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Content

Economic sciences

Nodar Bliadze, Eka Chikovani, Zviad Iakobidze, Lasha Gadelia THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS SIGNIFICANCE	3
Sevinc Ibrahimova