = 1...0,1, Ssu = 1...10 and X1 = X2 = X3 = 1...0,1, Ssu = 1...10 respectively. Here, in Figure 9, X4su increases by a factor of 1.77. The values in Figure 10 increase by a factor of 1.26.

Figure 11 shows that the 3D graph plotted for X4su with X1 = 1, X2 = 1...0,1, X3 = 0,1...1, Ssu = 1...10 increases by a factor of 1.14. Figure 12 shows that the 3D graph for X4su with variables X1 = X2 = 1...0,1, X3 = 0,1....1, Ssu = 1...10 increases by a factor of 1.16.

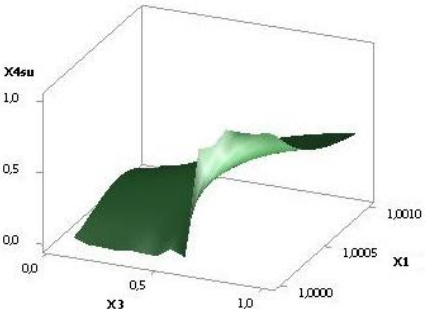

Fig. 11. X4su = f(X1, X2, X3, Ssu) X1 = 1, X2 = 1...0,1, X3 = 0,1...1, Ssu = 1...10

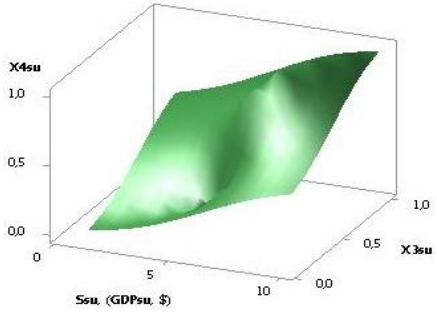

Fig. 12. X4su = f(X1, X2, X3, Ssu) X1 = X2 = 1...0,1, X3 = 0,1....1, Ssu = 1...10

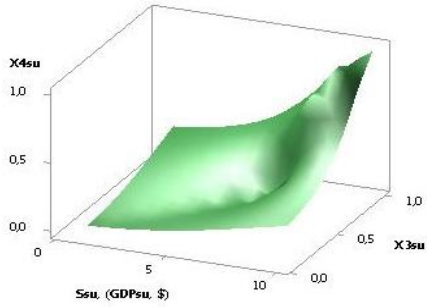

Fig. 13. X4su = f(X1, X2, X3, Ssu) X1 = 1...0,1, X2 = 1,X3 = 0,1...1, Ssu = 1...10

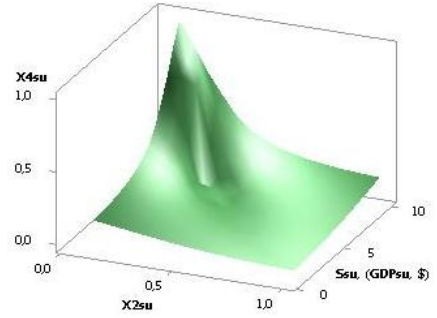

Fig. 14. X4su = f(X1, X2, X3, Ssu) X1 = Ssu = 1...10, X2 = 1...0,1, X3 = 0,1...1

Figure 13 shows the 3D graph for X4su with X1 = 1...0,1, X2 = 1, X3 = 0,1...1, Ssu = 1...10, increasing by a factor of 1.35. 3D graph for X4su, depicted in Figure 14, clearly increases by a factor of 1.29. This graph was plotted with the following values of the variables X1 = Ssu = 1...10, X2 = 1...0,1, X3 = 0,1...1.

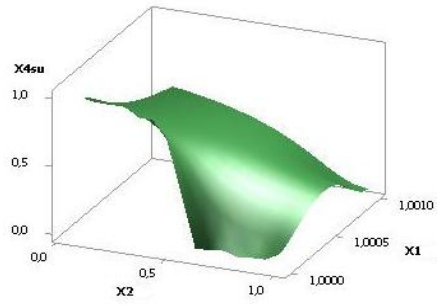

Fig. 15. X4su = f(X1, X2, X3, Ssu)
X1 = X3 = 1, X2 = 1...0,1, Ssu = 1...10

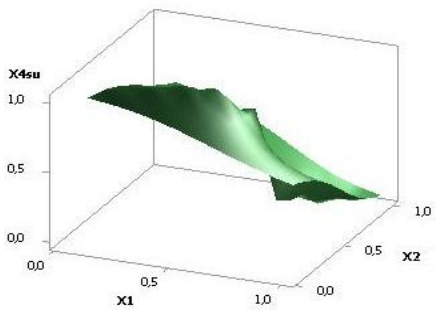

Fig. 16. X4su = f(X1, X2, X3, Ssu)
X1 = X2 = 1...0,1, X3 = 1,Ssu = 1...10

The next 3D graph in Figure 15 was plotted with the variables X1 = X3 = 1, X2 = 1...0,1, Ssu = 1...10. Here the 3D graph increases by a factor of 1.26. The following variables X1 = X2 = 1...0,1, X3 = 1, Ssu = 1...10 were used to plot a 3D graph in Figure 16. The resulting 3D graph for X4su increases by a factor of 1.28.

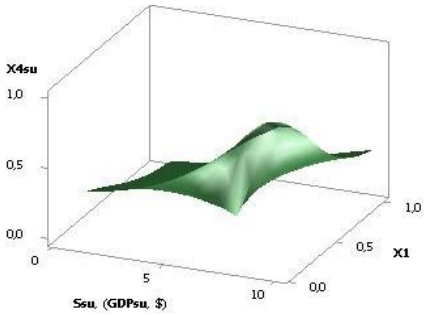

Fig. 17. X4su = f(X1, X2, X3, Ssu)
X1 = 1...0,1,X2 = X3 = 1, Ssu = 1...10

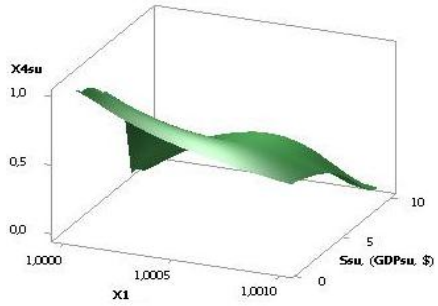

Fig. 18. X4su = f(X1, X2, X3, Ssu)
X1 = X3 = 1, X2 = 1...0,1, Ssu = 10...1

Figure 17 shows a 3D graph for X4su with X1 = 1...0.1, X2 = X3 = 1, Ssu = 1...10, demonstrating that X4su increases by a factor of 1.77. The 3D graph for X4su in Figure 18, with variables X1 = X3 = 1, X2 = 1...0.1, Ssu = 10...1, increases by a factor of 2.01.

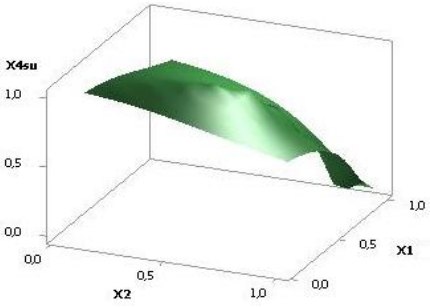

Fig. 19. X4su = f(X1, X2, X3, Ssu) X1 = X2 = 1...0,1, X3 = 1...0,1, Ssu = 10...1

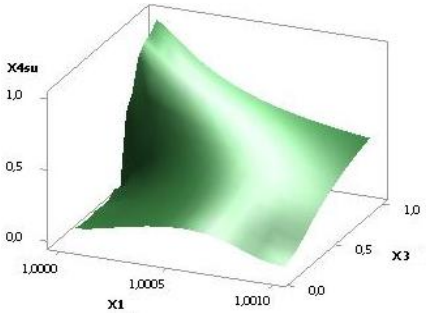

Fig. 20. X4su = f(X1, X2, X3, Ssu) X1 = 1, X2 = 1...0,1, X3 = 0,1...1, Ssu = 10...1

The 3D graph of X4su in Figure 19 increases by a factor of 2.7 with variables X1 X1 = X2 = 1...0,1, X3 = 1...0,1, Ssu = 10...1. The 3D graph presented for X4su in Figure 20 increases by a factor of 1.77 with X1 = 1, X2 = 1...0,1, X3 = 0,1...1, Ssu = 10...1.

The next Figure 21 shows the values of X4su increasing by a factor of 1.26 with X1 = 1, X2 = 1...0,1, X3 = 0,1...1, Ssu = 10...1. As seen in Figure 22, the 3D graph increases from 0.49 to 0.989, i.e. by a factor of 2.01 with the variables X1 = X2 = X3 = 1...0,1, Ssu = 10...1.

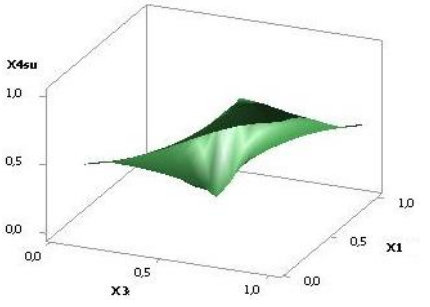

Fig. 21. X4su = f(X1, X2, X3, Ssu) X1 = X2 = 1...0,1, X3 = 0,1...1, Ssu = 10...1

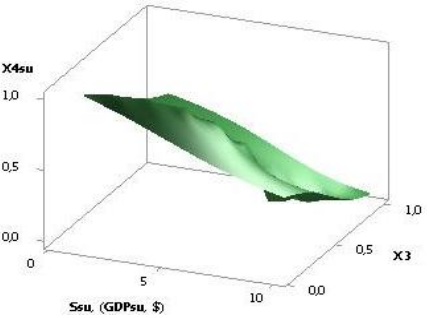

Fig. 22. X4su = f(X1, X2, X3, Ssu) X1 = X2 = X3 = 1...0,1, Ssu = 10...1

The calculations made form a basis for the Combined Table 1, which includes both the calculated values of the X4su variable and the other values used in calculations. Here the variables X4suf and X4suf signify the starting and final values of the X4su variable and indicate by which factor the X4su value did increase or decrease. This table includes calculations with X4suf / X1sub ≥ 1.

Table 1 – Arranging ratios of the $X4_{suf}$ / $X4_{sub}$ parameters in descending order

№ п/п	X1 ед.	X2 ед.	X3 ед.	$X4_{su}$, ед.	S_{su}, ед.^{2} (GDP_{su}, $)	$X4_{suf}$ / $X4_{sub}$
	1…0,1	1…0,1	1	0,37…0,99	1	2,70
	1…0,1	1…0,1	1	0,37…0,99	10…1	2,70
	1	1…0,1	1	0,49…0,99	10…1	2,01
	1…0,1	1…0,1	1…0,1	0,49…0,99	10…1	2,01
	1	1…0,1	1…0,1	0,56…0,99	1…10	1,77
	1	1…0,1	1…0,1	0,56…0,99	1…10	1,77
	1…0,1	1	1	0,56…0,99	1…10	1,77
	1	1…0,1	0,1…1	0,79…0,99	0,1…1	1,42
	1…0,1	1	0,1…1	0,73…0,99	1…10	1,35
	1…0,1	1…0,1	1…0,1	0,76…0,99	0,1…1	1,29
	1…0,1	1…0,1	1…0,1	0,76…0,99	0,1…1	1,29
	1…0,1	1…0,1	0,1…1	0,76…0,99	1…0,1	1,29
	1… 10	1…0,1	0,1…1	0,76…0,99	1…10	1,29
	1…0,1	1…0,1	1	0,77…0,99	1…10	1,28
	1…0,1	1…0,1	0,1…1	0,79…0,99	0,1…1	1,26
	1…0,1	1…0,1	1…0,1	0,79…0,99	1…10	1,26
	1…0,1	1…0,1	1…0,1	0,79…0,99	1…10	1,26
	1	1…0,1	1	0,79…0,99	1…10	1,26
	1…0,1	1…0,1	0,1…1	0,79…0,99	10…1	1,26
	1	1…0,1	1	0,81…0,99	1	1,22
	1…0,1	1…0,1	0,1…1	0,86…0,99	1…10	1,16
	1	1…0,1	0,1…1	0,88…0,99	1…10	1,14
	1	1…0,1	0,1…1	0,56…0,99	10…1	0,27

Table 1 was used as a basis for Table 2, in which all the values of the X4suf / X4sub ratios are sorted in descending order by groups. This allowed for simplification of selecting a X4su value depending on a number of variables in review.

Table 2 – Statistics of variables for X4suf / X4sub in descending order by groups

№ п/п	X1 ед.	X2 ед.	X3 ед.	$X4_{su}$, ед.	S_{su}, ед.^{2} (GDP_{su}, $)	$X4_{suf}$ / $X4_{sub}$
1 variable						
	1	1…0,1	1	0,81…0,99	1	1,22
2 variables						
	1…0,1	1…0,1	1	0,37…0,99	1	2,70
	1	1…0,1	1	0,49…0,99	10…1	2,01
	1…0,1	1	1	0,56…0,99	1…10	1,77
	1	1…0,1	1	0,79…0,99	1…10	1,26
3 variables						
	1…0,1	1…0,1	1	0,37…0,99	10…1	2,70
	1	1…0,1	1…0,1	0,56…0,99	1…10	1,77
	1	1…0,1	1…0,1	0,56…0,99	1…10	1,77
	1	1…0,1	0,1…1	0,79…0,99	0,1…1	1,42
	1…0,1	1	0,1…1	0,73…0,99	1…10	1,35
	1…0,1	1…0,1	1	0,77…0,99	1…10	1,28
	1	1…0,1	0,1…1	0,88…0,99	1…10	1,14
	1	1…0,1	0,1…1	0,56…0,99	10…1	0,27
All the variables						
	1…0,1	1…0,1	1…0,1	0,49…0,99	10…1	2,01
	1…0,1	1…0,1	1…0,1	0,76…0,99	0,1…1	1,29
	1…0,1	1…0,1	1…0,1	0,76…0,99	0,1…1	1,29
	1…0,1	1…0,1	0,1…1	0,76…0,99	1…0,1	1,29
	1… 10	1…0,1	0,1…1	0,76…0,99	1…10	1,29
	1…0,1	1…0,1	0,1…1	0,79…0,99	0,1…1	1,26
	1…0,1	1…0,1	1…0,1	0,79…0,99	1…10	1,26
	1…0,1	1…0,1	1…0,1	0,79…0,99	1…10	1,26
	1…0,1	1…0,1	0,1…1	0,79…0,99	10…1	1,26
	1…0,1	1…0,1	0,1…1	0,86…0,99	1…10	1,16

THE COMPARATIVE LEGAL CHARACTERISTICS OF CRIMES, ENCROACHING ON THE HONOR AND DIGNITY OF THE INDIVIDUAL

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Russia

Abstract. The article analyzes the norms of the criminal codes of a number of foreign countries, providing for liability for defamation, which is recognized as criminally punishable. In our opinion, it seems necessary to take into account the foreign experience of the criminal law regulation of liability for defamation when changing domestic legislation, at the same time, a comparative analysis of the penalties for defamation in foreign legislation is carried out, thanks to which it is possible to draw a conclusion on the assessment by the legislator of the degree of its public danger in a particular country.

Keywords: defamation, criminal law regulation, foreign criminal law.

Honor, dignity and reputation in our time are inalienable goods and represent the apogee of the moral values of the individual. The historical and legal analysis of the pillars of Russian and foreign law tells us that they originated in ancient times.

Being in society, a person puts honor, dignity and reputation in the hierarchy of needs in one of the first places after biological ones, which, in turn, ensure its safety as an organism. The above human qualities relate to spiritual intangible goods and respect for them, the prevention and suppression of attacks on them is a characteristic feature of the rule of law in a democratized society.

An analysis of the legislation of foreign countries showed some differences in the design of the main, qualified and privileged corpus delicti, in determining the severity of libel, in determining the circle of persons to whom it could be committed.

Swiss criminal law establishes liability for a crime that violates the honor and dignity of a person, such as defamation.

Article 173 of the Swiss Criminal Code defines the basic structure of defamation as an act in which someone accuses or suspects someone in front of a third person by disseminating information about dishonest behavior or other facts that could damage his reputation, who further spreads such an accusation or suspicion.

In the same article a rule is formed on the exclusion of criminal liability - if the prosecutor proves that the statements used or cited below are true, or that he has good reason to confidently consider them truthful, then he is to be punished.

Attention should be paid to the normative consolidation of the internal relationship of the subject of the crime to the committed act - if he is convinced that the information disseminated by him is reliable, then there is no corpus delicti.

The analyzed norm contains restrictions for exemption from criminal liability, securing the presumption of guilt - this is the case if the subject of the crime made statements without a justifiable reason, mainly with the aim of using them or spreading slander on someone, especially if the statements concern private or family life. In this case, the prosecutor (in Russian criminal law - the subject of the crime) can't prove his position.

If the subject of the crime refuses the statements, recognizing them as untrue, this can be recognized as a circumstance mitigating punishment, or the person may be released from criminal punishment.

If the perpetrator did not provide evidence of the truthfulness of the statements or they are untrue and he takes them back, then the judge establishes this in the verdict or in another document.

Art. 174 of the Swiss Criminal Code establishes liability for conscious defamation - a situation in which someone who is knowingly in front of a third party accuses or suspects, disseminating information about dishonest behavior or other facts that could damage his reputation, who knowingly spreads further similar accusation or suspicion

The qualified staff is a planned deliberate slander, the purpose of which is the spoiled reputation of the stipulated person, which provides for not an alternative, but a certain sanction - a prison sentence of at least one month.

Swiss criminal law provides for a guilty plea - if a person takes his statements back to the judge, he can be punished more leniently.

Swiss law, in contrast to Russian criminal law, protects the honor and dignity of not only living people, but also the memory of the dead or declared missing - i.e. those who cannot stand up for themselves, demand

the punishment of the perpetrator. The rights to protect the honor and dignity of such persons belong to their relatives. This right is not unlimited - so, if by the time the act was committed more than thirty years have passed since the person's death or from the day the person was declared missing, the person who committed the act is not punishable.

Written slander, images, gestures, as well as acts committed in a different way are equated with verbal slander and deliberate slander in verbal form.

That is, defamation in the criminal law of Switzerland can be either simple or deliberate, committed both orally and in writing. The goal is to disseminate information defaming the victim.

A similar position is presented in the Criminal Code of the FRG (hereinafter referred to as the Federal Republic of Germany), in which in section 14 "Insult", which provides for two corpus delicti related to reporting or disseminating facts about another person: § 186 "Vilification" and § 187 "Slander"[1].

The disposition of § 186 refers to the dissemination or communication of a false, degrading fact before society. In case of libel punishable in accordance with § 187 of the Criminal Code of FRG, the communication or distribution must be intentional, the fact must be knowingly false, and in addition to humiliating a person to the public, it may also threaten his creditworthiness.

Section 267 of the Danish Penal Code provides for alternative acts of encroaching on "... the personal honor of another person with insulting words or behavior, or uttering or disseminating allegations of an act that is likely to humiliate him and violate the respect of his fellow citizens"[2]. In addition to the crime mentioned above, article 268 provides for liability for the same acts, provided that the allegation was intentionally made or disseminated, or if the author had no reasonable grounds to believe that this was true. The person who disseminated the above information is convicted of defamation under the Danish Criminal Code.

The Swedish Penal Code[3] contains 5 different articles on crimes against honor and dignity. The first of these is an article on defamation.

[1]The Criminal Code of the Federal Republic of Germany / Trans.: Rachkova N.S.; Entry.: Yeshek G.-; Scientific ed. and entry. art.: Shestakov D.A. - S.-Pb.: Jurid. Center Press, 2003. P 350.

[2]Danish Penal Code. Translation from Danish and English / Transl.: Rycheva A.N.; Scientific ed. and foreword: S. Belyaev (Trans.) - S.-Pb.: Jurid. Center Press. 2001.- 230 P.

[3]Swedish Penal Code. Translated from English Criminal Code of Sweden as of May 1, 1999 / Scientific. Ed.: Kuznetsova N.F.; Trans. Ed.: Belyaev S.S. (Scientific Ed.) - M.: Publishing House of Moscow State University. 2000.- 167 P.

Based on the content of Article 1 ch. 5 of the Swedish Criminal Code, defamation is an indication of someone as a criminal or as a person leading a detrimental lifestyle, as well as otherwise disseminating information that aims to cause contempt of others.

Consequently, the dissemination of knowingly false, inaccurate information for the Swedish legislator does not matter in the qualification of this type of crime.

According to Shonov A.T., in regards with singular, vague sign of "severe defamation", forming an independent corpus delicti, it should be said that when determining the severity of defamation in accordance with Art. 2 chap. 5 of the Swedish Criminal Code it is necessary to establish the serious damage caused due to the content of the disseminated information, its volume or other reasons[4].

In the Austrian Criminal Code, article 111 of the fourth section "Crimes against honor", defamation refers to accusing another person of committing something or his convictions in such a way that it is perceived by third parties in contempt, or accusing him of an undeserving relationship or behavior that violates good morals, with the goal of worsening public opinion about him or humiliating him in the eyes of the public[5].

Responsibility for slander and defamation in the states - representatives of the Anglo-Saxon legal family is reflected in the legislative acts of many countries of the British Commonwealth of Nations, as well as in the United States and Ireland and originate from English defamation law.

Criminal libel in England, Wales, and Northern Ireland is governed under Campbell's Defamation Act[6] until January 12, 2010. To date, defamation disputes in the countries considered above are resolved in civil law in accordance with the norms established in the Defamation Acts of 1952, 1955, 1996 and 2013. Defamation regulations and laws are also present in Australia[7], New Zealand[8], and Hong Kong[9].

[4]Shonov A.T. Responsibility for defamation under Kazakhstan criminal law: Rep. dis. ... master. Astana, 2018. P. 12-13.

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[9]Resolution on defamation and libel of 1887 [Electronic resource] // http://oelawhk.lib.hku.hk/items/show/630

According to A. Shonov, an important stage in the development of English law in the field of libel and insult was the adoption of the Defamation Act 1996, article 2 of which provides an opportunity for a person accused of defamation to publish an official apology and offer to pay compensation.

The origin of the word “kleveta” used in the Russian language is lost in the mists of time. In the studies of A.G. Preobrazhensky, M. Fesmer and other authors indicated that in the Slavic languages it is not possible to establish the etymology of the word "kleveta", and most likely its roots should be sought in the Latin meaning of the word "calvor" (cheating)[10].

In the Russian legal system, the fate of the norm on liability for the dissemination of false information defaming the victim has come a long way. As correctly noted by P.V. Stepalin, the history of the formation and development of domestic criminal legislation on attacks on the honor and dignity of an individual is rooted in Russian Pravda, which provided for liability for offense, dishonor, verbal abuse, the so-called barking. This institution, in which, according to the corresponding time period, the concepts of such violations were revealed, their severity, the degree of responsibility of the guilty persons depending on the class and stratum of victims, the place of the commission and other circumstances, was contained in many other legal monuments - the Statutory Dvina Charter, Sudebniks 1497 and 1550, In the Council Code of Tsar Alexei Mikhailovich, in the Code of Criminal and Correctional Sentences, in the Criminal Code of 1903. All the Criminal Codes of the RSFSR also determined the composition of slander and insult. The Criminal Code of 1996 retained continuity in this matter.[11].

However, in December 2011, libel was decriminalized, but less than a year later the corresponding article was returned to the Criminal Code of the Russian Federation. Disputes about the feasibility of such a decision are still ongoing. Judicial practice under Article 128.1 of the Criminal Code is noteworthy in that it is characterized by a large number of acquittals[12]. This is because the act provided for in the first part of this article is

[10]Preobrazhensky A.G. Etymological Dictionary of the Russian Language, - M.: State Publishing House of Foreign and National Languages, 1959. – V. 1. P. 312-313; Fasmer M. Etymological Dictionary of the Russian Language: Trans. from Germ. and add. O. N. Trubacheva. – M.: Progress, 1967. – V.2. – P. 245.

[11]The criminal law of the Russian Federation. Special issue: Textbook / T.N. Volkova, Yu.V. Gracheva, L.D. Ermakova et al.; under the editorship of L.V. Inogamova-Khegai, A.I. Raroga, A.I. Chuchaeva. Ed. corrected and add. M.: CONTRACT, INFRA-M 2006. P. 217. The author of the chapter – P.V. Stepalin.

[12]See.: Yelets S.A. The threat of the spread of defamatory fabrications as a way of committing a crime // Sciences of Europe, Praha, 2019.

referred to as private prosecution. Criminal cases of private prosecution are instituted, with some exceptions, at the request of the victim and may be terminated in connection with the reconciliation of the victim with the defendant. When considering such cases, there is no prosecutor (with the exception of a number of cases), which deprives the trial of the accusatory bias and allows the principle of adversarial manifestation.

One of the indispensable signs of slander is its malevolence, which implies accurate knowledge of a person about false information. In case of a bona fide delusion of a person regarding the truthful nature of the information, one cannot speak of deliberate malevolence.

When qualifying defamation, it is necessary to distinguish between information that contains direct statements about facts that can be checked for compliance with their reality, and judgments of an evaluative nature, which, in essence, come down to expressing the subjective opinion of a person. Expressing one's own convictions by a person does not carry specifics, and therefore cannot be described as false or true, and therefore does not fall within the scope of the crime of "slander".

Thus, the comparative legal analysis allows us to argue that in order to unleash the potential of the norms for protecting the honor and dignity of the individual, which have been developed in foreign law and order, for their correct understanding and application, a relevant doctrinal study is necessary, based not least on comparative legal analysis. It is in this way that there is the possibility of understanding and identifying the common features of a protected institution, its components.

CRIMINAL PENALTIES ALTERNATIVE TO IMPRISONMENT IN THE CRIMINAL LEGISLATION OF THE CONTINENTAL LEGAL FAMILY

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Abstract. The article discusses the foreign experience of the appointment and execution of a fine as a criminal punishment. Based on an analysis of the laws of the Federal Republic of Germany, France, Austria, Belgium, Norway, and Switzerland, the author comes to the conclusion that it is necessary to improve the Russian criminal law regarding the application of criminal penalties alternative to imprisonment.

Keywords: foreign criminal law, punishments, alternative to imprisonment, fine, fine days, monetary fine, property fine, seizure of benefits.

The disadvantages of the Russian regulation of the use of criminal penalties, alternative to imprisonment, become apparent during the analysis of foreign legislation in this area.

The study of modern foreign criminal law shows a certain commonality of the approach to regulating the fine. However, each state has its own unique experience in the appointment and execution of this type of punishment.

The greatest variety in the ways of fixing a fine is observed in countries of the continental legal family. These are conventional units (Germany, France), and a fixed size (Belgium), and even the absence of an indication of the size of the fine (Norway).

So, the criminal law of Germany [1] distinguishes two types of fines: monetary and property.

A monetary fine is assigned in daily rates (from 5 to 360 full daily rates). The court determines the amount of the daily rate, taking into account the personal and material situation of the person who committed the act. The court in this case, as a rule, proceeds from the net income that an individual has or could have on average a day. The law establishes a minimum (105 euros) and a maximum (526 euros) to determine the daily rate.

When determining the daily rate, the income of a person, his property and other sources of subsistence may be taken into account.

It should be noted that § 41 of the Criminal Code of the Federal Republic of Germany provides for the possibility of imposing a fine as an additional punishment along with imprisonment in cases where a person has been enriched or attempted to enrich as a result of a criminal act.

Criminal law allows for easier payment. If the convicted person is not able to immediately pay a fine in accordance with his personal and material conditions, the court will appoint him a payment deadline or allow him to pay a fine in certain installments. However, the privilege authorizing the payment of a fine in certain installments shall lose its force if the convicted person does not pay part of the payment on time.

§43 of the Criminal Code of Germany regulates the replacement of a fine with imprisonment in cases of evasion of its payment. At the same time, the German lawmaker equated one day of imprisonment to one daily rate.

The second type of fine - a property fine - is assigned only as an additional to life imprisonment or temporary imprisonment for a period of more than three years and consists in paying a sum of money, the amount of which is limited by the value of the property of the person who committed the crime.

Calculation of the fine in daily rates is also characteristic of the criminal law of Austria [2]. In accordance with § 19 of the Austrian Criminal Code, the daily rate must be determined taking into account the personal characteristics and financial situation of the offender at the time of the verdict by the trial court. The minimum daily rate is set at 2 euros, and the maximum at 327 euros. If the fine is not paid, it can be replaced by imprisonment (one day of imprisonment is equal to two daily rates). The minimum fine is two daily rates.

Of particular interest in the Austrian criminal law is the so-called “seizure of benefits” (§ 20 of the Criminal Code), which, although the content corresponds to confiscation, is allocated as an independent form of liability (it should be noted that a separate §20b of the Criminal Code is devoted to confiscation of property). Seizure of benefits is understood as the payment of a sum of money in the amount of illicit enrichment received as a result of a criminal offense. If the amount of enrichment cannot be established at all or can be established only in a disproportionate amount, the court shall determine the amount of payment at its discretion.

The payment of a sum of money appointed by the court at its discretion in the amount of enrichment that has occurred should be prescribed to a

person also when property benefits come to him in connection with his temporary participation in a criminal organization or in a terrorist association, upon receipt of which it is obvious that they came from criminal acts and that their legal origin is doubtful.

Moreover, a person who is enriched as a result of another person committing an act prohibited under the threat of punishment is also sentenced to seizure of benefits. If a legal entity or a partnership is enriched, then they are also sentenced to pay a sum of money.

If several persons received property benefits, then each person shall be convicted taking into account his share in enrichment.

One more important remark of the legislator should be noted: if the person who directly enriched, died, or the enriched legal entity or partnership no longer exists, the benefit is withdrawn from their successor, since it existed at the time of the criminal act.

In France [3], the types of punishments depend on the category of the committed act (criminal penalties are assigned for crimes, correctional penalties for misconduct, punishments for violations are singled out in a separate group), as well as for the subject of the crime (penalties applied to individuals and legal entities). In cases of committing a crime, a fine can be assigned only as an additional punishment, and acts as the main punishment for misconduct and violation. The penalty applies to both individuals and legal entities.

Among the penalties, the French legislator singles out fines and fine days. Penalty days mean the convict's obligation to contribute to the state budget an amount the total amount of which depends on the daily contribution established by the judge and paid within a certain number of days. The amount of the daily contribution is established taking into account the income and expenses of the defendant, but it cannot exceed 308 euros. The number of fine days is determined taking into account the circumstances of the criminal offense, it cannot exceed 360 days.

Penalties in the form of a fine and fine days cannot be assigned together. In addition, these types of punishments cannot be imposed together with any of the punishments that deprive some rights or restrict them, as well as punishments in the form of work in the public interest (Art. 131-9).

The size of the fine as a correctional punishment is not indicated in the General Part, it is indicated in the sanctions of specific articles of the Special Part, however, given the fact that the fine for violating the 5th grade can reach 3077 euros, it is obvious that its size as a corrective punishment exceeds this amount.

The size of the fine for violations is regulated in Art. 131-13 (from 38 euros for violations of the 1st class, up to 1538 euros for violations of the 5th class).

The maximum amount of the fine applied to legal entities is five times the size of the fine provided for individuals by law punishing a criminal act (Articles 131-38). At the same time, for any violation of the 5th class, the fine can be replaced by one or more punishments, depriving the rights or restricting the rights (Art. 131-42).

Under the Norwegian Criminal Code [4], a fine can also be applied to individuals and legal entities. However, criminal law does not establish the amount of a fine in either the General or the Special Part. The legislator limits himself only to the observation that when imposing fines, in addition to the nature of the crime, the financial situation of the convicted person should be especially taken into account and how much he is supposed to pay in the circumstances (§ 27 of the Criminal Code). In addition, the sentence on the payment of fines immediately sets the term of imprisonment from 1 day to 3 months, which is assigned if fines are not paid.

In Belgium [5], a fine can be imposed both for committing crimes, as well as misconduct and police violations. The fine imposed on individuals for committing a police violation is not less than 0.02 euros and not more than 0.62 euros, for committing a crime or misconduct - not less than 0.64 euros.

The fines imposed on legal entities are:

In criminal and correctional cases:

- when the law provides for a punishment in the form of imprisonment for life: a fine from 5900 euros to 17900 euros;
- when the law provides for a punishment in the form of conviction and a fine, or only one of these penalties: a minimum fine of 12 euros multiplied by the number of months corresponding to the minimum penalty associated with deprivation of liberty, while not lower than the minimum fine, provided for this offense; the maximum fine may be up to 50 euros multiplied by the number of months corresponding to the maximum term of imprisonment, and be not lower than the doubled maximum fine provided for this offense;
- when the law provides only a fine for a given offense: its minimum and maximum amount are those that are prescribed by law for this violation.

In cases of police violations, the fine is from 0.62 to 6 euros.

In case of non-payment of the fine within two months from the date of the sentence or decision, if they were passed in an adversarial process,

or from the moment of official notification of them, if the relevant decisions were taken in absentia, the fine can be replaced by imprisonment, the term of which is established by the sentence or decision on conviction and which cannot exceed six months for convicted of crimes, three months for convicted of misconduct and three days for convicted of police misconduct.

The most detailed questions of the purpose and execution of the fine are regulated in the criminal law of Switzerland [6], where the maximum fine is 40,000 francs. Moreover, if a person acts out of selfish motives, then the judge is not bound by this maximum fine. The judge determines the size of the fine depending on the position of the person (circumstances such as his income and his property, his marital status and his family responsibilities, his profession and his earnings, his age and his health condition), but in such a way that property the disadvantages suffered by the person as a result of the imposition of this punishment were proportionate to his guilt. If the convicted person dies, then the fine is not executed (Art. 48 of the Criminal Code).

The order of execution of this type of punishment is as follows. The competent authority determines the term for the convict to pay from one to three months. If the convicted person does not have a permanent residence in Switzerland, then he is forced to pay a fine immediately or provide security.

The competent authority may allow the convicted person to pay the fine in installments, the amount and term of payment of which is determined depending on the situation of the person. A convicted person may also be allowed to work a fine by performing free work, namely in favor of the state or community. In this case, the competent authority may extend the time limit of enforcement.

If the convicted person does not pay the fine and otherwise does not work it out, then the judge replaces it with arrest (one day of arrest is equal to 30 francs of a fine, while the commuted sentence cannot exceed a period of three months).

The Swiss Criminal Code provides for the possibility of imposing a fine as an additional punishment along with imprisonment in cases of commission of mercenary crimes (Art. 50 of the Criminal Code).

Thus, the considered provisions of foreign criminal legislation regarding the regulation of criminal penalties in the form of a fine differ significantly from the domestic one in the most detail and concreteness, some of which seem promising for improving the Russian criminal law.

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SAVIORS OF THE PEASANTRY: WHOM AND FROM WHOM TO SAVE?

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Abstract. In the article on the example of one of the issues is the option of training teachers to organize discussion of controversial issues in the classroom is not in the form of a talk show based on emocional perception and scientific debate based on arguments. The effect of persuasiveness provides an opportunity to compare these two types of discussion in practice and independently determine their pros and cons. The authors offer tools that facilitate the work of the participants of the discussion, and allows to draw conclusions not on the basis of the principle of "like" - "do not like", but on the basis of objective data obtained experimentally. Despite the "attachment" to the problems of historical science, the proposed version can be successfully used in the discussion of any issues, adjusted for a special context. The material can be useful for teachers of secondary schools, teachers of secondary and higher educational institutions of pedagogical profile in the development of their own programs for the study of controversial issues of science in the framework of the taught training course. In addition, students and students can use it in preparation for a class discussion. The article takes into account the experience of work at the Department of history, social science and economics of the Novosibirsk Institute of advanced educator"s training and retraining.

Keywords: discussion, discussion question, critical thinking, additional education, educational technology.

Reason to discuss

It so happened that the problem of preserving or reviving the peasantry does not cease to occupy people: whether it is a discussion in the classroom, a talk show on television or a fiery speech of a Deputy in the State

Duma. It is characteristic that all participants in such discussions have their own position, which they are ready to defend up to the fist fight. All this prompted us to consider the problem of the preservation or revival of the peasantry through the prism of training teachers to teach debatable issues in history lessons. The experience gained by the authors in the process of research the topic "Formation of teacher readiness to teach debatable issues of historical science" at the Department of history, social science and economics of the Novosibirsk Institute of advanced training and retraining of educators was used in the preparation of the material[2, 5, 6, 8, 11] .

Hypothesis

The question of the preservation or revival of the peasantry for our society is undoubtedly a socially important debatable issue. As such, it can justifiably become the subject of discussion when considering the agrarian question in history lessons at school. We dare to assume that the discussion will be as violent as on a talk show, if you do not conduct preliminary theoretical work on the study of the subject of discussion. To carry out such work with students, the teacher himself must undergo appropriate training. But, since the issue is socially significant, the effect of its discussion in the classroom circles will go through the school and therefore you need to take care in advance to prevent possible negative effects [1, 3, 10].

Problem

Discussion of socially significant issues in the classroom always causes passions and therefore creates certain difficulties for the teacher leading the lesson after the discussion, and inconvenience for the school administration in connection with the complaints of teachers. In addition, the organization of the discussion requires from the teacher organizing it other qualities than those to which he is accustomed in the process of traditional teaching the subject. It is necessary to be well enough guided in various sciences, to be able not only to state a position, but to prove its importance in a reasoned way, to have the ability to hear the arguments of the opponent and react quickly to them. The experiment conducted at the training courses of history teachers in the process of research on the topic "Formation of teacher readiness to teach debatable issues of historical science" at the Department of history, social science and economics of the Novosibirsk Institute of advanced training and retraining of educators showed that it is possible to neutralize the negative consequences with competent preparation for the discussion [4, 7, 9].

Research mechanism

A teacher can receive appropriate training at courses of advanced training of education workers in the organization of additional professional edu-

cation, for example, in the framework of a special seminar on the topic: "The place and role of the peasantry in society". It is advisable to hold a seminar in three stages: the first - "Save and revive the peasantry!", the second - "Who are you, a peasant? No answer..." and the third - "Since there is no one to save, why saviors?" The experimental method allows us to solve the traditional problem of the organization of additional professional education - to improve the skills of educators. At the same time, it allows to work out innovative approaches to the organization of professional development depending on the emerging problems [11].

Solve the problem

Since the seminar is held in three stages, each should address a specific task.

At the first stage, the host should not restrain the enthusiasm of the participants in the discussion and prevent the discussion from acquiring the usual features of a talk show. The task is to interest teachers in the problem, to involve them in the discussion, to encourage them to formulate their credo and to give space to defend it in the process of controversy. The task will be solved when it becomes obvious that the positions of the participants in the discussion are clearly defined, they have nowhere to retreat. It is important that the positions were not only voiced, but also recorded in writing, which will greatly facilitate the work in the subsequent stages.

At the second stage, the host should throw in the question: "Who are we arguing about?" and formulate the task: "Define the concepts used in the discussion". The work will be facilitated by the use of a prepared table (see table 1).

Table 1

	Definition
The peasantry is...	
The peasantry includes ...	
The peasant is ...	
Categories of peasants ...	
The meaning of the slogan "Liquidation of the peasantry as a class"	
The meaning of the concept "Sheep ate peasants"	
Whom do you propose to preserve and revive?	
What will be the consequences of revival and preservation?	

So that the work does not become purely formal, it is necessary to take care of information support: dictionaries, encyclopedias, collections of materials on the agrarian problem during the English bourgeois revolution and in the documents of the socialists and Bolsheviks during the revolution in the Russian Empire.

It is important that each panellist fills out the questionnaire independently and does not disclose its contents. After filling out the questionnaires, the panelists submit them to a pre-formed analytical group. The task of the analytical group is to study the questionnaires and answer the question "Is consensus possible in the definition of concepts?" Finally, the analysis team fills out the summary table and presents it to the lead (see table 2).

Table 2

	Definition		
	Saviors	**Opponents**	**Other**
The peasantry is...			
The peasantry includes ...			
The peasant is ...			
Categories of peasants ...			
The meaning of the slogan "Liquidation of the peasantry as a class"			
The meaning of the concept "Sheep ate peasants"			
Whom do you propose to preserve and revive?			
What will be the consequences of revival and preservation?			

At the third stage, the presenter displays table 2 and conducts a frontal analysis of the information contained therein. The task is to establish the dependence of the participants' formulations on the definition criteria used by them. Then the dependence of the position of the Panelist on the concept formulated by him is established, the importance of a professional approach to determining his strategy in the discussion is demonstrated and the self-reflection of the panelists is carried out using table 3.

Table 3

	What am I wrong about?	How to adjust?
The peasantry is...		
The peasantry includes ...		
The peasant is ...		
Categories of peasants ...		
The meaning of the slogan "Liquidation of the peasantry as a class"		
The meaning of the concept "Sheep ate peasants"		
Whom do you propose to preserve and revive?		
What will be the consequences of revival and preservation?		

At the end of the reflection process, the work cycle closes and the discussion begins on a theoretical basis, not on an emotional one (see Figure 1).

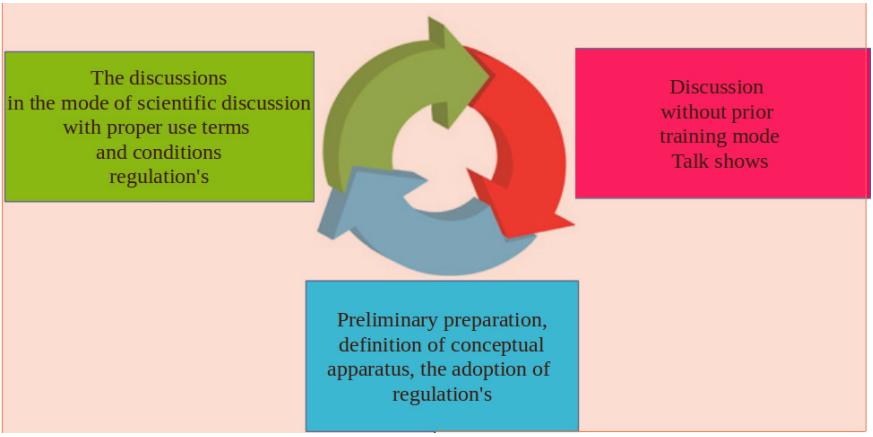

Figure1

Based on the results of the work, a comparative analysis of the emotional and theoretical options for the discussion is carried out, the degree of usefulness of both forms is determined and preferences for use in their professional activities in history lessons at school are determined.

Working with table 4 allows you to specify the negative consequences of certain actions during the discussion, to realize their harmfulness and try to avoid them in the future.

Table 4

Action	Risks
The use of a complex concept.	
The use of a term having different contents.	
The use of the concept inherent in one era in relation to another.	
Consideration of the phenomenon in isolation from the process of which it is a part.	
Replacing knowledge with faith.	
Transferring the meaning of one concept to another.	
Confusion of ideas.	
Appeal to the emotions rather than to reason.	
The desire to find a compromise where it can not be.	

The innovation effect

The traditional form of preparation of participants for the discussion was not very productive. The lecture version had to be rejected because the participants demonstrated knowledge of how to behave during the discussion, but often did not follow this knowledge during the discussion itself. Analysis of errors after the discussion also did not satisfy either the organizers or the participants. Pointing out mistakes on the part of the organizer invariably met with resistance on the part of the participant in the form of "I did not say this" or "You misunderstood me". Largely because of this, it was decided to develop and test a three-level seminar to give the participants a "free flight", writing down the positions of each, then study the conceptual apparatus used by the participants, bring it to a common denominator and repeat the discussion at a new level. The final reflection after that takes place in a completely different way and gives positive results for both the organizer and the participants of the discussion.

Conclusion

Participation in the seminar makes the participants aware of the importance of the preparatory phase, which is the topic of the discussion, singled out a discussion question, to be discussed yet to be discussed problems, an unequivocal definition of the concept, which will operate the panelists, are determined by the positions of the participants and thinking through strategy and tactics of debate.

Comparison of the first and third stages of the seminar allows participants to see the difference between the discussion show and discussion of the discussion question in the classroom, to reconsider their approaches to the organization of the discussion and thereby significantly improve the efficiency of the educational process.

Despite the fact that the seminar was tested on history teachers, the technology can be successfully applied to teachers teaching other subjects, with some amendments to the subject.

Recommended materials for classes

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MENTORING IN VOCATIONAL EDUCATION

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Abstract. The purpose of the article is to show the problems of mentoring in the modern system of vocational education. The research material was the World Championship of working professions WorldSkils, which was held in Kazan in August 2019. Using survey methods, interviewing championship participants, mentors, tutors, and mentors, it was found that not all of them know and use theory and methodology in their work vocational education. The results of the study convince a certain connection between the professional competence of mentors and the successes (or failures) of their students.

Keywords: mentoring, vocational education, world championship on working professions, WorldSkills.

Introduction

Mentoring in vocational education, associated with various forms of tutoring, mentoring, counseling and methodological guidance, seems to be the least developed part of modern didactics.

The WorldSkils World Championship in Workers Occupations held in Kazan on August 20-27, 2019 showed the need to actualize the problems of the professional and pedagogical culture of mentors, tutors.

Knowledge of professional pedagogy, pedagogical competencies are an integral part of professional pedagogical culture. The need to use the data of professional pedagogy (data on the effectiveness of methods, technologies, techniques, training and communication tools) is emphasized by many scientists (Allyn & Bacon, 2001; Barnes, 2017; Barsukov, 2016;

Bloom, 1956; Maslennikova, 2012; Menter, 2015; Masalimova, 2011; Arbuzova, 2007, etc.). Standards, programs, and vocational education requirements have long been in force (vocational education requirements, 1997). A well-known specialist in the field of vocational and technical pedagogy M.I.Makhmutov said that in vocational education methods, technologies, teaching aids should have a polytechnical character (Makhmutov, 1983). Many experts noted the effectiveness of such methods, technologies, and tools in vocational education (Bordovskij, 2018; Gabdulcha-kov, 2016; Hsu, 2015; Egorychev, 2014; Arbuzova, 2007; Khamel, 2014; Chapaev, 1998). However, practice shows that workers are often trained by mentors, tutors who do not have a pedagogical education, do not know professional methods, technologies, didactic means of vocational training and, especially, professional communication. Some of them achieve good results in training skilled workers (electricians, installers, builders, drivers, crane operators, etc.), while others do not.

The WorldSkils World Championship for working professions in Kazan brought together the best mentors, tutors, experts and young workers. On August 27, Russian President Vladimir Putin and WorldSkils International President Simon Bartley addressed training issues. If Putin talked about the model of continuous training and proposed holding the European WorldSkils Championship in St. Petersburg, Bartley talked about reducing jobs in the economies of different countries and reorienting vocational education to “green skills”, ecology, nature conservation and an amazing professional adventure, which the participants of the WorldSkils championship will have to survive in the future. Thus, the importance of pedagogy for vocational education is increasing.

We have set the **task**: to study the professional and pedagogical level of the tutors who prepared the pupils for the world championship. They all had a reputation as mentors.

In the course of solving the research problem, **questions** were posed:

1) what content should tutors offer in profiles;

2) what questions can be asked to pupils - young participants of the championship.

The purpose of the study: to determine whether there is any dependence of the achievements of the participants of the world championship on the professional and pedagogical training of tutors.

As the **methodological basis** of the study, the concept of A.I. Prigozhin on the classification of significant problems in the questioning process was used (Prigozhin, 2007). Therefore, the main research method was the questionnaire method: tutors were asked questions:

1) do they need pedagogy (as a theory and the art of learning) in preparing students for working professions;

2) whom they accompany at the championship - capable or gifted.

Young contestants were also asked questions:

1) whether they consider their mentor (tutor) as a pedagogue;

2) is participation in the world championship a result of preparation, a result of abilities or a result of talent.

Research

Interviews with 78 people (36 tutors and 42 contestants) conducted by us on August 21-27, 2019, see Fig. 1, 2, 3), showed interesting results.

Figure 1. Mentors - tutors, experts

When asked whether they need pedagogy in the training of young specialists, the majority (except the USA, Canada, England, France) answered “yes” and that they were actually interested in the theory and art of teaching. Among those who found pedagogy necessary, China, then Russia and Germany stand out noticeably (see Tables 1, 2, 3).

Representatives of the USA, Canada, England, France answered that personal professional experience is more important for them, they were not interested in pedagogy.

Thus, it turned out that 73% of mentors to one degree or another used the resources of pedagogy as a science and the art of communication and training, and 27% relied on their life and professional experience.

Figure 2. Championship participants - winners (from China)

Figure 3. Honoring of the winners of the world championship

To the question of whom they accompany at the championship (capable or gifted), the majority (on average 81%) answered "gifted" (China, Russia, Germany), 25% - "capable" (USA, Canada, England, Norway), 4 % - "capable" and "gifted" (Sweden, Spain, Colombia). Among those who highlighted the gifted, China is a notable leader.

Participants of the competition (both prize-winners and not prize-winners) answered the question whether they consider their mentor to be a pedagogue, almost all unanimously: yes, we do (97%).

To the second question (is participation in the world championship a result of preparation, a result of abilities or a result of talent), the answers were distributed approximately equally:

1) 32% - participation in the world championship is the result of hard training;

2) 30% - participation in the world championship is the result of the development of abilities;

3) 38% - participation in the world championship is the result of talent development.

However, it is noteworthy that most of the participants in the world championship (38%) consider themselves talented.

Research results

The data obtained (see tab. 1, 2, 3) indicate that in the process of training skilled workers, it is necessary to pay attention to the professional and pedagogical level of tutors: the winners of the championship were countries (China, Russia), which traditionally pay great importance to this.

Table 1. Mentors' answers to the first question

Positive responses from tutors (in%)	USA	Russia	China	Canada	Germany	France	England	Sweden	Spain	Colombia	Norway
Do they need pedagogy (like theory and the art of learning) when preparing students for working professions	27	87	95	26	84	27	28	24	32	45	51

Table 2. Mentors' answers to the second question

Answer: capable	USA	Russia	China	Canada	Germany	France	England	Sweden	Spain	Colombia	Norway
whom they accompany at the championship - capable or gifted	27	22	18	26	19	27	28	4	4	4	11

Table 3. Mentors' answers to the third question

Answer: gifted	USA	Russia	China	Canada	Germany	France	England	Sweden	Spain	Colombia	Norway
whom they accompany at the championship - capable or gifted	42	78	82	56	81	54	67	45	53	34	40

Some respondents did not answer the questions.

Conclusions

The results of the study suggest that mentoring as a special area of professional didactics is not yet very developed: professional and pedagogical training of tutors in different countries is not the same. The tutors themselves admitted that they did not know professional pedagogy and did not use it in the preparation of qualified specialists. However, the data obtained in the study suggest that many provisions of the modern theory and methods of vocational education should be revised.

Acknowledgments

We are grateful to the Ministry of Education and Science of the Republic of Tatarstan for the opportunity to communicate with tutors and participants in the World Championship of WorldSkils working professions and we hope that the data we receive will be taken into account in the preparation of the next world championship.

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ORGANIZATION OF PRACTICAL TRAINING AT THE BASIC DEPARTMENT AS A CONDITION FOR THE FORMATION OF COMPETITIVENESS OF UNIVERSITY GRADUATES

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Abstract. This article is devoted to the organization of practical training at the basic department through personality-oriented educational practices of university students. This form of conducting educational practices is considered as a condition for the formation of competitiveness of a university graduate. The experience of interaction with employer enterprises is analyzed.

Keywords: university, basic department, educational practice, personality-oriented approach, competitiveness of a university graduate, employer.

The creation of a basic department and the organization of practical training involve a shift in emphasis from the impact of a teacher of a higher educational institution on students on the creation and development of a special practice-oriented environment for their professional training, self-education and self-development. The practical part of preparing a competitive graduate student involves a cross between the implementation of professional tasks and the result of “individual improvisations”. In fact, practice is a “strategic action” by which professional tasks are solved within the boundaries of knowledge, abilities and skills inherent in a student [1].

The role of practical training at the university is very diverse and consists not only in consolidating students' knowledge gained during training, but in developing relationships with enterprises, when a higher educational institution does not break away from the real situation on the labor market, the needs and requirements of employers, and in their educational, research and innovation activities, they jointly solve the problems facing society, interconnected subjects of the educational and economic space [2].

That is why the students 'educational and practical training are an integral part of the main educational program (MEP) provided for by the federal state educational standard of higher education. Training and practical training is implemented at the base department and in the scientific laboratories of the university. Students practice in third-party organizations (enterprises, research institutes, firms) or in departments and scientific laboratories of a higher educational institution.

Modern forms of conducting industrial production practices of students: educational practice is conducted with students individually, as part of educational groups or subgroups. The choice of the form of conducting production practices of students at the basic department is determined by the specifics of the direction (profile) in which students are trained [3].

In our opinion, the most effective influence on improving the competitiveness of university graduates is personality-oriented forms of organizing practices at the basic department, which suggest the following:

- organization of interaction between the university and employers;
- orientation of the content of the practice to the needs of the student's personality and the requirements of employers;
- a personality-oriented approach to determining the content of educational and production practices;
- orientation to self-education and self-development of the student in the course of educational and practical practices;
- analysis, evaluation and design.

In connection with the foregoing, the main goal facing the team of Tomsk State University of Architecture and Civil Engineering (TSUAB), especially its separate units: the regional center for the development of education in the Kemerovo oblast and the base department in the city of Leninsk-Kuznetsk, Kemerovo oblast, is the creation of a continuous engineering system -building education, which has the necessary conditions and resources for the training of qualified competitive specialists in accordance with the social order of the region and city, as well as the development needs of the individual student.

In achieving this goal, an important role is played by the organization and conduct of various types of training practices. The main types of students' practices at the basic department are: educational, industrial, undergraduate. Student practices are planned and the distribution of time for the practice is carried out in accordance with the requirements of the Federal State Educational Standard of Higher Education [4].

The base department of TSUAB in the city of Leninsk-Kuznetsk was organized on the basis of a joint agreement between the university and the construction company LLC "EcoStroy LK". The leadership of the base department concluded additional agreements with enterprises of the city of Leninsk-Kuznetsk (LLC "Master", LLC "Polysaevskoye Stroitupravlenie", LLC "Remstroy", LLC "Plant of Building Materials", LLC "Dorozhnik", LLC "Avtomobilist", GPTP KO "Leninsk -Kuznetsk motorcade", etc.) for students to complete all types of practices in the areas of training (profiles) being implemented.

Students have the opportunity to independently choose the place of practical training according to their specialty profile. Under the mandatory condition that the profile of the enterprise corresponds to the direction of training, as well as the ability to fully implement the practice program.

The main goal of the TSUAB base department is to organize the practical experience of students back in the period of university education. All the scientific and educational activities of students at the TSUAB base department in the city of Leninsk-Kuznetsk, Kemerovo oblast are aimed at developing practice-oriented learning, developing students' skills for their real future professional activity, sufficient for their employment in the specialty profile immediately after graduation.

The TSUAB regional center in the Kemerovo oblast has developed and is implementing at the base department a "Comprehensive system of continuous practical training of students throughout the entire period of study at the university," parallel to the entire complex of theoretical training. Education at the basic department is carried out in the following areas: “Management”, “Construction”, “Operation of transport and technological machines and complexes”, “Land transport and technological complexes”, “Technosphere safety”, “Land management and cadastre”. The key links of the project are:

1. Intensive introduction to a specialty in the first year;

2. Organization of the activities of the club "Professional", a system of student structures, united in separate specialties at the base department;

3. The inclusion of students in real practical processes on the basis of a permanent scientific and production student group "Leader";

4. orientation on practical activities and employment of professional practices, course and diploma design;

5. creating conditions for students to consciously choose their areas of further specialization in the process of university education, awareness of their life goals, places and tasks in the new conditions, development of a real program of personal actions to achieve employment and ensure their own professional career.

The main forms of work for this program are:

1) preparation and public presentation by each freshman of the essay "My specialty";

2) the formation of creative groups of students with the obligatory participation of freshmen under the guidance of students - graduates;

3) work in creative groups, for example, practical participation in events with enterprises;

4) business practice: compiling resumes and practical attempts meet with the employer and get a job.

At the end of the practice, a conference is held where the results of the practice are summarized. The leaders of the practices organize an orientation and final conference. At the conference, students summarize the practice, share their impressions, talk about their experiences, give advice to each other, draw conclusions on the results of the practice. In the framework of the conference, it is recommended to invite successful graduates of the faculty for a conversation. Successful specialists will talk about the requirements that a profession makes for a person, about the stages of their professional path.

All types of practices stipulated by the Federal State Educational Standard of Higher Education are intended to be a condition for the formation of competitiveness, professional self-determination, professional orientation and the acquisition of work experience in the specialty. In order to create such conditions, we offer personality-oriented approaches to organizing practices: 1 course - introductory practices; 2-3 courses - industrial practice; 4 course - undergraduate practice.

A personality-oriented approach to determining the content of educational and production practices is disclosed in such principles as: the principle of professional and personal development of students, implemented in the process of passing educational and production practices as subjects of a humanistically oriented activity; the principle of an individual and differentiated approach to the professional and personal development of students; the principle of systematicity, continuity and substantial succession of all types of practices that ensure the formation of professional experience of future specialists [5].

We believe that the organization of personality-oriented educational practices at the basic department:

1. Provides continuous practice. Students become part of the team, which facilitates the process of social adaptation. Students have the opportunity to gradually, at an individual pace, enter production activities, consolidate the knowledge acquired in the walls of the university in practice, and develop skills. Students have time to work on gaps in knowledge and skills revealed by practice.

2. Brings the scientific and educational process at the university as close as possible to the process of passing all types of educational practices.

3. Provides practice places for each student and simplifies the control process of the university.

4. If desired, allows students to combine study with work in their specialty.

5. It makes it possible to undergo practical training at various enterprises and change the type of students' activities.

6. Promotes the formation of professional flexibility; development of the ability to properly build relationships with work colleagues, with clients.

7. Develops personal and professional qualities of a future specialist.

8. Creates the conditions for the formation of an individual style of future professional activity.

9. Promotes the formation of a professional orientation and professional self-awareness (adequate self-esteem of oneself as a professional and knowledge of the ways and methods of self-development and self-improvement).

Only regular practice, which takes place at the initial stage of vocational education, in our opinion, can remove or at least reduce the psychological barrier to future independent professional activity, will make it possible not only to reveal, but also deal with the shortcomings and gaps in knowledge, skills of students, will help to focus on working out the development of competitive qualities among students, necessary for future work and will facilitate networking with potential employers and successful behavior in today's job market. In this regard, the organization of personality-oriented educational practices becomes an important condition for the formation of competitiveness of university graduates.

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PROJECT ACTIVITIES AS A MEANS OF IMPROVING THE PROFESSIONAL COMPETENCE OF FUTURE TEACHERS

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Abstract. The article reveals the essence of students' project activities at the present stage of education. The significance of project activities as the main means of developing the professional competence of future teachers is substantiated. The author carried out a comparative analysis of the content of basic concepts, identifies the components of project activities.

Keywords: project method, project training, project activity, components of project activity, future teacher, professional competence.

The modern period of development of society is characterized by changes that affect all spheres of human activity. In these conditions, the need of society for an independent creative personality is growing. In higher education institutions, the concept aimed at building the educational process in which education solves the problem of involving students in an active independent educational and cognitive activity that simulates the process of their further self-education is gaining wider acceptance. Independent work stands out as an indispensable element of the educational process of their further self-education. Independent work stands out as an indispensable element of the educational process, because it allows you to close the gaps in the perception of educational information in the classroom, reveals the abilities of students, promotes learning motivation, stimulates performance, increases the strength of knowledge [1].

As practice shows, training at a university is aimed at the formation of professionally significant personality traits without taking into account the structure of its individual characteristics. Obtaining a certain amount of knowledge, skills in the learning process, students are unable to correlate them with individual personality traits, do not find application for their creative potential, do not realize their position within the chosen profession, do not master the means and methods of developing their potential capabilities, are not ready to carry out activities for the development and implementation of the project. This situation can be overcome if the educational process will include a mechanism for the formation of competence in project activities [2].

In higher education, focused work continues on the formation of the social experience of the individual, as during this period, a person becomes an independent subject of activity, choosing a profession, life position. In the mainstream of the competency-based approach, the student is considered as a subject who has a specific orientation of cognitive and communicative activity in solving specific professionally oriented tasks [1].

Personality is always associated with creativity, spiritual perfection. This means that university preparation should significantly expand the general cultural horizons of students, develop creative thinking that provides the formation of such abilities as the ability to predict one's own development within the framework of a given goal, make decisions at the level of inclusion in various activities, focus on the constant updating of knowledge and skills , realize oneself in the process of training and work, find innovative solutions in difficult situations, determine one's own interests and algorithm of activities [3].

The basic educational technology supporting a competency-based approach in education is the technology of project training.

Project training is not fundamentally new in world pedagogy. The formation and development of the theory and practice of project training is associated with the scientific search for domestic and foreign studies that began to develop actively in the late XIX - early XX centuries. Russian scientists associated teaching methods, including project training, primarily with the problem of personality development, preparing it for life and work. The development of the project method in Russian schools is associated with the names of such domestic educators as E.G. Kaganov, M.V. Krupenika, V.V. Ignatiev, V.N. Shulgin, P. Rudnev, V. Razletov, etc.

Scientific publications are distinguished by a wide variety of definitions describing the project method. The project method is defined as pedagogical technology, which focuses not on the integration of factual knowledge, but on the application of actualized knowledge and the acquisition of new ways of human activity in the socio-cultural environment as a didactic category, providing a system of techniques and methods for mastering certain practical and theoretical knowledge, of a certain activity [4]; as a set of educational and cognitive techniques that allow you to acquire knowledge and skills in the planning process and the independent implementation of certain practical tasks with the obligatory presentation of the results [4]; as a way of organizing students' independent activities, integrating a problematic approach aimed at revealing the learner’s personality, his individual creative abilities [6].

According to E.S. Polat project method is “a pedagogical technology for achieving an educational result, which includes a combination of research, search, problem methods, creative in nature” [5].

The structure of training on the basis of project-based training transforms learning activities, as it no longer focuses on what the teacher is saying, but focuses on what the student is doing. The teacher can suggest new sources of information, or can simply direct the students' thoughts in the right direction for an independent search. But as a result, students must independently or with joint efforts solve the problem, applying the necessary knowledge, sometimes from different fields, to get a real and tangible result.

Thus, the use of project-based learning technology orientates modern students on learning methods, on ways of thinking and acting, on developing cognitive activity and creative potential.

After analyzing the work on the research problem, we identified the components of the project activity:

• the cognitive component contains a system of representations, views, knowledge, reflecting individually-unique, active ways of the student’s cognitive attitude to what is happening,

• the operational-activity component contains a system of skills distinguished on the basis of the design logic that is characteristic for the organization of the process as a whole and for each of its stages. Mastering by students of the abilities to see a problem, prepare a project concept, determine a project goal, formulate hypothetical provisions, develop a strategy for solving a problem under study, select means to achieve goals, evaluate options proposed for solving and choose optimal ones, anticipate the final result.

• value-semantic is determined by a system of motives, needs, ensuring the application of knowledge, based on which the student will be able to carry out project activities. These indicators acquire a personal meaning and become the student’s value guidelines, are the main indicator of the social welfare range, due to which a line of behavior is built, the meaning of the chosen profession is determined.

In the process of implementing the project, a person does not just search for something new, but solves the real problem that has arisen before him. And although the development of a project is a creative process, theoretically a project can be carried out using ready-made action schemes, sequentially performing a series of clearly defined, algorithmized steps at a reproductive level.

Speaking about the project method as an organized, search, research activity, E.S. Polat focuses on the fact that this activity provides not only the achievement of a particular result, framed in the form of a specific practical solution, but the organization of the process of achieving the logo of the result [5].

THE CONCEPT OF "LANGUAGE IMAGE" IN AN ENVIRONMENTAL DISCOURSE FIELD

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Abstract. Analyzing researches in the field of linguoculturology in recent years, it is found that the tasks are difficult to solve, namely in the interpretation of the concepts of language and culture and in terms of their interaction. Of particular interest is the essence of linguistic culture in interaction with language as an integral part of culture. And not the least role is played by the concept of "Language Image" from the perspective of environmental discourse.

Keywords: language, culture, image, environmental discourse, ethnic culture, ethnic language.

Linguistic culture is an integral part of the cultural space in which a person (Homo sapiens) lives and acts as a member of a particular society and individual. It is the result of the establishment of living standards, functioning, language use, defining socially permissible and unauthorized; establishing an invariant of the language relevant for a given culture, a socially adequate degree of mastery of it by a person, as well as a standard of this ability.

Language culture (as well as culture as a whole) is a self-organizing system that can isolate life-resistant forms within itself, maintain a balance between invariant and new, possibly unstable, variable features that break into its structure [2].

However, under the conditions of transformations and rearrangements of culture, cultural "anarchy", it becomes important to establish features, markers, reference points that define the essence of linguistic culture, outline its boundaries and distinguish it from anticulture, designate the areas of its distribution, depth and extent of its relationship with other phenomena.

In this regard, the goal of the ecological discourse of linguistic culture is elucidation the mechanism of self-identification of linguistic culture, registration of its signifiers, boundaries, etc., as well as the formation of anti-entropic processes of development and assimilation of linguistic culture by a person.

In this regard, one of the most important tasks of the ecological discursive field of linguistic culture is, first of all, maintaining the prestige of the image of the national language in the consciousness of society.

The concept of “Language Image” as a phenomenon of national culture is a definite axiological field, significant both for society as a whole and for an individual.

At the social level, the representation of language as a value [1], the prestige of its image is an important practical idea for ethnoculture, which unites society in its pride in the national language and contributes to its power. M. Heidegger [4], considering the language to be the “home of being,” pointed out that many social problems and conflicts (in our case, interfering processes) lie in the scope of the language and that their resolution must be sought in the space of language games.

The importance of linguistic influence on cultural development is emphasized by many researchers developing the concept of "linguistic picture of the world." They show that in this picture the deep structures of everyday life are reflected, which affect the entire social behavior of the individual and distinguish one society from another.

At the individual level, the language as a whole (or any variant, sociolect, dialect, etc.) serves several purposes. One of its most important functions is the identification of the individual in a particular social group or society, the semiotization of his inner world. This function of language was noted by Socrates when he said: "Speak, so that I can see you." In this regard, it is obvious (and experimental studies confirm this) that disappointment in the prestige of one's own language, in the level of mastery of speech skills, etc. acquires a painful character for a person, because it is associated with the destruction of a certain area of the self-concept of the personality, with a decrease in the self-esteem of the individual.

Language also gives a feeling of a person’s belonging to the whole, whether it be a small social group, a large collective or society as a whole, gives a sense of solidarity and emotional comfort from the awareness of this belonging to “compeers” in the group.

Speaking of language, we speak of it, first of all, as a treasury of ethnic language. Although each ethnic language can speak of other ethnic cultures, nevertheless, each language is primarily intended for information support and regulation of the processes of its native culture. The signs of the language are, first of all, the phenomena of this culture. In order to correctly understand speech in a given language, it is necessary to clearly understand the ethnospecificity of its units both in the denotative-significative and connotative aspects of their semantics, as well as to have background

knowledge that is not fixed in the meanings and internal form of language signs, but allows us to understand statements and texts appealing to this knowledge.

Language – is the most natural area of study for culturology, since a native speaker is a person, and, in turn, a person begins a culture, which includes everything that is “not nature”, everything that is created by man.

Due to the fact that the features of linguistic use distinguish this social group from others, they are markers of a person's belonging to this community. This allows, on the one hand, to use the benefits essential for this group, and on the other hand, to a certain extent, limits the possibilities of the individual. The idea of the influence of language on the social life of an individual found the most vivid expression in B. Bernshtein's concept of two language codes: extended and narrowed [5]. B. Bernstein associates the differences in codes with the class division of society and argues that language codes belonging to different classes often pose insurmountable barriers between them, thereby reproducing the structure of social inequality.

The concept of “Language Image”, therefore, is of great importance to humans. Possession of a standard version of a language or a prestigious sociolect raises a person in his own eyes and the eyes of others, and also contributes to success in social life, as some types of employment require a high level of knowledge of the norms of standard pronunciation, spelling, etc.

The concept of “Language Image” is a historical and cultural phenomenon, because in the course of its development (social, economic, cognitive), it can change. The assessment of the language as a whole is changing, one or another of its variants is put forward in the first place or indulged in oblivion. For example, if we consider changes in the image of the English language, we can conclude that the idea of improving the English language for the purpose of social prosperity matured as the circle of ideas about "correct speech" or about "standard English" was determined. The name "standard" began to be assigned to prestigious versions of the language since 1711. Before that, the term "royal" (King's English) was used, although the real use of the language by members of the royal family was not meant (it is still more often criticized in England than it is taken as the example) [3].

In the XVI century, the “correct speech” was understood as the English language of educated, people in power, as well as that part of the population who lived near London and did not engage in production or peasant labor. This trend began to be supported by the creation of English textbooks, which reflected two traditions or two images of the language. The first is associated with a tendency toward unification and simplicity, and the second is associated with eloquence and enrichment with borrowing.

In XVII century, the norm of London pronunciation and use was firmly established as a standard. Variants that are characteristic not only for the ruling circles, but also for the general (national) existence of the language begin to be considered normative use, in connection with which attempts to find a middle between the extremes of eloquence and the dryness of short words, between the speech of the educated and uneducated, aristocracy and people appear in the grammar of the English language.

Until the middle of the XVIII century it was considered necessary to adjust the English language according to the norms of Latin or Greek. Only from the middle of the XVIII century did the idea that it is expedient to develop own model of normativity, synth for the English language, be recognized. This trend, as it develops historically, has been realized in the form of modern standard English (SE or RP). The development of the new standard of the English language precisely in XYIII is probably associated with democratic impulses in the development of society, which gave rise to new ideologies that suggest the promotion of the English language in other countries. Linguistic expansion was supported in the XIX century in connection with the imperial aspirations of the state and the expanded opportunities for contacts with peoples of different countries of the world. The extent of the spread of English in the XX century is well known.

The concept of “Language Image” is a heterogeneous phenomenon, since the language itself is heterogeneous. You can talk not only about the standard or literary language, but also about the images of languages of different strata (professional or criminal jargon, the language of women or men, the language of age groups). The image of the language is characterized by a certain ethno-mental horizon. In this regard, the value of a language for a nation of its native speakers is determined very differently from the image it receives in the eyes of representatives of other nations. The ecology of linguistic culture is intended primarily to maintain a positive image of the national language at the international level and to establish the image of the language for representatives of a given nation as an eternal, undeniable value.

The idea of protecting the image of the national language is realized through the language policy of the state, aimed at actively providing a standard language for those who speak it and stimulating linguistic and creative activities in society. Measures that support this area of cultural ecology include:

- the formation and effective functioning of language norms;
- issuing dictionaries of the literary language and its variants, spiritually valuable works of intellectual and artistic creation;
- the creation of linguistic, literary schools, the popularization of their ideas;
- the study of children's and youth subcultures, the identification of positive and negative aspects and the promotion of positive linguistic and creative moments through the involvement of children in literary and linguistic creativity;
- protection of linguistic norms in media works, where violation of pronunciation norms, lexical contamination, grammatical deviations, orientation to the norms of foreign cultures and languages are completely unacceptable, since they have a huge impact on the language code and in the shortest possible time make changes in the linguistic consciousness of representatives of society.

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TEXT: SCIENTIFIC AND FICTIONAL

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The article analyzes some issues of creating multifunctional texts.

Taking into account the necessary elements when creating the whole will ensure its correct presentation, therefore, the understanding of the content of the material by the recipient.

From the standpoint of functionalism, the author establishes functionally significant and structural elements of the whole, identifies typologically functioning elements of texts, aimed at the perception of the text and an effective approach to the creation of multi-style texts.

The author describes one of the important elements of fictional and scientific texts: semantic components.

The functioning of certain elements in the structure of the text, the ways of their presentation in order to preserve the idea of the author of the text are analyzed.

The material of analysis were texts from authentic fiction and scientific literature.

Based on a semantic interpretation, the author reveals the differences between the aspectual structure of a fictional and scientific text, distinguishes among them the most typologically significant and structural.

Keywords: text, fictional text, scientific text, descriptive-reflective form, reflective-cognitive, descriptive-reflexive, functional-narrative and informative-conceptual compositional-speech forms, aspect, aspectual structure, semantic components

The recognition by science of the fact that the content of a certain object is primary, then it (the object) takes shape, has led to a new approach to the analysis of works. Suppose an author (creator) has an idea; undoubtedly, it gives rise to the meaning of a certain object with a substantial part; then it all takes on a form.

Creating something is usually purposeful. This means that the idea of the author (creator) is inextricably linked with a specific goal - to be perceived by individuals and certainly those to whom it is intended. This begs the question: how will it (something created) be perceived by the addressee? The addressee perceives this created, first of all, in a form, and then, its contents. Form, in its essence, is the appearance, the appearance of the content of a certain created.

The texts are focused on certain communicative conditions. Within this issue, fictional and scientific texts deserve special attention. These types of texts have many typological and contrasting characteristics.

So, for example, the composition of a fictional text is represented by three compositional-speech forms: narration, description, reasoning.

Reflective-cognitive, descriptive-reflective, functional-narrative and informative-conceptual compositional-speech forms compose the composition of a scientific text.

The semantic structure of both types of text is represented by five semantic components: subject, predicate, object, subject of speech, author of speech (Ramazanova, 2013; Ramazanova, 2018).

And this is not a complete list of allomorphism and isomorphism between these types of texts.

Both that and another type of text as representatives of various functional styles are formed in accordance with the main task of communication in a particular area of human activity.

In the framework of this article, we consider in more detail the aspectual characterization of a text.

The number and nature of the functions that performing the components in the text depend on the type of text.

It is known that the functional orientation of the whole text determines the patterns of selection of the characteristics of individual statements. In particular, the choice of certain types of sentences, the forms of their presentation and, ultimately, the forms of narration.

Given that the text is a coherent and complete sequence of characters, it is necessary to create it taking into account the system.

It is, first of all, about structurality.

In a broader, less rigorous sense, the concept of “structure” was used in scientific and philosophical everyday life, as you know, for a long time and acted as one of the ways to define the concept of form (form as structure - organization of content), later on in linguistics.

The consistency of the text is represented, in our opinion, by the aspectual structure of the text.

Aspect (from Lat. Aspectus - view, look) - 1) the point of view from which the subject, phenomenon, concept; 2) *bot*. ... (Modern Dictionary of Foreign Words, 1994, p.69).

In the Linguistic Encyclopedic Dictionary, it is noted that aspectology, along with aspectual classes of verbs, studies various aspectually relevant components of the *context*, represented by non-verbal vocabulary and syntax tools.

In our work, the Latin expression "view" is taken as a basis, which conveys what a scientific text and a fictional text usually look like. In other words, what the exterior of both types of text looks like, what elements are included in their content. In this case, "content" means "the determined side of the whole, the unity of all the constituent elements" (Philosophical Encyclopedic Dictionary, 1989).

Accordingly, it is perfectly legitimate to single out the aspectual structure (in another terminology, the aspectual grid) of the text, we begin with the aspectual content.

In our opinion, the aspectual content of fictional and scientific texts, being a relatively independent part, has a semantic unity.

Any text, as you know, has a hierarchical structure. The hierarchical structure of a scientific text is determined by the form of scientific communication that has developed over the centuries. In other words, the structure of the scientific text itself is the result of scientific communication between scientists.

The hierarchical structure of the fictional text is determined by the form of creation of the objective world of the author's consciousness, which exists regardless of the tendency of a historical (real) event, regardless of truth or untruth.

In linguistics, recommendations are given regarding the successful implementation of the pragmatic side of the work. First of all, it is necessary to determine the title of the text, which would be able to arouse special interest, special tension. The presence of structural development is also an indispensable condition for the intention to take place. It is logical that within the framework of this structure, concreteness and conciseness are determined.

A similar opinion is expressed by foreign researchers. So, for example, the researcher Nadjet Bouayad-Agha believes: "The document structure is a tree representing a simple-grid document. Its constituents are abstract logical elements and its leaves express propositions or proposition functions. The abstract logical elements are those typically found in expository texts such as sections, headings, paragraphs, lists (Nadjet Bouayad-Agha, 2001).

All of this is fundamental in our analysis of the creation of texts.

The fixing of reasoning expressed by inferences regarding certain problems and questions should, in our opinion, be logically formalized. This design, according to our observations, is variable in both verbal and technical terms.

There are three main semantic blocks (Introduction, Main part, Conclusion) and one optional block in the structure of the scientific text: the Appendix (Ramazanova, 2013).

So, the aspect structure of the scientific text in expanded form can look as follows:

1. Introduction: history of the issue, list of issues, relevance of the problem, ways to solve this problem by setting goals and objectives;

2. Main part: problematic issues, options and methods for solving the problem, their features, the specifics of studying the subject, geography and pace of research, locality of application, methods of experiments, etc.;

3. Conclusion: findings, results, precedence, recommendations, a statement of the openness of certain issues;

4. Appendix: schemes, tables, diagrams, trajectory patterns, etc.

The first aspect, as a rule, is reflected in any scientific text. We especially note the scientific and philological text of the English language.

The purpose of scientific documents, which also includes a scientific monograph, is the transfer of primary scientific information obtained in the process of scientific research; in other words, the identification and description of new facts, patterns, discoveries. The recipient of this style is a scientist, specialist. Educational and scientific (in another terminology - scientific and educational) texts include textbooks. The addressee of such scientific documents, as a rule, are future specialists and students. The purpose of scientific and educational documents is to educate, describe the facts necessary for mastering the material.

Based on the above functions and goals of these genres, we conclude that the generalized model of the aspect structure has its own specific manifestation in various genres (in particular, in a scientific monograph and study guide). Our findings are summarized by analysis of factual material.

So, as the analysis of linguistic material shows, in the genre of “scientific monograph” (for example, the scientific monograph of T. van Dyck “Text and Discourse”) (Van Dijk, 1977), these elements are tracked, but in the genre of “study guide” (for example, educational Headway Student's Book Intermediate. Liz and John Soars) do not specifically highlight elements such as “goal” and “tasks.”

Thus, a feature of the second aspect is the variation and variability of the items presented, taking into account the sub-style and genre parameters of the scientific text.

The content of the third aspect almost completely takes place in the scientific and philological text of the English language in the genre of "scientific monograph", and in the genre of "textbook" questions about the openness of certain problems are not reflected.

Revealing the content of the fourth aspect, we emphasize that in both of the above genres of the scientific and philological text of the English language, some elements of this aspect have rightfully determined their place, with something more and something less with a periodic frequency.

Among these elements, we believe that in the English-language scientific and philological text, the tables occupy one of the leading roles. They gradually and qualitatively distinguish scientific material from the general content of information. Any text without appropriate graphic illustrations would be extremely difficult to read; otherwise, it would leave room for inaccurate interpretation.

Tables are design marks and linguistic notes that introduce additional information to the text material, and also reflect a special area of the text. They provide a multidimensional subject, visually compactly presented description of a special section of the English-language scientific and philological text.

A work of fiction is an object of aesthetic value, a material product of artistic creation, of conscious human activity. The structure of a fictional work is a certain structure of a work of verbal art, its internal and external organization, the way of connecting its constituent elements. The presence of a certain structure ensures the integrity of a work, its ability to embody and convey the content expressed in it (Structure of a fictional work, 2013).

So, fictional texts have their own meaningful combination.

The structure of a fictional text, based on our sample, also contains four (three main and one optional) semantic blocks, but they have a different terminological design. In particular, this is the Introduction, Main body, Epilogue, Conclusion. The penultimate is optional.

Thus, the aspectual structure of fictional text in expanded form can look as follows:

1. Introduction: expressing gratitude, information about the dedication of creation to someone (sometimes to something; for example, home land, etc.); information about the content in the form of a listing of chapters, sections (numbered, verbally; or both numbered and verbally;

2. Main part: a description of the events and heroes of the work through denotative and connotative elements, their social status, their fate and sphere of activity, their interests, their relationships and contacts, et.;

3. Epilogue: depicting events after a certain period of time after the denouement: a generalized account of the life of the main (sometimes secondary) characters after the events experienced, circumstances, some historically significant moments, etc.;

4. Conclusion: the final part of the work, providing additional information about the heroes of the work, describing the scenery, landscape, etc., confession to someone.

The first aspect, as a rule, is reflected in any text.

The aim of the artwork is the transfer of aesthetic values, the development of cultural positions. The recipient of this style is the reader.

So, as the analysis of linguistic material shows, in the genre “novel” (for example, Elizabeth May’s novel “The Falconer” (Elizabeth Mau, 2013)) these elements are found.

It should be noted that a feature of the second aspect is the variation and variability of the presented items, taking into account the genre parameters of the text.

The content of the third aspect almost entirely takes place in the fictional text of the English language in the genre of "novel".

Opening the content of the fourth aspect, we emphasize that in the English-language fictional text, some elements of this aspect (something to a greater extent, and something to a lesser extent) have fully defined their place.

So, for example, confession to someone takes a periodic role. It can be present, as a rule, in those cases when the author devotes his creation to a certain person or circle of persons.

The gradual emphasis on the generated idea, presented in the form of a fictional text, distinguishes the fictional material as something filled with spirituality.

So, in the process of his life, a person, learning something new, transfers his knowledge, sensations, feelings to others through description.

A commitment to preserving a certain style with observance of the norms of the literary language, the persistence of written speech with a representation of retrocitation (returning to what has already been stated) and anticitation (anticipating the contents of the form for further presentation) (terms - R.M. Likov), as well as the logic in the presentation, provide a pragmatic implementation parties of the reported.

In the fictional style, speech activity macrosphere is aimed at aesthetically acting functions.

In a scientific style, speech activity macrosphere is aimed at informative-influencing functions.

The aspectual content of fictional and scientific texts, being a relatively independent part, has a semantic unity.

The addressee perceives this created, first of all, in a form, and then, its contents. The form of the texts is expressed by the aspect structure.

The aspectual structure of both types of text is typologically presented.

So, as the factual material shows, as a rule, English-language scientific-philological and fictional texts have a solid aspectual structure; The design of each of them has its own characteristics.

In particular, the structure of a scientific text contains four semantic blocks (Introduction, Main part, Conclusion, Appendix. The first three of them are basic and the last is optional. As for the fictional text, there is a similar quantitative composition in it (Introduction, Main part, Epilogue, Conclusion), but optional is not the last semantic block (in contrast to the text of a scientific orientation), but the penultimate one (Epilogue).

It should be noted that the aspect structure of the English-language scientific and philological text reflects the course and order of research, its logical path.

In turn, the aspectual structure of the English-language fictional text reflects the course and order of presentation of events, logically revealing their interweaving.

In the procedural radius of the creation of the text, he (the author) sets a goal, which is to ensure that the perception of his creation takes place.

The analysis of the functionality of the constant and variative semantic elements of the English fictional and scientific-philological texts in the projection of typologically basic characteristic features allows us to differentiate the mechanism of their creation on the basis of a different mechanism of their structuring.

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STUDENTS' PERCEPTIONS OF CORRUPTION

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Abstract. Corruption in Russia causes enormous damage to the country's socio-economic development. In order to combat it, federal laws, decrees of the President and government decrees have been adopted that put forward specific tasks to eradicate this negative phenomenon. Their successful implementation depends not only on the quality of work of law enforcement agencies, but also on the civic position of members of society. Graduates of higher educational institutions trained to combat corruption and their readiness to fight it are called upon to play a significant role in this.

This article presents the results of an analysis of students' public opinion on corruption issues, the quality of education and the improvement of university anti-corruption training for the activities of graduates in the positions of heads and specialists of state and municipal government bodies.

Keywords: students' attitude to corruption, civic engagement in the fight against corruption, the level of anti-corruption training of students at the university, the degree of readiness of graduates to counteract corruption, improving the effectiveness of preparing students for the implementation of anti-corruption policies in the Russian Federation.

In the Russian Federation, fundamental anti-corruption laws and regulations have been adopted and are being actively implemented, of which the Federal Law “On Combating Corruption" [1, p. 3-18], the decree of the President of the Russian Federation “On the national anti-corruption plan for 2018 - 2020” [2, p. 12], the Government’s decree “On approval of the rules for verifying the accuracy and completeness of information on income, property and property liabilities submitted by citizens applying

for filling the positions of heads of federal state institutions, and persons replacing these posts" [3, p. 12-23] and others are essential. One of the main tasks defined by these documents is "increasing the effectiveness of enlightenment, educational and other activities aimed at the formation of anti-corruption behavior of state and municipal employees, popularization of anti-corruption standards in society and the development of public justice" [2, p.2].

Based on this, the plan of scientific work of the Department of Management of the RSU named after A.N. Kosygin for 2019-2020 provides for the study of public opinion on the problem of "Corruption through the eyes of students."

The relevance of a sociological study of public opinion on anti-corruption issues is due to the need to eradicate this negative phenomenon, to increase the role of university graduates in this process, to identify deficiencies in training and education, and to substantiate proposals for the formation of readiness of future government civil servants to combat corruption in state and municipal government bodies (SMB).

The purpose of the study is: based on an analysis of the public opinion of the students to identify their attitude to corruption, their willingness to fight it in the managerial sphere, to reveal the shortcomings and formulate proposals for improving university education and upbringing in the interests of implementing a state anti-corruption policy.

The objectives of the study are: to determine the degree of awareness and nature of students' attitudes to corruption, the quality of anti-corruption education and upbringing, the level of civic engagement of graduates, the willingness to combat corruption in the positions of state and municipal employees, and the formulation of proposals by trainees to improve the state anti-corruption policy.

The methods for collecting primary information are: oral, written and online surveys, formalized interviews, testing, questionnaires, solving situational problems, working in small groups, brainstorming, studying documents of the educational process on anti-corruption training of future leaders and specialists in the field of state and municipal management.

The study was conducted among students of the Russian State University named after A.N. Kosygin, engaged in the direction of 38.04 / 03.04 State and municipal administration and the Russian Open Academy of Transport of the Russian University of Transport among bachelors in the direction of 20.03.01-01-BB-Life safety in the technogenic sphere. The sample size of the respondents was 200 people.

The theoretical novelty of the article is the provision of real data on the level of awareness and anti-corruption training of students, the degree of readiness of graduates to combat corruption and the formulation of proposals to increase the effectiveness of the fight against corruption in SMB bodies and transport enterprises.

The applied value of the work lies in the possibility of using its materials in the process of training and education of students and strengthening the role of graduates in the fight against corruption in government bodies.

A sufficiently high degree of *scientific elaboration* of the problem of the fight against corruption has been confirmed by the Academic Center for Strategic Studies, the Center for Strategic Research under the Government of the Russian Federation, the Center for Economic and Political Reforms, the Center for Problem Analysis and Public Administration Design, and others.

In particular, according to the results of an independent study of public opinion of 1570 residents of the country in 2017, it was revealed that on average 47% of respondents reported the presence of corruption in authorities, healthcare institutions and the education system [4, p. 3]. Prosecuted for corruption crimes were 85 investigators, 13 prosecutors, 35 lawyers, 2 judges; 214 deputies of local governments, 217 elected officials, 11 members of the legislative branch and 1 deputy of the State Duma of the Russian Federation [5, p. 3].

During the research, proposals were formulated to improve the fight against corruption. Given these achievements, we believe that these recommendations are not always universal. Therefore, the improvement of anti-corruption work in SMB bodies should be based on specific studies directly in this area and, in particular, in the field of university training of leading personnel of management bodies.

The analysis of the results of studying the public opinion of students in the first block of questions made it possible to determine, firstly, the level of awareness and knowledge of students about the essence of corruption and counteraction to it.

20% of graduates were not sufficiently trained and could not correctly name the Law of the Russian Federation “On Combating Corruption”. 18% did not give the correct definition of corruption.

The students' correct answers (94%), defining corruption in the sphere of state and municipal administration, as the use by state and municipal employees of their official position in order to gain benefits for themselves, for their relatives and friends, made a positive impression. At the same time, it is alarming that 6% of future SMB leaders limit the concept of corruption only to bribery and the public sector of the economy.

Moreover, 60% of respondents mistakenly believe that the fight against corruption is the responsibility of only state bodies, state organizations and private sector organizations. The danger of this opinion lies in the justification of officials for maintaining corruption.

At the same time, the majority of graduates (79%) do not understand the content of anti-corruption measures. Many of the respondents exclude the role of individuals and activities to prevent corruption, minimize and eliminate the consequences of corruption offenses.

Adhering to the university tradition of assessing the level of knowledge of graduates about the essence of corruption and counteracting it, the average score was 3.2 on a five-point scale. The main reason for superficial knowledge, according to the students themselves, is the insufficient amount of information obtained in the process of training on the implementation of the state anti-corruption policy (50%). As well as insufficient media coverage of the causes and consequences of corruption.

Secondly, the content of the answers to the questions of the first block made it possible to determine the students 'opinion on the causes of corruption. Despite little life experience, students generally objectively assess the causes of corruption in SMB bodies (see: Diagram 1).

Diagram 1
Causes of corruption in SMB in the opinion of graduates

№	Causes of corruption	The indicator in % of the number of respondents
1	Low level of control	61%
2	Weakness of law and responsibility	48%
3	Corruption traditions and connections	39%
4	Low income of employees	14%
5	Self-interest and dissoluteness	12%
6	Other reasons	8%

The most popular answer options were "insufficient control over the actions of officials, their income and expenses (61%)", "weakness of the law and low level of responsibility for corruption misconduct (48%)", "cor-

ruption traditions and corporate relations (39%)," low wages (14%) "and" self-interest, selfish inclinations of officials (12%). Among other reasons, respondents identified: the lack of fear of punishment, the imperfection of the judiciary, a low legal culture, the instability of the economic situation, mutual responsibility and fear of reporting corruption (8%).

And thirdly, the answers to the questions of the first block allowed us to reveal the students' opinion on the negative consequences of corruption in the area of activity of SMB bodies (see: Diagram 2).

Diagram 2
The main consequences of corruption in SMB

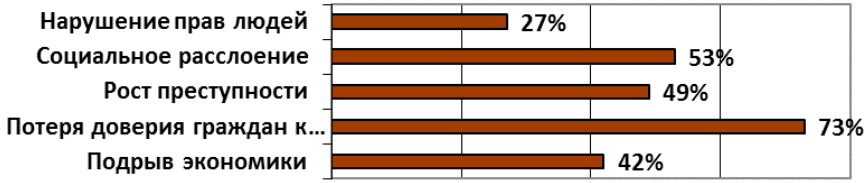
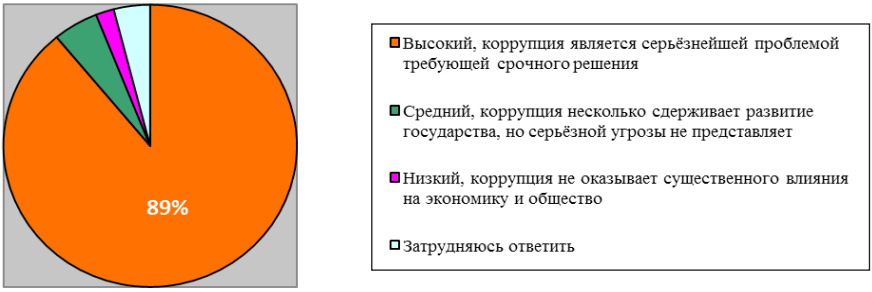


Diagram 3
The level of corruption in Russia, according to students (%)



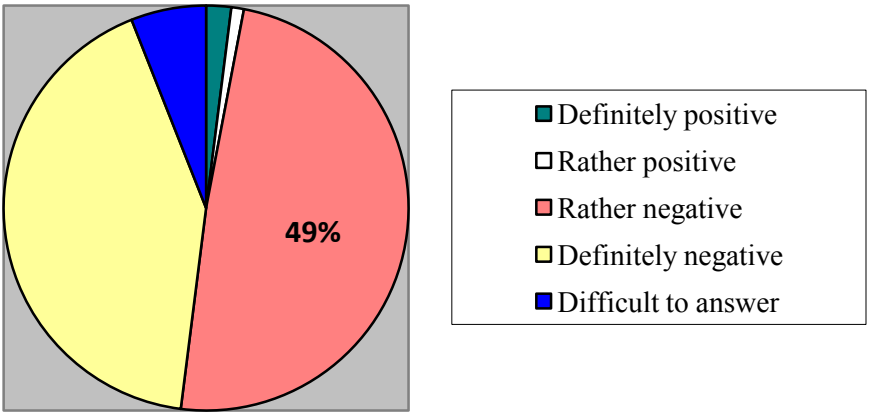
As can be seen from the data presented, 73% of the respondents consider the most negative consequence of corruption to be a loss of confidence in the authorities and, as a result, the emergence of legal nihilism that undermines the basis of public administration. More than half of the respondents (53%) cited the social stratification of society into a narrow circle of rich and a wide range of poor people as a consequence of corruption. 49% consider crime to be the main consequence and 42% consider it to undermine the country's economic development. 27% of respondents consider corruption a violation of human rights. In general, most graduates noted the significantly negative and extremely harmful role of corruption.

The second set of questions was aimed at determining the attitude of students to the problems of corruption and the fight against it. An analysis of the answers revealed that the vast majority of respondents (89%) rate the level of corruption in the country as high, which is a serious socio-economic problem requiring urgent solution (see: Diagram 3).

5% expressed the view that the level of corruption in Russia is average, it only holds back the development of the state and society, but does not pose a serious threat. Another 2% identified the level as low, not having a significant effect on all aspects of life. And about 4% of respondents found it difficult to answer the question

Particularly noteworthy are the results of the analysis of public opinion on assessing the effectiveness of the activities of SMB bodies in the prevention and fight against corruption (see: Diagram 4). As can be seen from the above data, 42% of respondents rate it “definitely negatively”, 49% “rather negatively”. Only 2% “rather positive” and 1% “definitely positive”. 6% of respondents found it difficult to answer the question.

Diagram 4
Assessment of the effectiveness
of the anti-corruption governing bodies (in %)



Judging by the opinion of the respondents, the insufficiently effective work of SMB bodies contributes to the spread of corruption in all spheres of life and activity of the state and society (see: Table 1)

Table 1
The level of corruption in the most important areas of life and activity of citizens (in points)

№	Field of activity	The level of corruption in points									
		1	2	3	4	5	6	7	8	9	10
1	Local government bodies	1	3	10	20	16	15	7	15	4	9
2	Education	3	0	3	4	5	6	16	22	15	26
3	STSI	0	0	0	3	8	12	13	21	20	23
4	Law enforcement	1	3	2	3	16	13	15	27	4	14
5	Healthcare facilities	2	2	5	2	4	9	28	21	13	14

Student grades are presented in points, where 10 is the highest level of corruption spread, and 0 is the practical absence of corruption traditions. To facilitate the perception of these indicators, we presented them visually, in average values in diagram 5.

Diagram 5
Average indicators of corruption in certain areas of life and activity of citizens according to students (in%)

№	Field of activity	Spread of corruption (in%)
1	Local government bodies	58,2
2	Law enforcement	68,0
3	Healthcare facilities	72,3
4	Education	77,2
5	STSI	79,3

As can be seen from the diagram, according to respondents, the highest level of corruption is typical for the STSI - 79.3%. Further downward: areas of education - 77.2; health care - 72.3; law enforcement - 68.0 and local government - 58.2%.

The scope of the scientific article does not allow to fully state the results of a study of public opinion of students on anti-corruption issues. Therefore, we will complete the work with systematic proposals of graduates on the implementation of the National Anti-Corruption Plan. The most popular anti-corruption measures among respondents were: full ratification of the UN Convention against Corruption (62%); identification of conflicts of interest among public servants "(61%); control over the income, property and expenses of officials "(60%); tougher punishment of corrupt officials "(49%); increasing the level of legal culture of the population (43%); increase in public services through the MFC (39%); improving university training and agitation in the media (26%); toughening the responsibility of corrupt officials (25%); other answers (8%).

Among other answers, suggestions on returning the death penalty to the judicial practice, confiscation of money and property of members of the family of criminals, encouraging the reporting of obvious facts of corruption and others deserve attention.

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METHODICAL ASPECTS OF THE QUANTITATIVE MEASUREMENT OF THE COMPANY'S INTELLECTUAL CAPITAL IN THE KNOWLEDGE ECONOMY

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Abstract. Current trends in the development of a knowledge-based economy indicate the importance of measuring intellectual capital. The article highlights the totality of foreign methods for measuring intellectual capital, reveals their essence, and also substantiates the possibility of application in Russian practice. A number of distinguished quantitative methods are specially considered: the J. Tobin coefficient, A. Pulik's method of intellectual added value. The author draws conclusions about the advantages and disadvantages of the methods used.

Keywords: intellectual capital, intellectual property, methods of measuring intellectual capital, added value coefficient.

One of the main directions of development of the knowledge economy is the active use of intellectual capital, which increases the competitiveness of business entities. The development of the modern economic system becomes more effective with the activation of intellectual capital, since it is highly professional personnel potential that determines the high level of its development [1, p. 261]. An adequate assessment of intellectual capital requires appropriate methodological tools, which actualizes the problem of its measurement.

The study of intellectual capital was actively performed by T. Stewart, E. Brooking, P. Sullivan, A. Prusak, D. Tees, C. Swabey, T. Fortune, D. Friedman, L. Edwinsson, J. Ruus, S. Pike, S. Albert, C. Bradley and others. In particular, for L. Edwinsson, intellectual capital was "knowledge that can be converted into value" [2].

The works of Russian scientists should also be highlighted. V.L. Inozemtsev, B.C. Efremov, B.B. Leontiev et al. A common feature in their understanding of intellectual capital was the allocation of knowledge and experience of personnel and intellectual property as parts of intellectual

capital. Despite various points of view and approaches to the definition of the concept of intellectual capital, all researchers on this topic are united by the inclusion of human capital and knowledge, expressed in various forms, in the components of intellectual capital.

The problem of valuation of intellectual capital was considered by M. Amstrong, Yu.G. Chernysheva, A.I. Belousov, A. Pulik, F. Schmidt, H.A. Breslavtseva, R. Eccles, J. Richard, A. Robinson, D.G. Sorter, V.I. Weaver, M.H.R. Perera, L.P. Usenko, V.G. Shirobokov, A.N. Schemelev, F. Evans and others.

In the modern sense, intellectual capital is the intellectual component of a company: professional and other knowledge, experience, abilities, skills, business reputation, image, business relations, intellectual property [3].

Due to the increased interest in intellectual assets that make up the intellectual capital of a company, an analysis of the relationship between the dynamics of changes in an intellectual company and the economic results of its activities becomes popular. Currently, several dozen methods have been developed for assessing the value of intellectual capital as a complex. A large number of competing valuation approaches is a consequence of the fact of considerable complexity and the limited ability to use traditional methods for the evaluation of intangible assets [4].

For the first time, issues related to the study of methodological support for measuring intellectual capital have found their application in Western practice The problem of measuring intellectual capital as the most important component determining the market value of an enterprise was first noticed by L. Edwinsson and M. Malone, who made an attempt to substantiate methods for its quantitative assessment [5]. They positioned intellectual capital as knowledge, practical experience and professional qualifications, which together provide the competitive advantages of an economic entity. However, L. Edwinsson and M. Malone did not offer reliable formalized methods for assessing intellectual capital and the enterprise formed on the basis of its value [6, p. 81].

At the same time, it should be noted that considerable experience has been gained in matters of assessing intellectual capital. At the present stage, there are 34 methods for epy assessment of intellectual capital, which are classified into four main groups [7]:

- Direct Intellectual Capital methods (DIC);
- Market Capitalization Methods (MCM);
- Return on Assets methods (ROA);
- Scorecard Methods (SC) [8].

Of particular interest to us are the existing two models for the quantitative measurement of intellectual capital (Tobin coefficient and Pulik's method). The economic theory of investment behavior of the American Nobel laureate James Tobin is based on the analysis of the coefficient and evaluation of the influence of development factors on the coefficient q = MV/RA, where RA is the cost of asset replacement [9]. The essence of the Tobin coefficient can be characterized as follows, if q> 1, then the company has the necessary amount of intellectual capital and investments are advisable, if q<1, then you need to get rid of this company [10]. Using the Tobin method in assessing intellectual capital implies a limitation that business reputation consists exclusively of intellectual capital and the influence of other factors is not significant. Such a restriction expresses probability and, as a result, does not always give an accurate estimate of intellectual capital [11, p. 343].

One of the most common methods for assessing the value of intellectual capital is the VAIC (Value Added Intellectual Coefficient) model, or Pulik coefficient [12], proposed by Austrian economist Ante Pulik in 2000. For the first time, the influence of the intellectual value added coefficient on the company's market value was tested by A. Pulik for 30 companies from the FTSE list (stock index calculated by the Financial Times) for the period from 1992 to 1998. A significant positive relationship was found between intellectual capital and market value [13].

The VAIC method allows a company to determine the contribution to the value added of tangible and intangible assets. The sequence of calculation of the intellectual value added coefficient is presented in Figure 1 [14].

Pulik's coefficient is calculated using the following formula:

$$VAIC = CEE + ICE. \quad (1)$$

Here *CEE* (Capital Employed Efficiency) - is an indicator showing how efficient the capital used is, this indicator is the ratio of value added (*VA*) to invested capital (*IC*).

Invested capital can be calculated using the following formula:

$$IC = EC + LTL, \quad (2)$$

where *EC* (Equity Capital) - Capital and reserves;

LTL - Long-term liabilities.

ICE - Intellectual capital efficiency - calculated by the formula:

$$ICE = HCE + SCE, \quad (3)$$

where *HCE* (Human Capital Efficiency) - indicator showing the efficiency of use of human capital, - is the ratio of value added (*VA*) to labor costs (*HC*); *VA* determined by the difference between revenue (*R*) and cost (*GOCS*) excluding labor costs;

SCE (Structural Capital Efficiency) - structural capital utilization indicator - is the ratio of the difference between value added (*VA*) and labor costs (*HC*) to value added (*VA*).

The advantages of A. Pulik's method are the simplicity of the assessment and the availability of data. It requires only company accounting data. Public information is checked by audit companies, which is the key to its reliability. Using this method allows you to move from a simple description to understanding the significant factors of the company's intellectual capital, and then to managing it in order to maximize the value of the company. Using performance indicators allows you to more accurately reflect the role of intellectual capital in creating company value. The main disadvantage is the lack of consideration of the time factor, which reduces the price of intellectual capital [15].

To model the influence of intellectual capital on the company's performance, the VAIC method is used as an independent variable reflecting the level of intellectual capital of the company. As the dependent variables, the researchers choose the market value of the company, labor productivity, revenue growth rate, return on assets, etc.

Analysis of the practical application of foreign methods for assessing intellectual capital allows us to conclude that A. Pulik's method most fully reflects the assessment of intellectual capital in the effectiveness of a company. In Russian practice, intellectual capital is identified with intangible assets. Among the various methods used in Russia, methods for assessing the value of intellectual property, potential, intangible assets are well developed. Of interest are the works of Makarov V.L., Kozyrev A.N., Leontiev B.B. [16; 17], allowing to assess the value of intellectual capital by the formula:

$$IC = HC + SC + CC, \quad (4)$$

where *HC*- human capital;

SC - structural capital;

CC - customer capital.

Thus, intellectual capital today is one of the most effective competitive advantages in the knowledge economy. Scientists have accumulated significant scientific potential, based on various calculation principles, taking into account the influence of relevant factors, which allows the assessment of intellectual capital. In assessing intellectual capital, the most time-consuming is the establishment of quantitative characteristics of qualitative parameters. A correct assessment of intellectual capital gives an objective assessment of the total capital of the company, being an important direction in the development of its personnel policy. In this regard, existing methods and approaches to assessing intellectual capital will only be improved in the future in order to obtain the most adequate assessment of the actual intellectual capital of the company.

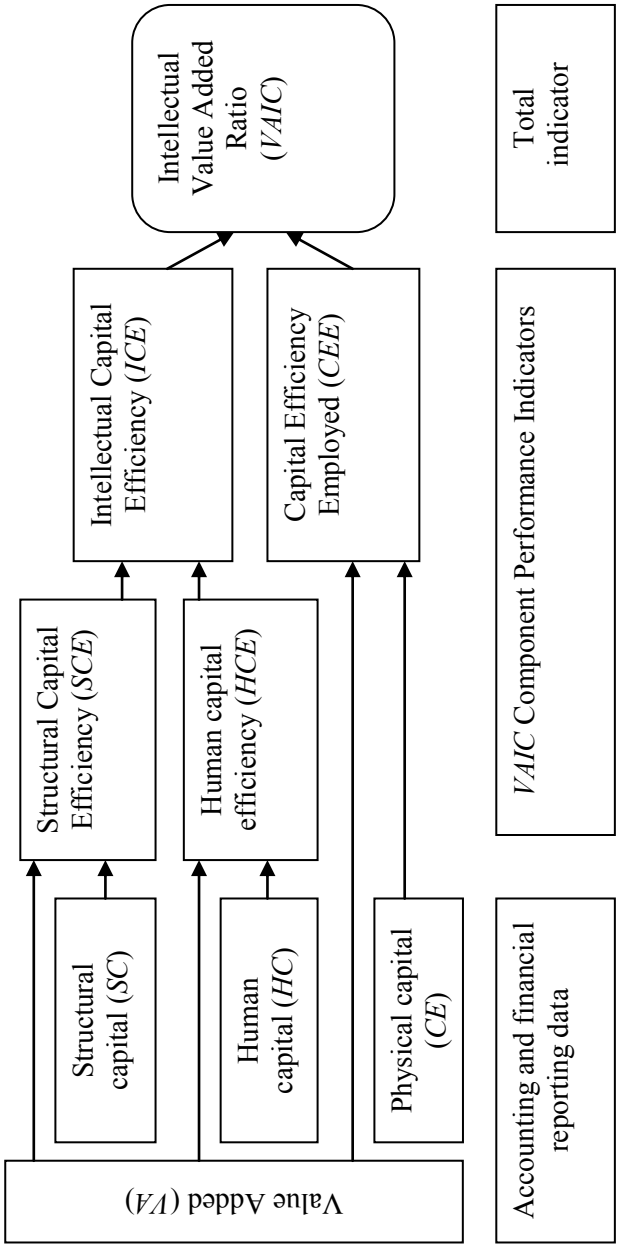

Fig. 1. The sequence of calculation of the intellectual coefficient of value added

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RESEARCH OF CHANGES IN SEMANTIC SPHERE OF STUDENTS IN PROCESS OF VOCATIONAL TRAINING

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Abstract. This paper provides an overview of the study of semantic sphere of senior and junior year students of a university. The relevance of this paper is conditioned by estimability of training process quality through changes of axiological – semantic sphere of students. The purpose of this paper is to study the dynamics of axiological – semantic sphere of students during vocational training. The main hypothesis provides for availability of characteristic changes in the semantic sphere of students during training. The concept of D. A. Leontiev dynamic semantic system was used as a theoretical base of the study. G. A. Kelly repertory grid method was chosen as the main methodology. During the study, cognitive constructs of junior and senior year students of the Nizhny Novgorod State Pedagogical University were obtained (N = 49). It was demonstrated that in the process of learning activity, the axiological – semantic sphere of students changes significantly which is consistent with the learning of trade. The cognitive complexity increases, the personal acceptance of professional values takes place.

Keywords: Axiological – semantic sphere, cognitive constructs, personal meanings, university students.

In the present-day world with its ever increasing pace of life, strict requirements in the area of professional competence are imposed on any person. This, in turn, raises the necessary level of knowledge and skills that a person must master when learning a trade. At the same time, the process of professional activity subject formation includes changes in the area of internal regulation and motivation of such activity. Such a remark is of special importance since many domestic and foreign authors agree that motivation as a set of motivating factors, has a significant impact on mastering and pursuit of almost any professional activity.

According to studies of home authors Asmolov (1984), Golovakh and Khronik (1984), the entire system which has a hierarchical structure is responsible for the functions of activity motivation and regulation. Autonomous and unchangeable lifelong formations are at the top level of this sys-

tem. D.A. Leontiev (2003) refers to them as personal values. The lower level which is directly involved in the activity process regulation is occupied by personal meaning and semantic set. Intermediate / middle level responsible for translation of personal values into specific meanings and semantic sets is occupied by motives, semantic dispositions and semantic constructs. The former manifests itself in substantive-practical activities, and the latter falls mainly within the domain of consciousness, vision of the universe. It is important to note the constant, supra situational nature of semantic constructs which allows to assume that these semantic structures, being formed during the study, will be used by the student in the course of new professional activities.

Semantic constructs are a system of internal scales, often not engaged in self-reflection. The scales can be of different nature. There are Gnostic constructs that compare objects by their own features; metaphorical ones that attribute to objects the features of another class objects, and semantic ones that evaluate objects by their impacts on the subject (D. A. Leontiev, 2003).

Foreign researchers, such as Kelly, G. A., Osgood, C. E. (L.Hjelle, D.Ziegler, 1992), Fransella, F (1987) et al. also talk about representation of reality in human mind by correlating it with a number of scales. The most developed in this respect is the theory of cognitive constructs by Kelly (L.Hjelle, D.Ziegler, 1992).

Semantic constructs are construed specifically within the framework of psycho-semantic approach by A. G. Shmelev (2002) and V. F. Petrenko (1988). As noted by D. A. Leontiev (2003), Gnostic constructs can be combined with evaluative ones, so that the objective feature scale acquires semantic poles. However, Shmelev assumes that such a "fusion" is a resultant of a more general, four-position model of the construct. According to this model, there are both positive and negative feature options for each of the poles of the objective feature scale. For instance, a sign of humor can be characterized by either a positive definition "cheerful" or a negative definition "frivolous". The same is the case for the opposite pole of the objective feature. It can have characteristics both "serious" and "sullen". However, negative definitions "frivolous" and "sullen" can be perceived as an extreme expression of the feature, while "cheerful" and "serious" imply moderate expressiveness. Moreover, the four-position model provides for the possibility for some environmental properties to influence on the choice of feature scale poles. In the addressed example, in an environment with a high level of risk the individual is more likely to use poles "serious" and "frivolous", and in an environment with a low level of risk – poles "sullen" and "cheerful".

In view of this, the study of the students' semantic construct transformation during the learning process is of special interest considering that, on the one hand, it will show the personality transformation while deepening new knowledge and skills. On the other hand, it will be possible to trace the change in the world view associated with the transition from learning to professional activities.

The purpose of this study is to identify significant changes in the structure of students' semantic constructs during the learning process.

The research objective is to study the specifics of university students' semantic sphere dynamics. The research hypothesis: characteristics of students' semantic construct system will change in the learning process.

Some comments should be made about the sample group. Firstly, such goals involve the pursuance of the research on the same test subject group in order to exclude individual factors. However, in the case of semantic construct study, a years long period of time should pass between the researches. This means that the test subjects will be exposed to dynamic external world factors. The exposure to these factors can significantly exceed the impact of individual differences. From this perspective, the study was pursued simultaneously on two groups of senior and junior year students.

Secondly, it was taken into account that the start of training in a university causes significant changes in the student's life (Gaponova S. A., 2004). Thus, the very fact of training start can cause significant changes in the semantic sphere (Balashov V. S., Gaponova S. A., 2014). In order to minimize this effect, second year students were invited to the sample group and not first year students.

Thus, the sample consisted of 49 students of the Minin University aged from 18 to 23 years. Of these, 16 students of the second study year and 33 students of the fifth study year; 15% of the total sample group were boys and 85% of the total sample group were girls.

The modified repertory grid methodology was used to reveal peculiarities of the semantic sphere structure. The Kelly evaluation grid version (L.Hjelle, D.Ziegler, 1992) described by Fransella and Bannister (1987) was used as a basis.

Statistical processing of the results was carried out using factor analysis through differentiation of main components. In order to identify differences in the percentage of constructs with Gnostic poles between two sample groups, the Fisher angular transformation criterion (φ) was used.

Instead of a fixed set of elements, it was suggested that the test subjects should freely choose significant people in a professional setting as the elements. This approach was dictated by the lack of actual professional expe-

rience. The validity of this approach was justified by A. L. Muzyka (2010). For regulation of the element selection process the casuality measurement procedure was used (Golovakh E. I., Khronik A. A., 1984, Klimchuk V. A., 2005). Identification of constructs was carried out by the method of triads, after which it was suggested that the test subjects should evaluate all elements of the newly identified constructs. In case of obvious dominance of the emergent pole element the latter was rated "3", with the dominance of the implicit pole the latter was rated "–3". "2", "1", "–1" and "-2" were given in the case of unobvious expressiveness of emergent or implicit poles, respectively. If none of the poles obviously dominated the rate was "0".

The study pursued among second year students produced the following results. Since the study method involved independent and free filling out of the lattice element list, the number of elements can be considered to be the first indicator. The average number of collected elements in one test subject equaled to 9. Other analysis of the element list was not anticipated. In total, the study revealed 156 constructs. The frequency distribution of repetitive constructs was near-normal. Since the number of revealed constructs in test subjects is different, it is impossible to speak of the intensity or cognitive complexity of construct systems (Francella F., Bannister D., 1987). The factor analysis through extraction of main components selection showed that in 50% of cases, two factors were distinguished; in 25%, three factors were distinguished; and in the remaining 25% 4 factors were distinguished.

As for evaluation of the construct system hierarchical structure, it is expedient, along with the used method of the evaluation grid, to apply the assessment of super ordinariness of a construct according to its load in all factors distinguished through the main component method.

The leading constructs distinguished according this attribute, can be conventionally divided into two categories. The first category is the "activity". It includes such constructs as "Active - Passive", "Laborious-lazy", etc. It included 44% of the test subjects. The second category is "interpersonal relations". It includes the following constructs: "Shut-in – people person", "Harsh - kind", etc. Such a leading construct was found in 55% of test subjects.

Taking into account the four-position model suggested by A. G. Shmelev (2002), the leading constructs can be divided according to the poles used therein. Constructs with two Gnostic pluses amount to 38%. In the other group, both poles of the construct are evaluative. Such constructs amount to 50%. Finally, in the third group, one of the construct poles is Gnostic, and the other one is evaluative. These constructs amounted to 12%.

The study pursued among fifth year students produced the following results. The average length of the element list was 10 elements. This is not a significant difference from the previous group of students. In total, 503 constructs were identified. As in the previous sample group, the frequency distribution corresponds to the normal one. However, if the average number of constructs identified by one test subject is taken into account, the second year students have 9.75 constructs, and the fifth year students have 15.25 constructs. Such difference is significant: ($p < 0.01$). The same difference is evident in the average number of factors identified through the main components. For the first group, the average value amounted to 2.75, and for the second group the average value amounted to 3.5. This difference is significant as well: ($p < 0.01$).

Considering leading constructs by the above categories "Activity" and "Interpersonal relations" , the first category includes 57% of all results, and the second one includes 43% of all results. As can be seen, these data differ from the results of the first group, which was dominated by the category of "Interpersonal relations". However, this difference is not significant.

When considering the leading constructs from the perspective of the four-position model, the distribution is as follows: constructs with Gnostic poles amount to 12% of the total number; constructs with evaluative poles amount to 45% of the total number. Finally, constructs with one Gnostic and one evaluative pole amounted to 42%. Thus, the difference in the percentage of constructs with Gnostic poles between two sample groups (38% among the second year students and 12% among the fifth year students) is significant according to criterion φ ($p < 0.05$). The difference in the percentage of constructs with one Gnostic and one evaluative poles (12% and 42%) is significant as well ($p < 0.05$).

The analysis of the acquired data shows that despite the small number of the experimental group, it was possible to obtain statistically reliable results indicating that during the training, the students really note significant changes in the structure of semantic constructs. Both an increase in the number of defined constructs and an increase in the number of factors defined through the main components were found. So, it is safe to say that the system of constructs becomes more complicated.

At the same time, no significant changes in the categorical composition of constructs were found. Perhaps this means that the personally significant attributes of the profession chosen at the admission to the university have not changed.

Finally, a decrease in the number of constructs with Gnostic poles and an increase in the number of constructs containing evaluative poles can be construed as personal acceptance of future profession attributes.

Thus, the hypothesis stated at the beginning of the study is confirmed. During the training process, characteristics of the students' semantic construct system change. Firstly, the cognitive complexity of the system in-

creases. This allows a person to better take in new situations. Secondly, there is a transformation and transfer of the evaluation scales from the area of objective assessments to the area of subjective assessments.

This allows to use the repertory grid methodology for assessment of training process effectiveness for university students. Moreover, further researches in the area of the dynamic semantic system structure, a meaningful analysis of its components, a comparison of these data with the actual effectiveness can open up ample opportunities for diagnosis and correction in the area of vocational education.

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IMPACT OF PSYCHOSOCIAL FACTORS ON THE CORRECTION OF ATTENTION DEFICIT HYPERACTIVITY SYNDROME

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Abstract. The article investigates the influence of intra-family psychosocial factors on the effectiveness of attention correction in children with ADHD of primary school age using biofeedback technology. It is shown that with the support of the family in children, the effectiveness of biofeedback training increases. This factor is especially significant for children from families with negative psychosocial status.

Keywords: psychosocial factors, support of relatives, attention index, younger students, biofeedback.

A family is the main environment of a child's life and a determining factor in the formation of his personality and, accordingly, his future. The social conditions of the development of the child in the family, the options for the relationship of children with parents and relatives can both aggravate the maladaptation of children with attention deficit hyperactivity disorder (hereinafter - ADHD) and prevent it. ADHD is a polymorphic clinical syndrome, the main manifestation of which is a violation of the child's ability to control and regulate their behavior, which translates into motor hyperactivity, impaired attention and impulsivity [1; 4].

As a result, children with ADHD have difficulties adapting to systematic schooling: low academic performance and asocial behavior with increased injuries [2; 3]. According to official statistics, in Russia, from 2 to 20% of children and adolescents or about 1-2 million children have specific behavioral and attention disorders in the form of ADHD, but the education system and parents are extremely low on the characteristics of ADHD in children [1; 4]. In the absence of an effective correction of the difficulties experienced by a child with ADHD, they can persist until adulthood, when this syndrome can manifest itself in depression, increased anxiety and addiction [2; 4].

Parents of children with ADHD are often incompetent regarding the symptoms of their child's syndrome, do not understand what is happening with their child, but his behavior is very annoying. Most often, parents explain everything with "improper upbringing" and take an accusatory position in relation to themselves and each other. The presence of ADHD requires a specific educational approach from the family, and is not a manifestation of a child's lack of education or "his moral inferiority". Depending on the family's understanding of the syndrome the child has, his immediate environment forms both positive and negative factors affecting the effectiveness of correctional work with children. Understanding the importance of family relationships, R.A. Barkley, for example, proposes to consider training for parents on tactics of behavior with children as a method of treatment of ADHD, empirically confirmed. According to him, the effectiveness of such trainings in families with children with ADHD up to 11 years old is 65-75%, in families with adolescent (youthful) age 25-30% give encouraging changes [3].

The aim of the presented work is: a study of the effectiveness of biofeedback training for the correction of ADHD in primary school children; study of the effectiveness of correctional work with children, depending on intra-family psychosocial factors.

Materials and methods

The study involved 22 students with ADHD from 1-2 grades of the Novosibirsk school. During the first and second years of training, all children underwent a correction course of beta-stimulating biofeedback training [5]. Before and after the correctional course of biofeedback, an electroencephalographic (hereinafter referred to as EEG) study was carried out necessary to evaluate the diagnostic sign of ADHD: EEG theta/beta coefficient (attention index), which changed during treatment [7].

The psychodiagnostic study included a survey of parents of students with ADHD (a questionnaire was proposed - testing “Social factors of family life”) at the beginning of the first grade in order to identify negative social and psychological factors in the family.

The developed ADHD correction program contained advisory work with parents of children with ADHD, beta-stimulating biofeedback training for children 1-2 years of study, in addition, psychologists and teachers teaching children with ADHD also received full information on this disease: about the causes, course and methods of treating the syndrome. Parents of children with ADHD received consultations on the following topics: a complete overview of ADHD (causes, course and treatment methods), the attitude to ADHD as an adverse effect on the child and the life of the family as a whole, behaviors with their children (the “parents- friends of the child ”, not“ outside observers ”). Behavioral strategies were recommended that promote cooperation with your own child: maintain a sense of humor in a conflict situation, learn to set life priorities, see the future in your child, be able to forgive children, yourself, others, etc.

During the sessions of beta-stimulating training, the child observed on the monitor a graph of the curve reflecting the dynamics of the controlled signals (power of theta and beta rhythms) in a calm state and when performing cognitive load (verbal counting, listening to texts) in real time in the game or multimedia form (see figure 1). For biofeedback classes, the “BOS-LAB” hardware-software complex was used (LLC Komsib, Novosibirsk).

The task was set for the students: during the sessions, to reduce the ratio of the power of the theta rhythm to the power of the beta rhythm, i.e. attention index, and level of muscle tension. The structure of biofeedback training is presented in more detail in our previous works [5; 6]. The biofeedback training program included a discussion of the results of the sessions together with each student and his parents (relatives), as well as free attendance by parents of biofeedback sessions.

Analysis of variance (ANOVA) was used to analyze the data, numerical data are presented in the form $M \pm m$, where M – the average, and m – the error of the mean.

Fig. 1. The game form of beta-stimulating training. The car is assembled if the student holds the control signal (attention index) under the threshold value

Results and discussion

1. According to a survey of parents in a group of 22 children in 10 families (45%), signs of an unfavorable psychosocial microclimate were revealed. Namely: the traumatic immediate environment of the child in the family (upbringing in an incomplete family, absence of both parents, remarriage, illness or death of a parent); the presence of intra-family conflicts; insufficient material security of families and difficult living conditions.

2. The EEG theta/beta coefficient after the biofeedback course was significantly decreased in all students from 1.91±0.04 μV2 to 1.56±0.04 μV2 ($p<0.01$). Children from families with unfavorable psychosocial status showed a decrease in the attention index in the training course by 0.277±0.046 (in the range from 0.171 to 0.440 μV2). Children from a group of families with a favorable psychosocial environment reduced the EEG theta/beta coefficient by a large amount (0.379±0.028, changes ranging from 0.300 to 0.540 μV2). These changes in the groups differ significantly ($F(1.20)=5.30$; $p=0.031$). Note that the values of the attention index after

the training course practically coincide: 1.570±0.062 and 1.569±0.062, respectively, and their difference before the start of the training is not statistically significant: 1.869±0.062 and 1.956±0.062 (F (1.20)=0.977, p=0.336).

3. Relatives (mothers, fathers, grandparents) in 16 (73%) children took an active part in the correction process. No significant differences were found in the decrease in the attention index in these groups. So, in the group of children who underwent training without the support of their relatives, the parameter value is 0.291±0.033. In the second group of children, whose relatives participated in the correction, the average value is 0.365±0.021 (F (1.20)=0.547, p=0.114). Nevertheless, it should be noted that the effectiveness of the training with the participation of relatives was higher.

4. A comparative analysis of the influence of negative psychosocial factors and support from relatives on the effectiveness of ADHD correction was performed (see Fig. 2).

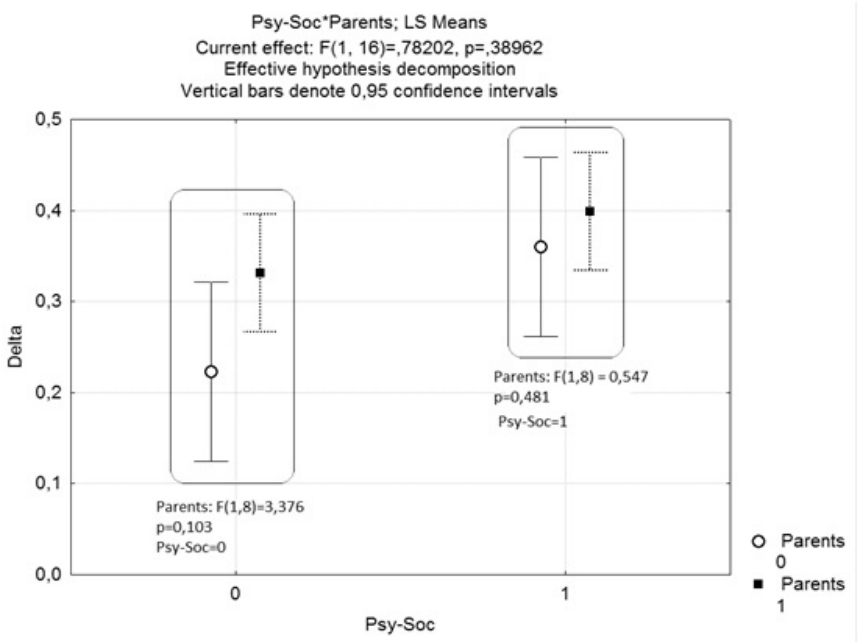

Fig. 2. Gains (Delta, the difference in the attention index before and after the biofeedback course) in groups differing in the psychosocial factor (PsySoc, 0 – unfavorable conditions, 1 – favorable microclimate in the family) and the support factor for relatives (Parents, 0 – no support, 1 support)

Although there were no differences between the groups by the combination of factors of the psychosocial climate in the family and the support of relatives (see Fig. 1), in the group of families with an unfavorable psychosocial status the support factor for relatives improved the training results, although the level of statistical significance was not achieved. But perhaps this is due to the small sample size (in this group there were only 10=7+3 people).

It can be assumed that for children from families with a favorable psychosocial microclimate, the presence of a relative and his participation in the discussion of the results of classes did not matter much. If in the family there were conflicts or other negative psychosocial factors, then relatives attending classes and joint discussion of the training results increased its effectiveness. In some cases, this positive psychological factor smoothed out the difficult social situation of the child (absence of a parent, etc.), and the results of the training were higher than expected.

Conflicts and quarrels in the family and the resulting experiences and emotional stress do not contribute to the successful correction of ADHD. A complicating factor is also a feeling of failure, the insecurity associated with it, which the child is not able to overcome for a long time. Mental stress increases if the child is constantly criticized or punished (both at school and at home). Comparing your child with a others, more successful (from the point of view of parents or teachers) is also not good. It is better to notice the merits and successes of your own child and often reward him with praise.

Support from a person significant to the child increases the effectiveness of ADHD correction. This is especially important for children from families with psychosocial problems, as lack of acceptance and care in the family exacerbate the child's personality characteristics associated with the presence of the syndrome. It is more difficult for children to control their behavior, motor hyperactivity and impulsivity, and attention. By inviting relatives to cooperate, we help them see in their "naughty child" a diligent and successful person, build other relationships with him, based not on mutual accusations, but on mutual understanding. In prosperous families, where children receive the love and care they need, where a comfortable level of child safety is formed, the active involvement of relatives in the correction process by the biofeedback method is of little importance.

Conclusion

The main signs of ADHD were described more than 200 years ago, however, practical studies of the syndrome began only in the second half of the 20th century and continue to develop actively, which is largely due to the high social significance of the disease. The variety of manifestations of

attention deficit hyperactivity disorder constantly requires improvement of biofeedback technology, as well as an increase in its effectiveness level to adapt corrective work to various types and severity of the syndrome. The work examined psychosocial factors and their contribution to the effectiveness of neurobiological training. It was shown that the generally accepted EHD biomarker ADHD - theta/beta coefficient, after the biofeedback course was significantly reduced in all students, however, in the group of families with an unfavorable psychosocial status, the support factor for relatives improved the training results. Thus, to increase the effectiveness of care for children with ADHD, complex measures are necessary - psychophysiological methods, supplemented by pedagogical, psychological procedures; corrective work not only with the child, but also with his environment - all this allows you to achieve maximum results.

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ISOLATION OF ORIGINAL ONCOVIRUSES USING HUMAN BLOOD CULTURES AT ACUTE LEUCOSIS AND CHRONIC MYELOLEUCOSIS

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Summary. The article presents the results of the author's long term research on use of human leukocytes cultures for studying human leucosis etiology. As a result of this research work, original strains of the viruses were isolated whose role in the etiopathogenesis of the diseases deserves a further insight and is currently under study. The diseases are characterized by long persistence of the viruses and long viraemia.

Keywords: Oncovirus, acute leucosis, peptide mapping, electron microscopy (EM), buoyant density

Introduction

Previously, human leucocyte cultures derived from the blood of healthy donors stimulated with PHA were successfully used for isolation of human hepatitis C virus from the blood of patients. In the present study, the same cultures were used for isolation and cultivation of oncoviruses at acute leukosis and chronic myeloleukosis.

Materials and methods

The method of cultured leukocytes was as follows. Venous blood was collected into sterile tubes containing 1 or 2 drops of concentrated heparin. Blood samples were centrifuged at 1000 rpm 10 min or left for 18 hrs at 4^0 C. The plasma was removed, and the leukocyte film was collected off the surface of erythrocytes. Leukocytes were then suspended in cultural medium 199 containing 25-30 % of the autologous plasma to a final concentration of 2-3 or 6-7 million cells per 1 ml. An equal amount of leukocytes from healthy donors was added followed by PHA to a final concentration of 0.1-0.2 mg per 10 ml of cell suspension. The cells were incubated in an atmosphere with 2.5-5.0 CO_2 at 37^0 C. For a long-term culturing of leukocytes from patients with leucosis, leukocytes from healthy donors and PHA were not added.

For EM studies, cells were taken off the glass mechanically or with versene solution and washed off by centrifuging in medium 199 (1500 rpm). After that cells were fixed either with 1.6% glutaraldehyde for 1 hr followed by 1% osmium at 4^0 C for 45 min, or with 3% glutaraldehyde in 0.1 M cacodylate buffer (pH 7.2). (Osmium fixator was prepared in acetate-veronal buffer, pH 7.2). Slices were prepared using LKB-8800 A microtome and contrasted with 1% uranyl acetate in 70 % methanol for 15 min at room temperature followed by 1.5 % lead citrate for 10 min at room temperature. For negative contrasting, concentrated virus was placed on a net with a formvar underlayer dusted with coal and exposed to electric field. Contrasting was achieved by 3% phosphone-tungsten acid (pH 7.2). A 5EM-7A microscope was used. The density of the oncovirus was defined in a linear density gradient sucrose solutions.

The virus activity was measured in the reverse transciptase (RT) assay by Spiegelman et al.. The proteins of the leucosis-like virus were fingerprinted. In serological studies, a rabbit serum against the virus isolated from leukocytes of a chronic myeloleukosis donor was used.

An indirect immunofluorescensce on blood or bone marrow smears was used. A total of 101 samples of bone marrow from patients were studied. Patients were diagnosed based on the clinical clinical survey data and the results of morphologic research of blood and bone marrow samples.

Results

The oncovirus was isolated through cocultivation of short-living PHA-stimulated leukocytes from patients with acute leucosis and from healthy donors. The virus was passaged in PHA-stimulated cultured leukocytes from healthy donors. For passageing of the isolated virus, healthy leukocytes were inoculated before adding PHA. For the inoculate, destroyed infected leukocytes suspension free from cell debris, was used. For passageing of the oncovirus isolated from long-living cultures from patients with chronic myeloleucosis, primary human embryo fibroblasts and human embryo kidney cells were used. The clarified cultural suspension from the previous passage was used inoculate for the next passage.

The comparative study of the two types of leukocyte cultures from leucosis patients (short-living PHA-stimulated and long-living) showed an extreme difficulty of isolation and culturing of the human leucosis agent. In our opinion, use of primary leukocytes is a helpful approach to solve this problem. Leukocytes upon stimulation by PHA transform into blastocytes, which produce morphologically formed biologically active virus passaged on in cultured PHA-stimulated leukocytes.

Another approach is obtaining passageable lymphoblastiod cultures from white elements of the peripheral blood from leucosis patients. From patients with acute leucosis, we isolated three strains of the virus named 'leukocytic human leucosis virus'. In EM studies of ultrathin slices, C and A types particles typical for oncoviruses in size and structure were observed over 15 passages. Particles of the same types were also detected in the cultural fluid and infected leukocytes homogenates. In control PHA-stimulated leukocyte cultures, no viral or virus-like particles were detected. The isolated leukocyte leucosis virus strains proved apathogenic for laboratory animals and chicken embryos and did not show cytopathic activity after inoculation of various primary and pasaged cultures. They did not cause chromosome alterations in infected leukocytes, but in a number of cases they stimulated the mitotic activity of the leukocytes, which was the direct indication of the presence of the virus. Leukocytic leucosis virus is instable to high temperature and is completely inactivated with ether. Its buoyant density is 1.16 g/cm^3. The reverse transcriptase activity of the virus was shown by using exo- and endogenous templates, the latter being the virion RNA with a sedimentation constant of 70 S. Similar viral particles were detected also in the cultural fluid.

The obtained results were used in our further studies on etiopathogenesis of human leucosis. We attempted to derive passageable cell lines from the blood of leucosis patients whose cells would contain morphologically formed oncovirus. Out of 74 assays conducted, only 5 cases proved successful. Those cells were from a patient with chronic myeloleucosis. The observation showed that only few cells or groups of cells preserved vitality and attached to the glass (or plastic) as transparent cells with protrusions. Besides, some cells in the cultures had rounded shape. In the process of culturing they might enlarge transforming into giant cells with perinuclear graining. In some cases, giant and polynuclear cells formed clusters, from which cells with protrusions stemmed and that event was a good prognostic feature. The cultures began growing as cells with protrusions forming first foci (islets), then colonies followed by a mololayer. The histological studies showed that cultures were made up of large cells with big oval nuclei containing a few visible nucleoli with a thin cytoplasm, sometimes vacuolized. The cultures metabolized actively, acidifying the medium rapidly. Cells of some patients were passaged for as long as 7 months. Ultrathin slices of the cultured cells in EM studies revealed viral particles of type C with characteristic morphology. Particles were spheric or ellipsoid in shape, 87 to 130 nm in diameter, with a 65 to 70 nm nucleoid. Type C particles were observed in EPR channels and intracellular space.

We did not observe big clusters of particles. The characteristic budding of virions occurred on the plasma membrane or inside vacuoles formed by enlarges sites of the EPR. The cells looked viable and possessed all the typical organoids. The cytoplasm was partially vacuolized.

Thus using long-lived leukocyte cultures we showed that cultured cells contained oncovirus-like particles even without PHA stimulation.

We paid a special attention t6o the leukocyte leucosis virus as its isolation and passageing were based on use of human leukocytes and serum only, so contamination with any bovine oncoviruses from bovine serum was excluded, As it was shown, the oncovirus from leucosis patients was propagated in the leukocytes from healthy donors.

Human embryo fibroblasts and human embryo kidney cells were used in further passageing of the oncovirus. The virus' capability to replicate in primary human embryo cell subcultures was studied by radioisotopes and EM. In 6 studied cultural fluid samples an RNAase-resistant fraction labeled with ^{3}H-uridine was detected in the density range of 1.15 – 1.18 g/cm^3, which corresponds to the density of the known oncoviruses. Such particles did not replicate in the presence of actinomycin D and were absent from non-inoculated control leukocyte cultures.

In the cytoplasm of inoculated cells studied by EM, osmophilic clusters of fibrillar and membrane structures contained viral particles of type A with a diameter of 87 nm (nucleoids 45 nm). Virions of type C were also detected budding from the cell membrane. Some type C particles were found outside cells. Inside cells, condensed mitochondrial matrix and enlarged lammelic complex were observed. RNA extracted from particles of 1.16 g/cm^3 was analysed by centrifuging in sucrose gradient. It is a 70 S molecule characteristic for oncoviruses. A reverse transcriptase assay detected 70 S RNA molecules marked with small fragments of newly synthesized DNA. In non-inoculated cultures, such structures were never found.

Long-living cells from 5 chronic myeloleucosis patients also supported replication of the oncovirus. Cells that began growing into a culture were the most likely producers of the virus. It is remarkable that the progeny of those cells preserved virus-producing capacity. Type C virions formed on the outer cytoplasm membrane, occurred outside the cells and had centered optically dense nucleoids. Type A particles were found inside the cells in fibrillar osmiophilic clusters. Viral particles synthesized after inoculation of embryonic cells also had a buoyant density of 1.16 g/cm^3. The active reproduction of this virus in human embryonic cells did not cause either transformation or cytoplasmic changes in the clusters.

In the next series of experiments, we studied the structure of the oncovirus and compared it with other mammalian oncoviruses. The major inner virion protein (product of the gag gene) accounts for roughly 25 % of the total virion proteins of oncoviruses, so it can be easily obtained by PAAGE. The peptide mapping of it is very informative for typing of novel isolates as has been shown in a number of cases.

After PAAGE the proteins p15, p24 and gp70 characteristic for mammalian oncoviruses can be clearly seen. The major inner p24 protein was studied in collaboration with J. Elder, J. Gautsch and R. Lerner from the Oncovirus Lab, Scripps Institute, San Diego, CA. The p24-containing band was cut out of the slab, iodated with NaI^{125} and treated with either trypsin or chemotrypsin. The obtained polypeptides were separated by two dimensional elecrophoresis on cellulose sheets. The migration pattern of the obtained peptides differed from those obtained previously for p24 of the all known oncoviruses.

The further concentration and purification of the virus allowed to use it in experiments. The specificity of the isolated virus was studied using immunomorphological and serological approaches. Ouhterloni gel precipitation was applied initially. Hyperimmune sera against (i) mouse leucosis virus, (ii) feline leukemia virus and (iii) type D virus from HE-p2 cells did not give any precipitation. Out of 12 sera from rabbits immunized with purified virus, only two contained specific antibodies. This fact indicated to a low antigenicity of the virus. In further studies by IF these sera were used in a 1:4 dilution. The immune rabbit sera preliminary were adsorbed with human (healthy donors) and bovine sera in order to get rid of non-specific rabbit antibodies against serum components.

Human embryo fibroblasts infected with leukocytic leucosis virus, showed a cytoplasmic fluorescence for 24 hrs p.i. onwards. First, the fluorescence granular, later it grew confluent. The dynamics and morphology of the fluorescence corresponded to the data obtained for the other vertebrate oncoviruses.

After these experiments, the immune rabbit sera were used to survey of smears of bone marrow and blood autopsies from leucosis patients. 73 individuals were surveyed. A specific fluorescence of the bone marrow cells cytoplasm analogous to that of the inoculated fibroblast cultures was detected in 19 out of 31 patients with various forms of leucosis and in 9 of 42 control group individuals. The difference was statistically highly reliable ($p < 0.01$).

The cytoplasmic fluorescence was observed in 15 out of 25 cases of acute leucosis and in 4 out of 6 cases of chronical myeloleucosis. The control group consisted of 42 patients with so called ‘border conditions’: plasmocytosis, reticulosclerodermia, myelomic diosease, Werlhof disease and others. Only 1 person was healthy donor of the bone marrow sample.

The blood samples studied from 70 of the total of the 73. Fluorescence of the leucocyte cytoplasm in the smears was detected in 10 out of 12 patients with acute and chronic forms of leucosis and in 5 out of 58 control group individuals: 2 blood donors and 3 patients with rheumatoid arthritis. The difference between the two groups was statistically reliable ($p < 0.01$).

The next step of our study was examination of the virus in complement fixation test (CFT) for detection of antibodies against this virus in human blood sera.

In total, 128 blood sera from healthy donors and 74 sera from patients with acute and chronic myeloleucosis were surveyed by CFT with leukocytic leucosis viral antigen. Antibodies against the studied virus widely occur in sera of leucosis patients. The specific fluorescence of the cell cytoplasm and the nature of the fluorescence agree with the data on the other oncoviruses. This similarity was observed in both bone marrow and blood smears from patients with acute leucosis and chronic myeloleucosis as well as from some patients with reticulosclerodermia, myelomic disease, rheumatoid arthritis and even some clinically healthy persons. The observed similarity appears fairly explicable given the wide spread of oncoviruses in humans and animals.

Discussion

The conducted research has shown a successful application of cultured leukocytes from human blood for isolation of oncoviruses from patients with acute leucosis and myeloleucosis alike. Our data suggest that the two approaches are suitable for studying the viral nature of human leucosis, (i) primary PHA-stimulated leukocyte cultures for isolation of new viral strains and (ii) passaged lymphoblastoid cultures from white blood of patients for studies of virus persistence in the cells in the long run. These two approached supplement rather that exclude each other.

The leukocytic cultures technique proved efficient in isolation of oncoviruses. Passageing of the isolated viruses in leukocytic cultures as well as in primary fibroblasts and embryo kidney cells allows to grow the virus in amounts sufficient for further studies.

In our study, both immunologic techniques, immunoflourescence and complement fixation, detected the examined viral antigen or antibodies against it reliably more frequently in samples from leucosis cases compared with samples from control groups. This fact is a strong indication to the etiologic role of the studied virus in human leucosis.

THE ROLE OF FIBULIN-5 PROTEIN IN THE PROGRESSION OF PATHOLOGICAL VASCULAR REMODELING IN PATIENTS WITH ISOLATED SYSTOLIC HYPERTENSION

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Abstract. The search for new diagnostic molecular markers and the development of pharmacological correction of the mechanisms of vascular wall aging in patients with isolated systolic arterial hypertension (ISAH) is an urgent and timely task. Molecular regulation of vascular smooth muscle cell remodeling (SMC), changes in which, along with perivascular fibrosis and endothelial dysfunction, lead to increased sensitivity to proctractile mediators and calcification, forms the basis of vascular aging mechanisms and rigidity. Clinically, this process manifests itself in ISAH in individuals of an early period of old age and senile age. An important component of vascular risk in the development of atherosclerosis associated with the progression of ISAH is inflammation of the vascular wall, one of the participants of which is fibulin-5 protein. Dysregulation of fibulin-5 expression during inflammation in the vascular wall is determined by the activity of the axis transcription factor SOX9/histone deacetylases (HDACs) and can be a promising target for the development of new drugs to prevent aging of the vascular wall.

Keywords: fibulin-5, arterial hypertension, vascular remodeling.

Currently, the focus of clinical medicine is shifting toward personalized medicine, which is based on methods for the prevention of a pathological condition, its diagnosis and treatment, based on knowledge of genetic, epigenetic, transcriptome, proteomic, metabolic and metagenomic markers, as well as a combination of variable phenotypic characters [1].

Vascular SMC remains the focus of attention in cardiovascular biology due to their role in the regulation of vascular wall contraction and vascular remodeling. Interactions of SMC vessels with other cells are key in the regulation of endothelial function and remodeling of extracellular matrix (ECM) in the vascular wall [2]. The question of the role of SMC vessels in the development of pathological processes such as atherosclerosis, arterial hypertension (AH), including ISAH, remains debatable. AH is most prevalent among cardiovascular pathologies: 2/3 of the Earth's population over 65 have AH [3]. Results of the implementation of the Federal Targeted Program for the Prevention and Treatment of AH in Russia in 2002–2012 demonstrated the presence of registered AH in 8.1 million people with an increase in the effectiveness of the treatment of the disease to 30.4% (in the USA it is 56%) [4]. Today AH is often associated with accelerated aging. In the structure of AH in people over 65 years of age, the most common is ISAH with a GARDEN> 140 mmHg and DBP <90 mm Hg, which is a risk factor for coronary heart disease, stroke, heart failure, terminal renal failure, and death [5]. The question remains open: what mechanisms form these levels of SBP and DBP in people of an early period of old age and senile age? The search for new diagnostic molecular markers and the development of pharmacological correction of the mechanisms of aging of the vascular wall in patients with ISAH is an urgent and timely task. Molecular regulation of vascular remodeling of SMC, changes in which, along with perivascular fibrosis and endothelial dysfunction lead to increased sensitivity to proctractic mediators and calcification, forms the basis of vascular aging and stiffness mechanisms. Thus, the problem of studying the prognostic role of proteomic markers in the progression of pathological vascular remodeling in patients with ISAH and associated risk factors in the development of the concept of personalized medicine is highly relevant now.

One of the components of maintaining the elasticity of the vascular wall is the process of elastogenesis [8]. Studies have shown that for elastogenesis, fibulin-5 protein, or an embryonic vascular protein with six calcium-binding epidermal growth factor (EGF) repeats, is needed to eliminate the disorganization of elastic fibers in vascular SMC. Fibulin-5 is a 66 kDa glycoprotein with a matrix protein family secreted by various types of cells, including vascular SMC, fibroblasts, and endothelial cells [9]. Fibulin-5 was

identified in 1999 by groups of scientists searching for genes responsible for modulating the SMC vascular phenotype and developing the cardiovascular system [10,11]. Fibulin-5 includes the Arg-Gly-Asp motif on the N-terminal domain and interacts with cell surface integrins (αvβ5, αvβ3 and α9β1). The tandem arrays of calcium-binding EGF-like domains and the C-terminal fibulin domain interact with the components of the elastic fiber: elastin, emilin and type 1 lysyl oxidase-like enzyme (LOXL1). In the process of elastic assembly of elastic fibers, tropoelastins are deposited on microfibrils, arranged in an orderly fashion and crosslinked by LOXL enzymes to form mature elastin, which gives the fibers elastic properties. Tropoelastins perform a phase transition - coacervation, from soluble monomers to insoluble aggregates, which ensures the concentration and alignment of tropoelastin before crosslinking. For incorporation of tropoelastin, microfibrils are required, which consist of fibrillin-1 and -2, acting as scaffolds and directing the morphogenesis of elastic fibers. Violations of the synthesis and functional activity of fibrillin-1 and -2 leads to breakdowns of elastogenesis. The final crosslinking step is initiated by the oxidative amination of tropoelastins with the participation of LOXL enzymes. Fibulin-5 induces the assembly and maturation of elastic fibers by organizing tropoelastin and crosslinking enzymes on microfibrils. The location of fibulin-5 on fibrils promotes coacervation and alignment of tropoelastins on the rills, and also facilitates the crosslinking of tropoelastin by binding to types 1, 2, and 4 LOXL, which are secreted by fibroblasts and SMC vessels. It was shown that the concentration of fibulin-5 is crucial for the organization of elastic fibers in the absence of serum in cell culture. High concentrations of fibulin-5 in the blood serum of aging mice, as well as with atherosclerotic vascular lesions, including ISAH, were revealed. Thus, a decrease in the full-length fibulin-5 protein caused by age-related proteolytic cleavage contributes to the loss of the elastogenic potential of SMC during aging of the vascular wall and contributes to the development of atherosclerosis and ISAH.

Vascular inflammation is considered an important component of vascular risk in the development of atherosclerosis and the progression of ISAH. This is due to the stimulation of proliferation, migration, dedifferentiation and reduction of SMC vessels by cytokines. While apoptosis of SMC vessels is observed in the later stages of vascular inflammation, in the earlier stages the SMC vessels themselves control oxidative stress and inflammation. Epigenetic modifications play a crucial role in the development of cardiovascular diseases. In vascular cells, epigenetic mechanisms mediated by HDACs regulate the expression of genes involved in controlling the differentiation and contractility of vascular SMC cells, cell proliferation,

inflammation and ECM accumulation. Dysregulation of fibulin-5 expression in the vessel wall during inflammation is shown, which depends on the activity of the axis transcription factor SOX9/HDACs. In human vascular SMC, selective inhibition of class I HDAC eliminates inflammation-induced inhibition of fibulin-5 expression. In vascular HCM, inflammatory stimuli reduced the total levels of histone H3 acetylation in non-vascular cells; the HDACs MS-275 inhibitor counteracted this effect: the drug effectively modulated the arrangement of acetylated histones on the proximal fibulin-5 promoter. Since the decrease in promoter acetylation is associated with transcriptional repression, these data indicate the role of epigenetics in suppressing fibulin-5 expression under the influence of inflammatory stimuli. The participation of transcription mechanisms in modulating the expression of fibulin-5 by inflammatory stimuli and HDAC inhibitors is associated with regulation at the level of the proximal promoter of fibulin 5 (329 bp long), which contains critical elements for its expression. In studies, fibulin-5 was identified as the target of transcription factor SOX9 in human vascular SMC. Since fibulin-5 protects the vessel wall structure from damage, and SOX9 is necessary for the normal positioning of ECM proteins [34], the parallel regulation of SOX9 and fibulin-5 in the vascular wall is consistent with the role of both proteins in impaired ECM remodeling in vessels. Inhibition of fibulin-5 and SOX9 expression was associated with accelerated apoptosis in SMC and mesenchymal cells.

It was found that SOX9 expression was inhibited by inflammatory mediators in vascular SMC. A temporary pattern of SOX9 expression in SMC vessels against the background of the introduction of tumor necrosis factor α (TNFα) (preceding the downregulation of fibulin 5 expression) and the ability of overexposure SOX9 to overcome the inhibitory effect of inflammatory stimuli on fibulin 5 expression confirm the role of transcription factor in regulation gene expression of fibulin-5. HDAC inhibitors induced the expression of SOX9 and deregulated both SOX9 and fibulin-5 caused by inflammatory stimuli. In addition, in cells injected with TNFα, the HDACs inhibitor MS-275 prevented a decrease in SOX9 binding to the fibulin-5 gene promoter. These results confirm that HDAC inhibitors modulate the expression of the fibulin-5 gene by enhancing the attraction of SOX9 to its promoter.

Studies have shown the role of tandem expression of serum response factor (SRF)/myocardin proteins in the development of accelerated vascular wall aging. SRF can regulate the expression of the fibulin 5 gene, providing the ability of the vascular wall to contract. Chronic inflammation of low activity is a complicating factor for diseases associated with age, which is confirmed by an increase in the activity of IL-1,6 in atherosclerosis.

Aging is the result of metabolic and proteostatic dysfunction. The mammalian target of rapamycin (mTOR) target signaling pathway is capable of regulating SASP, autophagy, and growth arrest of aging cells. Telomere shortening correlates with an increase in mortality in people over 60 years of age. Activation of mitogen-activated protein kinase (MAPK) p38 occurs in response to oxidative stress, DNA damage, and telomere contraction. Overexpression of fibulin-5 increases basal and TGF-β-stimulated activation of p38 MAPK. SASP production (pro-inflammatory cytokines, chemokines, growth factors, and proteases) is recorded in aging cells. Nuclear factor κB (NF-κB) is a key regulator of SASP transcription.

Various combinations of key SASP factors, such as pro-inflammatory and TGF-β secretomas, are independently regulated. The pro-inflammatory secretion of SASP is regulated by the transmission of signals from IL-1. IL-1α partially reproduces inflammatory SASP in vitro, IL-1β can reduce the intensity of SASP expression. The juxtacrine Notch signaling pathway promotes the secretion of TGF-β-rich secretoma. Hypoxia in ISAH enhances the expression of fibulin-5 by TGF-β-enriched secretome and blocks the interaction of integrin-fibronectin in the vascular wall during aging.

One of the main functions of SASP is the involvement of immune system factors to destroy aging cells. SASP components are involved in remodeling of fibrous tissue: matrix metalloproteinases (MMPs) contribute to the degradation of fibrous plaques in ECM. IL-8, cell growth-regulated oncogene α, (growth-regulated oncogene α GROα), IL-6 and immunoglobulin 7 binding protein (immuno-globulin binding protein, IGBP-7) are among the components of SASP that accelerate aging. IL-8 stimulates the synthesis of MMP7 and the degradation of fibulin-5, which enhances aging in the vessel wall.

The activity of IL-1α, 6, TNFα, NF-κB and other inflammatory factors increases in tissues with age, and inhibition of the NF-κB factor provides resistance to progeria. Fibulin-5 inhibits the activity of NF – κB and limits the activity of the aging process.

Aging cells are identified with atherosclerosis in the SMC vessels at the site of plaque formation. Macrophages were the first aging cells with a high level of SASP production and their key contribution to the development of atherosclerosis. SMC stem cells are characterized by a decrease in the ability to differentiate and repair muscle tissue, which is the main reason for their aging. With age, SMC stem cells age and activate p16INK4a. This fact can contribute to compensatory TGF β-mediated increase in fibulin-5 expression level.

The identification of molecular signs of aging helped to comprehend the aging process and demonstrated the prospect of delaying the development of diseases associated with aging, including ISAH, using biotarget and cytoprotective therapy. The potent elastogenic activity of fibulin-5 may ensure its future therapeutic use as a senolytic (a drug whose pharmacological effect is the ability to selectively initiate the death of aged cells) in case of atherosclerosis of vessels and ISAH.

The promising use of fibulin-5 in ISAH by means of TGF-beta-enriched secretome blocks the interaction of integrin-fibronectin in the vascular wall during aging, reducing the loss of vascular elasticity. The subsequent use of syndecan-4 as a biotarget agent stimulates the transmission of signals from TGF-2 and inhibits the calcification of SMC vessels. It is known that the factor inhibiting the migration of macrophages triggers the dedifferentiation of SMC vessels by activating the axes of Januskinases and p38 MAPKs. Fibulin-5 as a biotarget drug can enhance this process in response to oxidative stress and DNA damage.

It is known that a decrease in the level of MMP-2 in the vessel wall protects against the development of vascular remodeling caused by angiotensin II (An II) without affecting the increase in pressure. Endothelial cells regulate the development of vascular remodeling through the activation of pro-MMP2. Fibulin-5 promotes an increase in TGF-β-mediated activity of MMP-2, thus stopping the vascular remodeling process and the contractile effects of angiotensin II.

An effective therapeutic window in the case of using fibulin-5 as a senolytic can be limited in patients with ISAH with impaired immune function, in which cells that die by the apoptosis mechanism are not removed and secondary necrosis occurs with the release of pro-inflammatory factors associated with the risk of pathological molecular patterns, which further exacerbate systemic chronic inflammation.

Conclusion

Thus, the key role of cell aging in the process of remodeling of the human vascular wall is revealed, which is associated with the formation of ISAH in people of early period of old age and senile age. The role of the multifunctional signal molecule of fibulin-5 in the age-related loss of elasticity of the vascular wall in cardiovascular pathology and in the realization of the pharmacological effects of cytoprotectors is shown. The creation of a drug based on the fibulin-5 molecule can contribute to the expansion of the group of senolytics, or “tissue-specific” SASP-modulating drugs, to prevent aging of the vascular wall.

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METHODS FOR ASSESSING OBESITY IN ROUTINE CLINICAL PRACTICE

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Annotation. Obesity has already been named a global noncommunicable epidemic in WHO documents. Traditionally, obesity and related diseases have been considered a problem in Western countries. Over the past two decades, however, urbanization has created the basis for the obesity epidemic in many Asian countries [1]. For two centuries now, we have been using the obesity assessment method (body mass index proposed in the 1830s by Belgian scientist Adolf Kettle) introduced by WHO as a "gold standard" that does not properly reflect the true distribution of fat tissue in the body and can give false data about a person's belonging to the risk group for the development of obesity. Our article discusses the main methods of assessing obesity, its pros and cons.

Keywords: obesity, Kettle index, waist circumference, hip circumference, Brock-Brugsch index.

Most countries around the world have shown a tendency to increase the prevalence of overweight / obesity in the population over the past decade. It is believed that this problem is characteristic not only for developed countries as a "disease of civilization" but also for middle- and low-income countries. The progressive increase in the number of overweight/obese people puts this problem at the forefront of health systems as socially significant. To date, no country is immune from obesity, as evidenced by world

statistics. This is generally considered to be a traditional American problem: in 2013-2014, a total of 50.8% of American men and 51.6% of American women were obese [2]. However, selective epidemiological studies around the world suggest otherwise: Ghana, for example, the prevalence of overweight has almost doubled and obesity has tripled between 1993 and 2014. Egypt has the highest rates of overweight and obesity - 44% and 39% per adult population, respectively. In addition, obesity has doubled in Kenya, Benin, Niger, Rwanda, Ivory Coast and Uganda, and has tripled in Burkina Faso, Mali, Malawi and Tanzania [3]. The most recent data on the prevalence of obesity among the population showed that in 2014-2015, 63.4% of adults in Australia and 27.6% of children were overweight or obese [4].

Numerous population-based studies of the prevalence of obesity among the population in the Russian Federation confirm global trends. The share of Russian residents with a diagnosis of obesity from 2013 to 2018 increased 1.47 times (from 206.1 per 100 so-called in 2013 to 304.1 per 100 so-called in 2018) [5]. Obesity as a non-infectious pathology is characterized by the iceberg phenomenon: the disease is registered only among the part of the population that seeks medical help for obesity and diseases associated with overweight, or in cases where obesity / overweight was diagnosed during screening studies (periodic medical examinations). The true prevalence of obesity among the inhabitants of our country significantly exceeds official statistics [6].

The aim of the work was to assess the objectivity of various methods for diagnosing obesity among young people (18 - 25 years old).

Materials and methods. The study involved 225 people aged 18 to 25 years, men and women, who measured the main anthropometric indicators: height, weight, waist circumference (WC) and hips (HC), the ratio of waist circumference to hip circumference (WC/HC; the norm in men is not more than 1.0; in women - no more than 0.85) and the Kettle index (body mass index (BMI) - weight (in kg) / height (in square meters) ^{2}). According to WHO recommendations, a BMI of 18-24.9 kg / m² was considered normal; 25-29.9 kg / m² indicated overweight; more than 30 kg / m² - about obesity. The ideal weight was calculated according to the formula of Paul Brock (1891): height in cm –100, the ideal weight plus 15% of the ideal weight was considered the upper limit of normal body weight. Statistical data processing was performed using the Microsoft Excel 2007 program, Student's criteria, chi-square, were used to determine the significance of differences, the differences were considered statistically significant at $p < 0.05$.

To develop the most effective anti-obesity policy even at the stage of primary care, it is necessary to introduce objective criteria for assessing overweight / obesity. To date, there is only one “gold standard” for assessing overweight / obesity - the Ketle index recommended by the World Health Organization. Using BMI, you can quickly assess abnormalities and assess the severity of obesity; this method is easy to use and does not require a medical education.

In the course of our study, it was found that among the respondents 12.44% had a lack of body weight (BMI <18.5 kg / m2), overweight - 19.55% of the respondents; normal body weight was determined among 68.01% of young people, which was significantly more often (p <0.0001).

Table 1.
BMI indicators in the studied groups of men and women

	BMI <18,5 kg/m², M±m	18,5<BMI<24,9 kg/m², M±m	BMI>25 kg/m², M±m	Significance of differences, p
women	17,61±3,73	21±3,69	29,74±3,63	<0,0001
males	17,34±3,41	22,1±3,68	29,88±3,82	

Unfortunately, the existing “gold standard” has a number of disadvantages. Firstly, the composition of the body can vary greatly and can be obtained as false-overestimated BMI in people with developed muscles, hypersthenics, due to edema; and false-underestimated results in elderly people with reduced muscle mass, in people of asthenic physique. Thus, BMI does not reflect the true indicators of excess / deficiency of adipose tissue, taking into account gender and age. Secondly, the Ketle index does not answer the question: due to what does a person have overestimated BMI - due to fat, muscles or accumulated fluid? It turns out the phenomenon of “equal weight - different weight” due to an inaccurate estimate of the ratio of adipose and adipose tissue in the body. And thirdly, BMI does not give any idea about the regional distribution of fat in the body, which is an important risk factor in the early diagnosis and prevention of hypertension and coronary heart disease [7].

There is currently strong evidence that central obesity carries more health risks than general obesity, as measured by body mass index (BMI). It is noted that central obesity can also be in people, than BMI is within normal limits. Therefore, it was suggested that the waist circumference (WC), which indicates central obesity, be included as an additional criterion for assessing overweight in conjunction with BMI to classify health risks [8,9].

Central (abdominal, visceral) obesity - obesity, in which the bulk of adipose tissue is located in the abdomen. The main indicators in clinical practice for assessing the presence / absence of visceral obesity are the waist circumference (WC) and the ratio of the waist circumference to the circumference of the hips (WC / HC).

Paradoxically, among the respondents whose BMI was significantly higher than the norm (44 people), in only 3 people (women) the WC / HC index exceeded the norm and amounted to 0.88 ± 0.06, $p < 0.0001$. Among the respondents with normal BMI values, the WC / HC index was also exceeded: in 3 girls - 0.85 ± 0.07 and in 1 man (WC / HC index - 1), $p < 0.0001$. Thus, it can be confirmed that BMI does not fully reflect the body structure and the ratio of adipose and muscle tissue in the body, and the excess of normal values is explained only by the developed muscles of young people.

It is worth noting that this assessment method is not standardized and different anatomical landmarks can be used for measurement, which can significantly affect the absolute values of WC; also depends on the features of the constitution, the act of breathing, the time and amount of food taken. The use of the WC / HC index is also not standardized, but it can be used as a marker for the predominance of visceral fat over subcutaneous [9].

The simplest “everyday” method for assessing ideal body weight is the Brock-Brugsch index, which allows you to determine the ideal weight, taking into account height less than 155 and more than 170 centimeters: with growth less than 165 cm = height -100; with growth from 165 cm to 175 cm = height - 105; with growth over 175 cm = height - 110.

As a check of the reliability of this method, 149 people were selected (66.22% of all respondents), whose BMI and waist and hips were within normal limits. Among them, the Brock-Brugsch index was calculated, which showed that 46.97% (70 respondents) are overweight, $p = 0.177$. Therefore, it can be argued with certainty that this anthropometric method for assessing overweight / obesity is not informative and as “idealized” as possible.

In conclusion, in our study, the BMI was found to be unreliable as the only "gold standard" for the diagnosis of obesity, because even in respondents whose BMI exceeded 25 kg / m2, the WC / HC index used for differentiation confirmed only in 6.81% of cases overweight. BMI does not take into account where excess weight comes from - from excess fat or muscle tissue. Thus, by underestimating the risk for people of normal weight but high in fat, BMI can overestimate the risk for muscular, healthy people. The combined use of BMI and WC / HC will significantly improve the diagnosis of not only peripheral, but also visceral obesity. Unfortunately, both methods do not take into account the structure of the body, which can lead to false-overestimated and false-underestimated indicators.

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RELATIONSHIP OF THE CROWN GROWTH ACTIVITY AND THE RADIAL INCREMENT OF THE SCOTS PINE SKELETAL ORGANS

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Annotation. The relationship between shoot system linear growth and radial increment trunk and skeletal root of the Scots pine (*Pinus sylvestris* L.) in the forest steppe Predbaikalia was investigated in 1976-2005. It was showed that for the shoot growth was followed by pine needles growth, after that the trunk and skeletal root to radially incremented. The shoots were the first finished the growth then going pine needles, the trunk and the skeletal root. There was some diversity in their growth duration, because of difference in growth beginning and ending dates. The trunk growth period was the longest, while the skeletal root growth period was the shortest. During the vegetation, the most significant relative growth rate (RGR) were observed in the growing shoot, with the maximum RGR being approximately 3 times greater than in the pine needles or the trunk. The values of the pair and multiple correlation coefficients in context as a strong joint effect of the variability of growing pine shoots system on the its skeletal organs were interpreted.

Keywords: Scots pine – vegetative organs growth – phenological phases – organs increment

The tree plants annual increment in height and on radius spatially partitives and removes crown shoots, trunk and roots, but transport ways of trees unify them into a single whole. At the level shoot systems and skeletal parts of tree plants develop the allometry interlinks which are expressed in the certain conformity of the organs sizes and form necessary for performance of functions [6], underlying display of vital activity, both separate trees, and their communities. A woody plant, like any biosystem, is an open and nonequilibrium system, and, despite the increasing transport paths length with the over time, the relationship between processes of the vegetative organs growth is preserved in it. If the photosynthetic shoot systems of woody plants through transport streams are

connected with skeletal parts and there is a relationship between them, then annually are forming the linear sizes of shoots and pine needles, on the one hand, and the radial growths of the trunk and skeletal roots, on the other hand, which must be allometry interlinks with each to other. The aim of the work was to study periodicity and dynamics of the growth processes of shoots, needles, trunk and skeletal roots and to reveal the nature of the relationship between activity of the growing crown and skeletal organs of the Scots pine in sharply continental conditions of forest-steppe Predbaikalia.

The experimental material was obtained in the Predbaikalia test section located 80 km northeast of Irkutsk. The territory falls within Olkhon-Priangarsky pine-forest-steppe district with considerable forest content (up to 50%). The climate is sharply continental with average annual air temperature is minus 3 degrees Celsius, with insignificant amount of precipitation (average 271 mm), with low relative air humidity in April-June (on individual days to 6-10%), with humiditate coefficient 0,6–0,8, which indicates deficient moisturizing of the observation territory [1].

The radial growth was studied by the microscopic analysis method by cutting out the wood samples out from the peripheral part at the 1.3 m height from the southern part of the trunk, and those of the skeletal root with the diameter of 40–50 mm at the 0.5-1.0 m distance from the trunk base on the side facing the ground surface [12].

The pine crown growth activity have evaluated by the rate lengthening of the axial shoots and young pine needles of these shoots, using the Kishchenko results of investigation [4]. The linear increment of the pine shoots and its needles was measured by metallic ruler. Measurement of shoots length was conducted every day, and that of needle length – every ten days during the whole period of their growth in 1976-86, 2003-2005 using model pine trees growing next to three-story wooden towers built in spring of 1976. In 1987-2002 observations of shoots and pine needles seasonal increment were performed at the end of the vegetation period.

The shoot growth phenophases was determined according Yelagin's method [8]. In 1976–1986 the phenophase beginning and termination were determined with a precision of up to 2-10 days. In 1987–2002 the beginning and termination of the growth period of these organs were determined according to the previously defined dependence of pine organs growth processes on environmental factors [10].

Taxonometric parameters of the dead-cover's Scots pine stand forest showed in table 1.

Tab 1. Taxonometric parameters of Scots pine stand received in 1976 and 2003

Year	Type of pine stand	Structure	Average indices			Bonitation	Number of trees on hectare	Stock of wood, m^3 on hectare
			Age (years)	DBH (cm)	Height (m)			
1976	dead-cover	9P1L	22	18	12,1	I	2809	280
2003	dead-cover	10PL	50	24	21,8	I	1725	430

P – *Pinus sylvestris L.*; L – *Larix sibirica Ledebour*

Increments of plant organs were measured in 15-18 model trees and the results were averaged. The obtained results were processed statistically with the help of Statistica v5.5 software. The reliability of differences in statistical indices was considered at the significance level no higher 0.05.

There was observed a considerable divergence in the data of pine organs visible growth beginning and termination (tab. 2). Shoots were the first to begin growth, and then pine needles started to grow approximately in two ten-day. The termination of shoots growth at length, as a rule, registered at the end of June − the beginning of July, and needles − in the first, less often in the

Tab. 2. The data of the growth period under study Scots pine organs beginning and termination

Pine organs	The number of vegetations and the dates of growth periods				Average duration of the organs growing period, ten-day period
	The beginning, ten-day of the month	The number of vegetations	Termination, ten-day of the month	The number of vegetations	
Axial shoot	III.04	2	III.06	14	5.5±0.5
	I.05	11			
	II.05	12	I.07	16	
	III.05	5			
Needles (on axial shoot)	III.05	11	III.07	9	7.0±3.2
	I.06	16	I.08	15	
	II.06	3	II.08	6	
Trunk	III.05	11	I.08	13	7.8±0.5
	I.06	16	II.08	17	
	II.06	3			
Skeletal root	III.06	2	I.08	2	5.0±0.3
	I.07	2	II.08	2	

The roman numbers designate decades of month and near to them worth Arabic numbers – months of year; ± - error of the arithmetic mean of the biological frequency; pine organs: “Trunk” – at the breast height; “Skeletal root” – 0.5-1.0 m from the base of trunk.

second decade of August. Trunk radial growth at the 1.3 m height was registered at the pine needles growth phenophase beginning. Skeletal roots radial growth (0.5-1.0 m from the trunk base) were fixed approximately twenty days later as compared to the trunk at height of 1.3 m. Termination of tracheides formation of the under study the trunk and skeleton roots parts coincided in time.

The beginning of visible growth of the pine organs (tab. 2) depended mainly on the environmental temperature conditions [8, 9], while termination depended on endogenous factors [5]. In some years the drought resulted in the ten days earlier vegetative organs growth termination. Nevertheless, the seasonal growth periodicity of studied pine organs constantly was repeated.

Figure presents typical dynamics of relative growth rate (RGR) of pine organs under study for ten-day period. During the vegetation period the highest values of RGR were observed in the growing shoot (fig. a), and maximum RGR was approximately in 3 times bigger, than at needles or the trunk. As a rule, the course of shoot and needles growth was characterized by one peak but during the trunk and the skeletal root growth there could be number of them. Changes of annual RGR (fig. b), on the contrary, showed that trunk had the highest fluctuation and RGR values of the under study pine organs during all investigation period could be both positive, and negative.

Correlation of annual relative growth rate of the pine needles and the pine skeletal organs appeared strong: $r = 0.82$ ($p = 0, 0000$) for pair «pine needles − trunk» and $r = 0.76$ ($p = 0.0000$) for pair «pine needles − skeletal root». Correlations between RGR of the shoots and trunk, the shoots

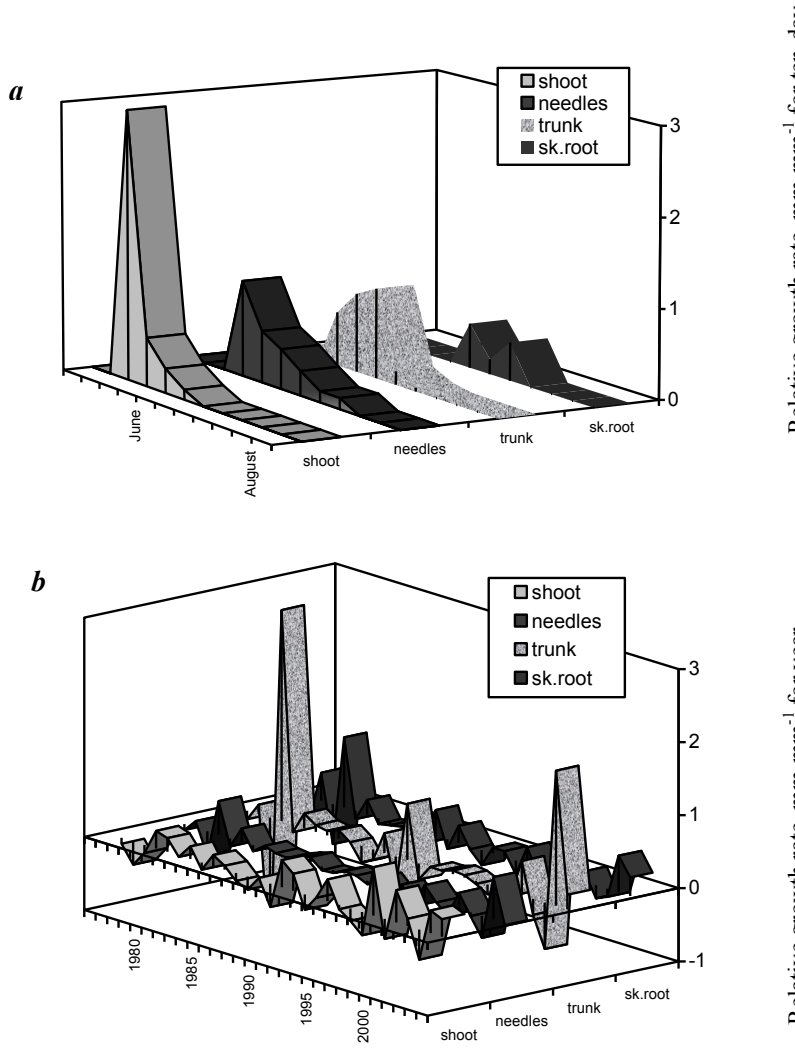

Fig Relative growth rate of Scots pine organs during the vegetation (a) and in annual changes (b) and the skeletal roots were weak, but in the first case statistical link was significant at p <0.05 (r = 0.40; p = 0.0295). The value of multiple regressions (tab. 3) has shown strong joint influence of variability RGR of the shoots and pine needles on variability RGR of the skeletal organs

Tab. 3. Multiple regression results

Dependent Variable	Independent Variable	BETA	p-level	Multiple R	Adjusted R squared	F	p-level
RGR of trunk (N=29)	RGR of needle	0.773	0.0E-06	**0.835**	0.673	29.820	0.0E-06
	RGR of shoot	0.149	0.205				
RGR of skeletal root (N=29)	RGR of needle	0.847	0.0E-06	**0.800**	0.613	23.207	0.02E-05

During vegetation (fig. a) duration of the crown shoot growth activity period actually corresponded to the period of the pine skeletal organs radial increment (tab. 2). Thus the Scots pine growth in height which presented as the shoots ten-day RGR values and on radius as the trunk and skeletal roots RGR corresponded to each other. During all vegetations of the investigation period constant multiplicity of difference of the RGR maxima took place practically. So, the more there was the value of the shoots seasonal linear increment, the larger biosystem of the Scots pine tree grew in the radial direction, and extremely small length of the pine needles corresponded to so small radial increments of the trunk and skeletal roots.

On a context seasonal periodicity of the pine shoots growth was observed year rings in the skeletal parts completed formation. Even during the droughty vegetative periods it was not marked negative value in the ten-day RGR dynamics (fig. a). Influence of an environment was distinctly shown in annual RGR dynamic (fig. b). Here negative values RGR took place in droughty years and positive values of relative growth rate were normally fixed in the years following droughts.

In the crown removal experiences radial growth of the pine trunk began and last during the significant time interval at absence of the source current assimilates. However, the pine trees without the crown deprived of not only the photosynthesis current products source, but also influence of the crown growing activity which criterion the young shoot systems increment was. Crown absent resulted in significant disturbance of the system connections between it and skeletal organs and formation at the trunk of the radial increments consisting of the only several layers early tracheides. At the same time, system connections and influence of the growing crown were showing as periodical vegetative organs growth (sink) and distributions organic substance resource (source), created by a photosynthesizing crown. Apparently, presence of the crown photosynthesizing shoots and it's the young shoots showing growth activity, was an indispensable condition of the Scots pine skeletal parts could complete radial growth.

Formation of the trunk annual ring consisting of the several of the early wood cells at the pine trees without crowns, was suggested to presence of the photosynthesis reserve products fund and a possibility of their use on growth processes. It is known [7] that the autumn reserve of photosynthesis products is primarily accumulated in the roots and certain amount of them was utilized in conifers at the beginning of the xylem first layers formation in early spring [2].

It is necessary to emphasize, that the beginning of the visible growth pine shoots in conditions of forest-steppe Predbajkalja when photosynthetic activity of the pine needles yet did not reach the maxim were due to storage assimilates. As the study of carbon dioxide gas exchange of pine crown showed [11], carbon balance of the growing shoot have became positive only in the last ten days of July. Up to this moment the growing shoot was virtually a significant acceptor of organic matter carbon. According to literary data [3], it is in the period of shoots active growth concentration of soluble carbohydrates in the last year's pine needles have dropped considerably, apparently due to meeting the demand of growing shoots for assimilates. Thus, on the one hand growth activity of the pine crown to which the increase in space occupied with the crown is connected, and with another − the increment of the skeletal organs early tracheides forming transport ways of the ascending water current were preadapted of storage's assimilates with source of formation is the same pine crown. Storage's substances act in this case as the part of an intersystem resource of organic substance which presence essentially moves apart opportunities of ability to live of the woody vital form to which the Scots pine belongs also, in time and in space.

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TMTE SECTION STUDY - AS_2TE_3

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Abstract. To establish the nature of the chemical interaction and phase formation in the As_2Te_3 – TmTe system by complex methods of physicochemical analysis, alloys of the As_2Te_3 – TmTe section and the initial components of this section are studied. According to the results of a set of methods of physicochemical analysis, it was found that the alloy of the composition $TmAs_2Te_4$ and alloys of the concentration region 100-98.5 As_2Te_3 consist of one phase.

The analysis results and the constructed diagrams show that the As_2Te_3 – TmTe sections are a quasibinary section of the Tm-As-Te ternary system and a triple intermediate phase of the composition $TmAs_2Te_4$ is formed in them according to the following peritectic reaction L + TmTe ↔ $TmAs_2Te_4$

Keywords: system, alloy, section, temperature, phase

Introduction

In the development of inorganic chemistry, issues related to the synthesis and physicochemical study of semiconductor compounds with valuable functional properties are of significant importance. Triple compounds of rare-earth elements (REE) have a set of unique functional properties that have found technical application in various fields of modern technology [1-4].

The initial components of the studied sections are promising semiconductor substances for the production of new functional materials for various fields of technology [5,6]

TmTe and As_2Te_3 congruently melting compounds at 2015K and 650K, respectively. For the synthesis of section alloys, the starting components are TmTe and As_2Te_3 compounds. For the synthesis of the starting components, Tm of grade A-2, arsenic of grade B-5 and tellurium of grade A-2 subjected to seven-fold zone purification were used. The alloy synthesis mode was stepwise.

Some physicochemical properties of alloys of the As_2Te_3 – TmTe system

composition, mol%		Thermal Effects, K	density, d, g/cm^3	Microhardness Hμ, kg/mm^2
As_2Te_3	TmTe			
100	0	645	6,25	70,5
95	5	555,600	6,28	73,5
90	10	555,600	6,3	75,0
80	20	555,725	6,35	75,2
70	30	555,920	6,45	80,3
60	40	550,1055	6,75	95,5
50	50	1090,1255	7,25	227
40	60	1090,1450	7,20	225
30	70	1095,1650	7,10	220
20	80	1085,1820	6,95	218
10	90	1090,1975	6,90	228
0	100	2015	6,90	285

First, the samples were heated to 4500°C and kept at this temperature for 2 hours, then the temperature of the furnace was raised to 7500°C with a holding time of 2 hours. After that, the temperature was increased to 11000C, at this temperature the samples were kept for 4 hours, then the furnace was disconnected from the current source. Samples were cooled slowly inside the oven. Alloys up to 50 mol% turned out to be compact gray, and after 50 mol% TmTe the samples became porous. To homogenize the alloys, they were annealed at temperatures of 500 and 10,000°C depending on the TmTe content for 300 hours; after homogenization, the alloys were subjected to physicochemical analysis.

The results of the differential thermal analysis showed that in the alloys of the system there are two series of thermal effects related to the liquidus and solidus of the system.

X-ray phase analysis showed that when the ratio of the components is 1: 1, new diffraction lines appear in the alloys that differ from the lines of the starting components. The composition of the intermediate phase corresponds to the chemical formula $TmAs_2Te_4$. The microhardness of the compound is 227 kg/mm. The density of the compound differs from the density of the starting components and is 6.75 g/cm^3 (table). The values of some physico-chemical properties are given in table.

Based on the results of physicochemical analyzes, a state diagram of theAs_2Te_3 – TmTe section was constructed (Fig.)

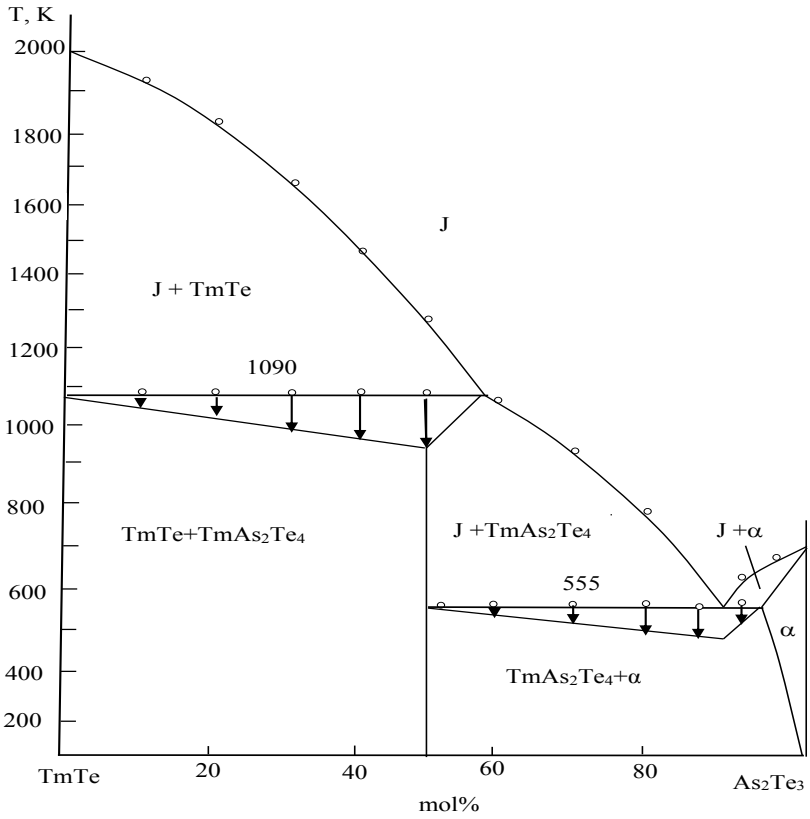

Fig. As_2Te_3-TmTe section diagram

After the synthesis, the obtained compounds were isolated individually and their single crystals were grown. For the growth of single crystals based on published data and taking into account the properties of the compounds, we selected the growth method, the method of chemical transport reaction. The carrier is iodine, the proposed reactions are as follows:

$2TmAs_2Te_4 + 15J_2 \leftrightarrow 2TmJ_3 + 4TmJ_3 + 4AsJ_3 + 8Te$

$2TmJ_3 + 4TmJ_3 + 4AsJ_3 + 8Te \leftrightarrow 2TmAs_2Te_4 + 15J_2$

The crystal lattice parameters of the compound are calculated. It was found that the compound crystallizes in rhombic syngony with parameters a=11,35, в=14,15, c=3,60Å, the structural type was $PbSb_2S_4$

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SIMULATION OF MICROCONTROLLER CONTROL «SMART» INTERSECTION

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Annotation. The given work is devoted to research of problems of traffic regulation with the help of «smart traffic lights». Development of traffic control algorithms in Almaty is an actual social and economic task of the metropolitan akimat. The concept of «smart crossroads» appeared in connection with the wide application of affordable microcontroller equipment, which allows to create adaptive systems by controlling traffic intensity at the busiest intersections of the city. The main idea is to correctly regulate road traffic in order to reduce and eliminate traffic jams on the roads. This problem now in our country is one of the priority for the organization of traffic. A new version of the traffic light is proposed, which we will call – «Smart traffic light». This device will increase the capacity on the roads by performing real-time traffic diagnostics and switching traffic lights depending on the traffic situation.

Keywords: traffic signal, regulation phase, interval, saturation flow, signal cycle, traffic monitoring, smart intersection.

Development of traffic control algorithms in Almaty is an actual social and economic task of the mayoralty of the city. The concept of «Smart intersection» appeared in connection with the wide application of affordable microcontroller equipment, which allows to create adaptive systems by controlling traffic intensity at the busiest intersections of our city. When developing a training simulator for the microcontroller traffic light management of the Smart Crossroads project, the calculation methodology and modeling of projects create

prerequisites for the further development of the project. Creation of a simulation model of the traffic light at a crossroad with variable traffic intensity is made using the S7-300 microcontrollers and the Siemens LOGO Soft Program.

The development of the layout for the «Smart intersection» project was started and the original program on LOGO! Soft Comfort was written. The work of the real traffic light in this program is realized.

The analysis of today's problems and prospects of equipping modern streets with new modernized traffic lights was carried out. The problem of a flexible control system of traffic signaling for a system of intersections is investigated. The scheme of operation of control zones is explained and explanations are given. Success in the creation of automated traffic control systems will significantly improve the situation on the roads of the country. The camera sensors determine the density and speed of movement in the control zone. Calculating the traffic density on the roads, the traffic light automatically sets the switching time. The work of the «smart traffic light» on the set of intersections of carriageways, the density of the flow at the entrance and at the exit of the intersection will be calculated in all directions and the received data will be transmitted to other traffic lights.

The effectiveness of the project is that this system is applicable not only to a separate intersection, but also to an entire network consisting of a multitude. This will not only improve the organization of traffic on a separate intersection of carriageways, but also on their totality, by analyzing, processing and transmitting information about the traffic situation to subsequent intersections.

Smart traffic light. Smart intersection. With the advent of information networks, traffic lights began to be connected to unified traffic control centers, so that in an emergency, to change the signal at a particular intersection, it was not necessary to send a police officer there. And in order to understand exactly where the congestion arose, the presence of automobile presence sensors began to be installed on the streets - as a rule, for this purpose, an induction loop was installed in the roadway, which recorded a change in the electromagnetic field when a car was passing.

Thus, by about the second half of the twentieth century, the responsible services learned how to quickly obtain information about the traffic situation and respond to them by changing traffic lights. Since by this time the development of computer technology has already begun, programmers and mathematicians have been given a new task: to make a complex system adapt for changing conditions on its own, and not wait until a person makes the necessary decision and gives it the appropriate signal. Currently, there are four main methods for constructing such systems (three of them are even implemented in practice) - they will be discussed.

Continuous cycle:

SCOOT (Split, Cycle and Offset Optimization Technique), which was launched in 1973 in Great Britain, was one of the first systems that respond to the traffic situation in the United Kingdom (Split, Cycle and Offset Optimization Technique). It is also among the most common: it is used by more than 200 cities around the world. In the name of the system, three basic parameters of its algorithm are encrypted:

Table 1 SCOOT main parameters

SCOOT main parameters	
Cycle	Duration of a full cycle (switching in order of all phases) of a traffic light
Split	The ratio of time allocated for each phase (as a fraction of the cycle time)
Offset	Displacement of the beginning of the cycle of a specific traffic light from the point of time set for the entire system (allows coordination of the cycles of different intersections between each other)

Another kinds of phase, cycle and interval:

- Adjustment cycle (Interval). The period of validity of a certain combination of traffic lights

- Phase of regulation (Signal Phase). The totality of the main and subsequent intermediate tact

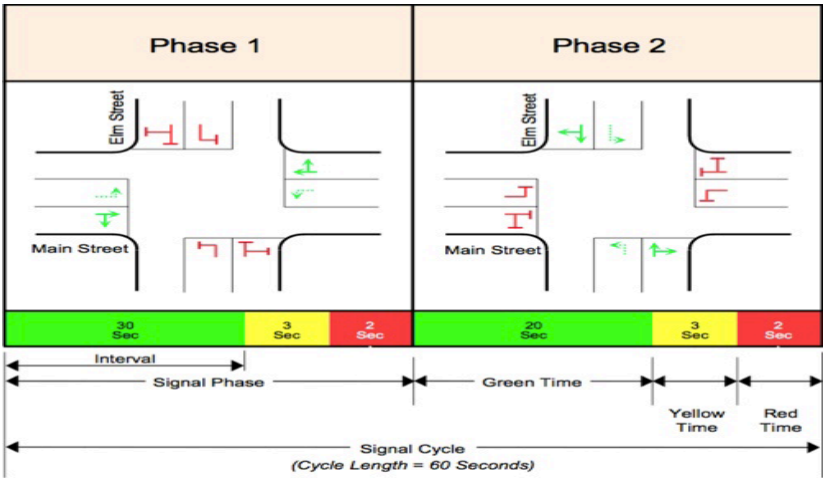

Figure 2 Phases of signals

Each traffic light in the SCOOT system has «its own» vehicle presence sensors (one or more - for different lanes and at different distances) installed «upstream». As a rule, the network of streets is divided into links - from the intersection to the intersection. Each link begins with a sensor, and ends with a traffic light reacting to its readings.

To decide whether to change the main parameter — the cycle length — the computer with the SCOOT program calculates the so-called saturation degree of all phases of the traffic light. This indicator is presented as a percentage of the «green» signal used: the algorithm estimates how many more cars the intersection would have managed to drive, «squeezing» into the gaps between the cars that the sensor captures. The task of SCOOT is that for the «loaded» phase itself the saturation should be no more than 90 percent.

In addition, once during a cycle, the program calculates the efficiency coefficient based on the sum of forced stops and car waiting time. Depending on the value of the coefficient, SCOOT decides whether to lengthen or shorten a phase for 4 seconds. Before the start of the new phase, the offset relative to other traffic lights is also consistent - also within four seconds.

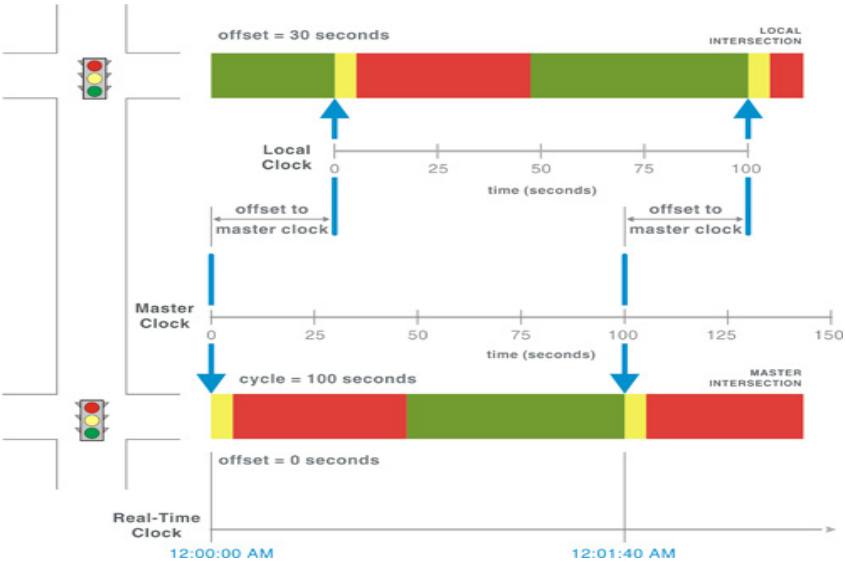

Figure 3 Local and master intersection

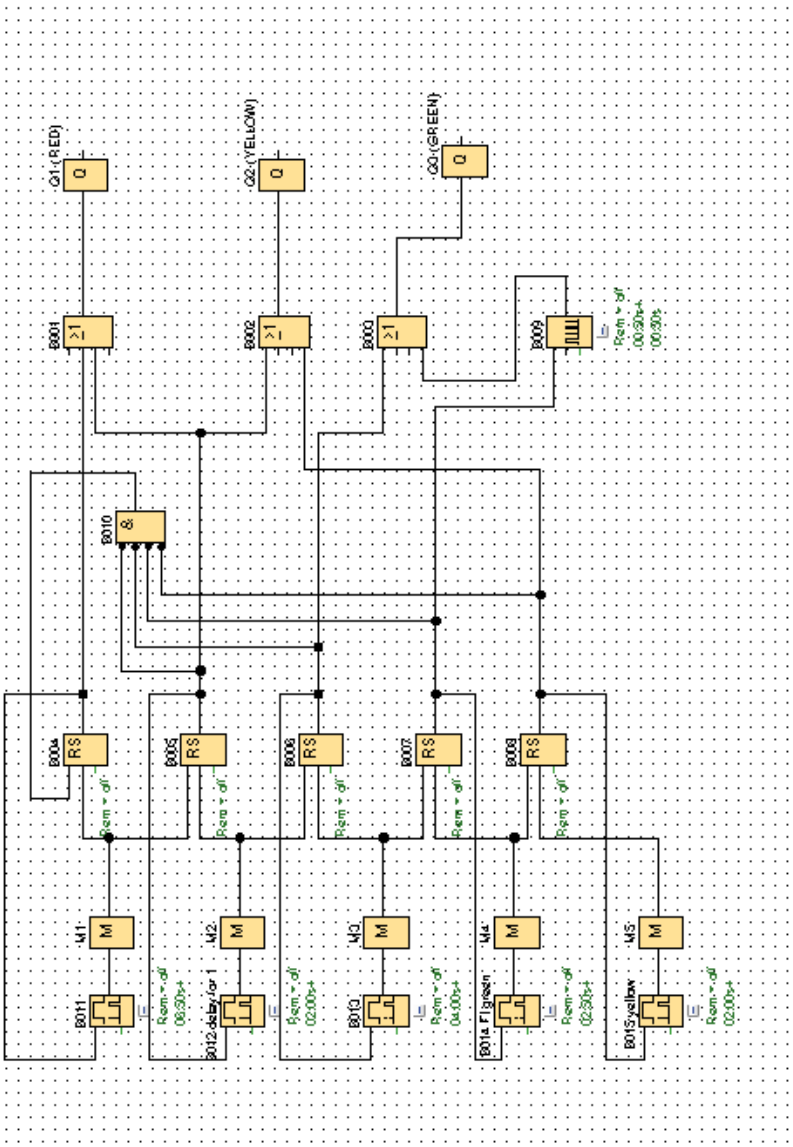

Figure 4 Program of traffic light for simple intersection

It is seen that the phases at the next intersection are shifted relative to the previous one. Time offset is just enough for a group of cars had time to drive up to him and slip on the green. The calculation is usually performed for some average speed adopted in this region. Therefore, «racers» and «brakes» usually break off on such highways.

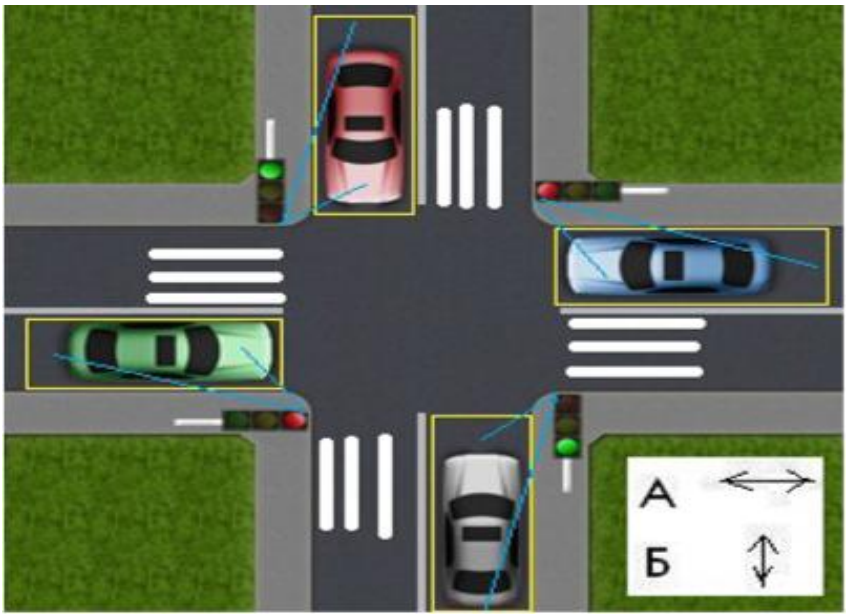

Figure 5 Simple intersection

Commissioning with LOGO!

- connect LOGO! as indicated and connect to the pc using an ethernet cable
- in the program under test, execute the «Parameters / Transfer / PC to LOGO!» function.
- if several LOGO! s, select the appropriate IP address of the desired LOGO!

the software registers whether the PC has the appropriate IP address for communication, if necessary it offers an alternative IP address, sets it up as soon as it is confirmed, and then sends the program to the LOGOS!

- Activate the online test with the display of the states and actual values of the LOGO! in RUN mode.
- 8 basic functions

- Special functions: 14 timer functions, 3 counter functions, 13 analog functions, 8 miscellaneous, 1 data log .

Program for the simple intersection

First, let's consider an example for a regular cross-shaped intersection, the scheme of which is shown in Figure 18. There is a special area on the road where the camera sensors determine the density and speed of movement (hereinafter referred to as the «control zone»). Set the initial period of switching the traffic light (tp): for example, 6 seconds (flashing green-> yellow-> red).

We define the rules of work (behavior) of a traffic light as follows:

- if there are no cars on the road, the traffic light operates in standard mode (a predetermined value for directions A and B and for pedestrians) until a car appears in any direction (A or B) in the control zone;

- if traffic prevails in a certain direction, then it is given a priority time (Tp), after which the traffic light switches. The formula for determining Tp:

$$Tp = (n / (m \cdot k)) \cdot t (n) + t,$$

where: n is the number of cars in the direction of the green signal of the traffic light, m s the number of cars in the perpendicular direction, k is the number of lanes in the direction of the traffic light, t (n) is the time depending on the number of cars in the direction of green traffic signal $t (n) = n \cdot s / v$; s is the distance between the machines (4m) + average length of the machine (4m) (m); v - vehicle speed (m / s); t is the time it takes the car to drive through the traffic light and the control zone (in this case, the control zone is 200 meters + 20 meters intersection, the car's speed is 60 km / h (i.e 16.6m / s), (200 + 20) /16.7 = 13 seconds). Additional rule: if m = 0, then the traffic light does not switch to perpendicular directions until at least one car appears or the pedestrian presses the button; if the value of n / m is greater than 5, then it is assumed to be 5.

Consider the actions of pedestrians.

To switch the traffic light to green light for pedestrians, they need to press a button. After that, the traffic light works like this:

- if there are no cars, the traffic light switches in time equal to the switching period of the traffic light;

- if there are cars, then the traffic light switches after some time, which depends on the flux density, determined by the formula:

$$T = n / k \cdot ts + tp;$$

where: n is the flux density in the direction of the green signal of the traffic light; k - number of lanes in the direction of the green signal of the traffic light; ts - the time it takes the car to drive a traffic light (2 seconds). At the same time, after pedestrians, the traffic light turns on the direction B (when fixed in the control zone of the car), if before that there was direction A, and vice versa. We define the motion density formula:

$$P = N / (S \cdot k),$$

then P is replaced by n or m to calculate the priority time, S is the control zone (m); N - number of cars in the control zone.

Let's draw an algorithm that we are going to use in this program. The red light will be on the zeroth step of the algorithm. Transition to the step one where the red light and yellow lights should be on happens for example after 6 s. Afterwards, as we know, the green light turns on let's say after 2 s. Step three replaces step two, where green light will blink . Step three gives the control to the step four in which yellow light turns on.

Open the settings of the program and choose input/output names, there we can give names to the I/O such as «RED», «YELLOW» and «GREEN».

Put the outputs Q1, Q2, Q3 to the empty circuit diagram on the right side, because it gives the output and result of the program. On the left side of each output put the «OR» element and connect each with the related elements. Now choose RS triggers. We have five steps of algorithm, so put five RS triggers in circuit diagram. The zeroth step connect with «OR» element to control red light. Second RS trigger connect with the first and second OR elements. Output of the third step connect with the third OR element. Fourth trigger we cannot connect directly to the OR element, so we need impulse generator here and connect to it, and connect generator to the third OR element. Fifth trigger connect with the OR element which is related to the yellow light.

Put AND element with its help we will realize setup of the zeroth step. When running the program concerning to law initial step is set by the trigger command «S», when the other steps are equal to 0. When starting the program, all the triggers are reset, so all steps except the zero are connected to the inputs of the element AND. All inputs of element AND need to be inverted. Since the output AND should be 1 when all steps are at zero. The output AND is connected to the trigger input of the zero step. Since the output AND should be one when all steps are at zero. The output «And» is connected to the trigger input of the zero step. It is necessary to place elements that implement the logic of transitions. It will be five timers on delay, which should start at the appropriate step of the algorithm.

The trigger output is connected to the timer input. The timer output is connected with the trigger reset input. They can be connected using flags. Take a memory element from the catalog and place it next to the timer and connect them. Set time parameters for timer elements. Output activity is indicated by a red frame.

Experimental part looks like this:

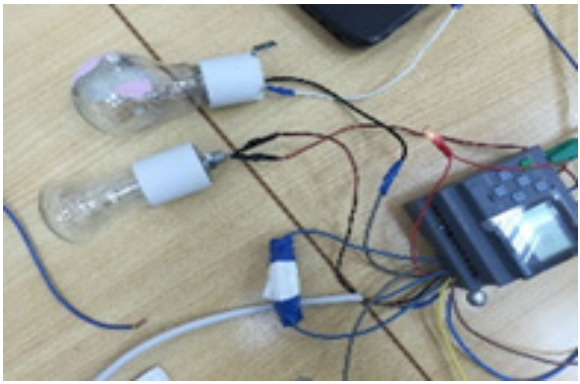

Figure 6 Experimental part realized on LOGO Soft Comfort

Each lamp gives us three output which is related to Q1, Q2, Q3 from the program.

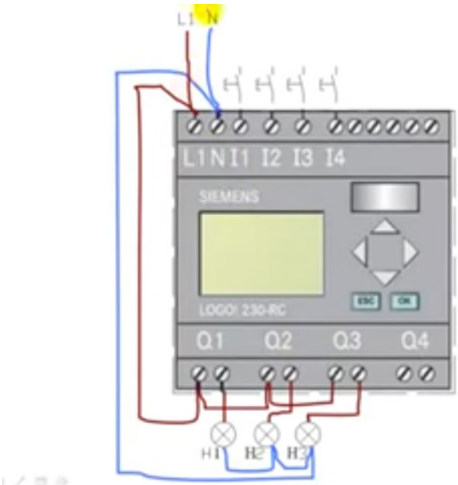

Figure 7 Real connection of traffic light to Siemens LOGO

CONCLUSION

The dissertation deals with the work of traffic lights and the improvement of their functionality. Considered different types of modes of operation of traffic lights such as during traffic jams, normal mode and night mode.

The first chapter analyzed the current implementation and the problem. What is the market today, state initiatives, the impact on the environment and human health when idle in traffic jams and exhaust emissions from cars.

The second chapter deals with the intersection itself and the geometry of the intersections, as well as the loss of time when cars are idle.

The third chapter describes the main task of the smart traffic light, the main functions, the installation of cameras on the roads, the organization of the operator's workplace and the synchronization of the signal.

The fourth chapter provides a solution for unloading traffic jams during peak hours. Using various timers, as well as adjusting their time, a clever system of traffic lights was developed in the program Siemens Program Soft Comfort.The analysis of today's problems and prospects of equipping modern streets with new modernized traffic lights was carried out. The problem of a flexible control system of traffic signaling for a system of intersections is investigated. The scheme of operation of control zones is explained and explanations are given. Success in the creation of automated traffic control systems will significantly improve the situation on the roads of the country. The camera sensors determine the density and speed of movement in the control zone. Calculating the traffic density on the roads, the traffic light automatically sets the switching time. The work of the «smart traffic light» on the set of intersections of carriageways, the density of the flow at the entrance and at the exit of the intersection will be calculated in all directions and the received data will be transmitted to other traffic lights. The effectiveness of the project is that this system is applicable not only to a separate intersection, but also to an entire network consisting of a multitude. This will not only improve the organization of traffic on a separate intersection of carriageways, but also on their totality, by analyzing, processing and transmitting information about the traffic situation to subsequent intersections.

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STRUCTURAL FEATURES OF SUBSTITUTED AZOMETHINE COMPOUNDS, DERIVATIVES OF ALKYLSTYRYL KETONES AND 1,4-DIAMINOBENZENE

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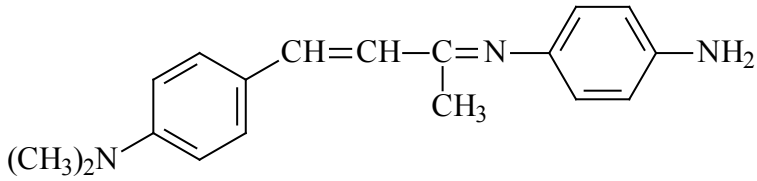
Abstract. The presented material details an analysis of the results of quantum-chemical calculations of molecules of azomethine compounds, derivatives of dimethylamino-substituted alkylstyrylketones and 1,4-diaminobenzene. The relevance of the research topic is dictated by the expansion of theoretical ideas about the structure of organic compounds. The choice of research objects is due to the presence of a complex of valuable applied properties in azomethine compounds. The calculations were performed using semiempirical methods. Based on the calculation results, 3D models of molecules were constructed that showed the features of the spatial arrangement of atoms. The distribution of electron density is presented in graphical form, maps of the surface of the electrostatic potential are constructed. The values of bond lengths, bond angles, atomic charges, and other calculated molecular parameters are given.

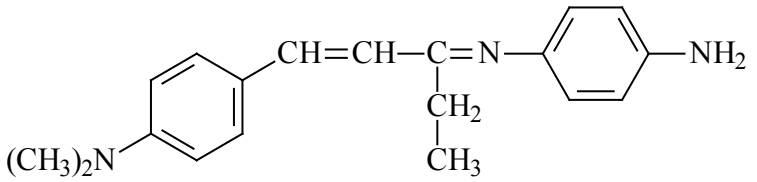
Keywords: azomethine compounds, Schiff bases, substituted alkylstyryl ketones, 1,4-diaminobenzene, quantum chemical calculations, molecular geometry, valence angles, bond lengths, electronic structure, atomic charges

Currently, the efforts of synthetic chemists are aimed at the synthesis of new organic substances with potentially interesting applied properties. A large number of compounds are synthesized and studied annually, among which the azomethine compounds deserve special attention. Azomethine compounds, also called Schiff bases, are the basis of biologically active substances [1,2], are part of polymeric materials [3-6], and their complexes with metals can be used in various fields of science and technology [7-10].

The presented material is a continuation of studies of substituted alkylstyryl ketones and their derivatives [11-13]. This paper presents an analysis of the results of quantum-chemical calculations of azomethine compounds (I) - (III), which can be obtained by condensation of dimethylamino-substituted alkylstyrylketones with 1,4-diaminobenzene. The calculations were performed using semiempirical methods [14,15].



I



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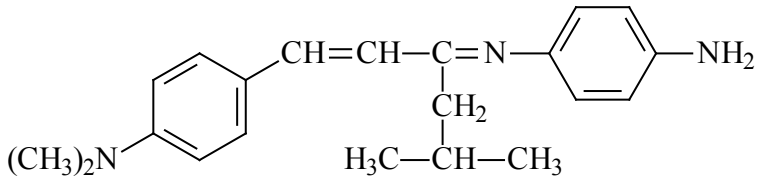

III

At the first stage of the work, the spatial arrangement of atoms was studied, for which 3D models were constructed from calculated data (Fig. 1).

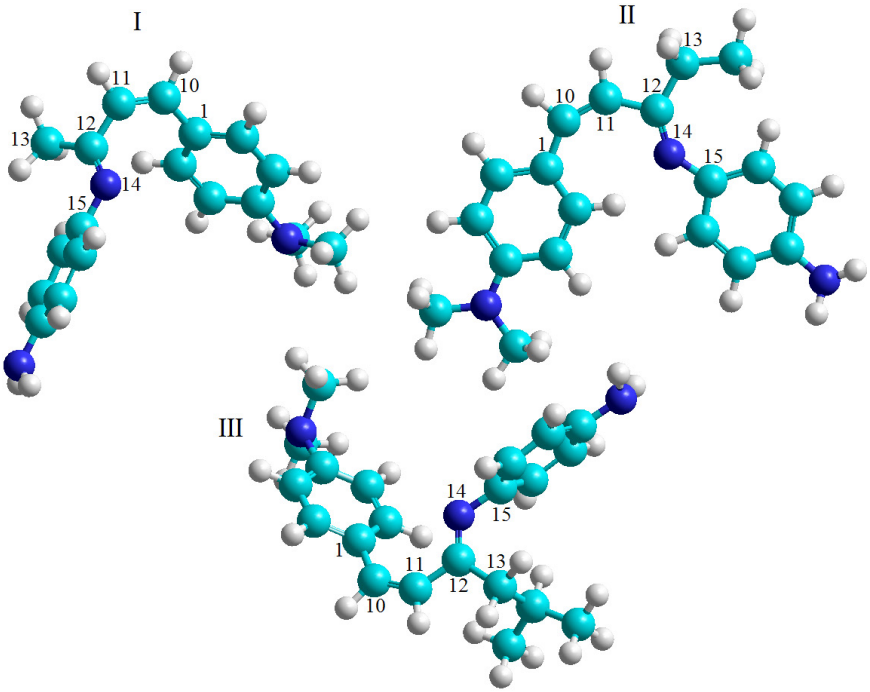

Fig. 1 3D models of molecules of azomethine compounds

Modeling showed that molecules (I) and (III) are more distorted in space than molecule (II). The main contribution to the geometry of the molecules is made by atoms connecting two benzene fragments. Due to significant steric influences, a relative displacement of individual parts of molecules (I) and (III) occurs. A different picture is observed for compound (II). The calculations showed that the ethyl radical practically does not cause steric distortions and the molecule (II) has a planar but nonlinear structure. This feature is reflected in the values of the bond angles and bond lengths presented in table 1.

Table 1 - Valence angles and bond lengths in molecules

Valence angle	Value,°	Bond length	Value, Å
Compound (I)			
C_1-C_{10}-C_{11}	127,0	C_1-C_{10}	1,454
C_{10}-C_{11}-C_{12}	126,3	C_{10}-C_{11}	1,337
C_{11}-C_{12}-N_{14}	119,1	C_{11}-C_{12}	1,479
C_{12}-N_{14}-C_{15}	123,7	C_{12}-N_{14}	1,294
C_{11}-C_{12}-C_{13}	112,4	N_{14}-C_{15}	1,409
C_{13}-C_{12}-N_{14}	128,5	-	-
Compound (II)			
C_1-C_{10}-C_{11}	138,1	C_1-C_{10}	1,444
C_{10}-C_{11}-C_{12}	138,5	C_{10}-C_{11}	1,341
C_{11}-C_{12}-C_{13}	105,3	C_{11}-C_{12}	1,492
C_{13}-C_{12}-N_{14}	136,0	C_{12}-N_{14}	1,282
C_{12}-N_{14}-C_{15}	139,2	N_{14}-C_{15}	1,394
C_{11}-C_{12}-N_{14}	118,7	-	-
Compound (III)			
C_1-C_{10}-C_{11}	131,3	C_1-C_{10}	1,453
C_{10}-C_{11}-C_{12}	130,7	C_{10}-C_{11}	1,338
C_{11}-C_{12}-C_{13}	113,2	C_{11}-C_{12}	1,471
C_{11}-C_{12}-N_{14}	121,6	C_{12}-N_{14}	1,296
C_{12}-N_{14}-C_{15}	121,1	N_{14}-C_{15}	1,418
C_{13}-C_{12}-N_{14}	125,2	-	-

At the next stage of the work, the analysis of the results of calculating the electronic state of the compounds was performed. Fig. 2 shows electron density distribution diagrams. In molecules (I) and (III), due to spatial distortions, there is an uneven distribution of electron density and its localization in individual regions. Molecule (II), however, does not have spatial distortions, and the electron density in it is distributed uniformly throughout the structure.

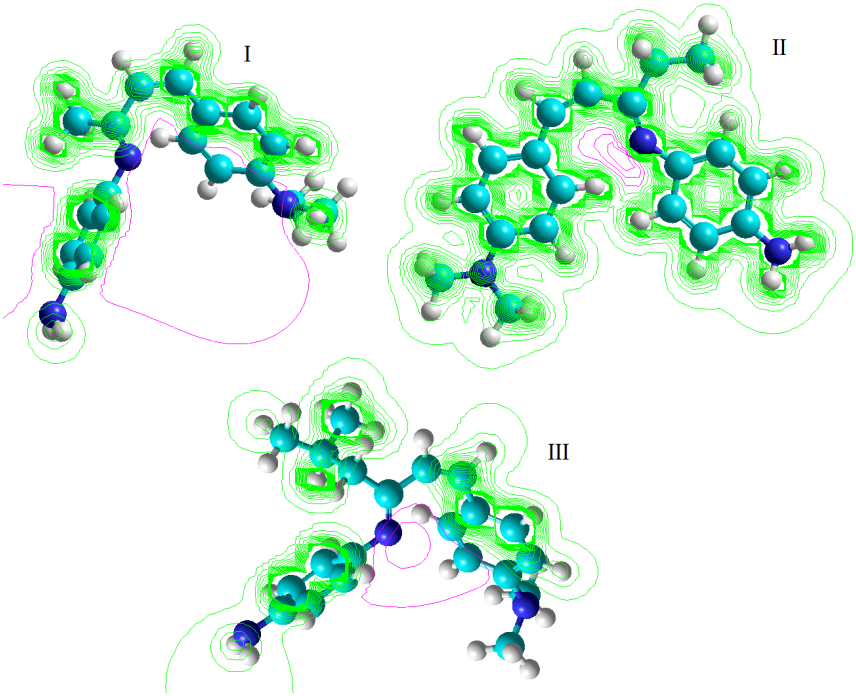

Fig. 2 electron density distribution diagrams

Fig. 3 shows the electrostatic potentials in the form of 3D models of surface maps, from which it can be seen that the maximum negative charge is concentrated mainly on nitrogen atoms. Quantitative values of the charges on some atoms are shown in table 2.

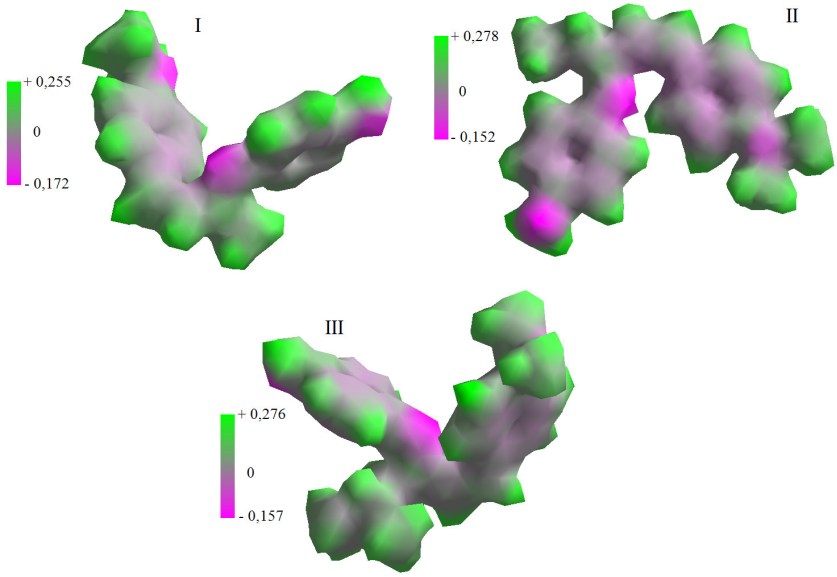

Fig. 3 3D models of electrostatic potential surface maps

Table 2 - Charges on the atoms of a chain connecting benzene fragments

Atom	Value, charge u.		
	(I)	(II)	(III)
C_1	-0,069	-0,110	-0,049
C_{10}	-0,083	-0,042	-0,067
C_{11}	-0,141	-0,178	-0,147
C_{12}	0,023	0,103	0,041
C_{13}	-0,229	-0,175	-0,172
N_{14}	-0,130	-0,223	-0,135
C_{15}	-0,050	0,002	-0,043

Other energy parameters are also calculated in the work, the values of which are presented in Table 3. The data show that, as the alkyl radical attached to the side chain becomes more complex, the total energy, bond energy, and electron energy increase in absolute value, and the dipole momentum decreases. In the series of compounds under consideration, a flatter molecule (II) has a maximum heat of formation, and a molecule with the most complex radical has a minimum heat of formation.

Table 3 - Energy parameters of molecules

Energy parameter	(I)	(II)	(III)
Total energy, kcal/mol	-74089	-77661	-84863
Bond energy, kcal/mol	-4417	-4677	-5256
Electron energykcal/mol	-527050	-564933	-670301
Heat of formation kcal/mol	92,27	107,09	78,72
Dipole momentum, D	2,037	1,904	1,621

Thus, based on the results of quantum-chemical calculations, the influence of the nature of the side chain alkyl radical on the geometric and electronic structure of azomethine compounds, derivatives of dimethylamino-substituted alkylstyryl ketones and 1,4-diaminobenzene is studied. It was found that the ethyl group does not lead to spatial distortion of the molecule relative to the totala plane. This, in turn, favorably affects the distribution of electron density in the molecular structure. Methyl and isobutyl groups lead to a significant distortion of molecules and, as a result, impede electronic transitions between atoms.

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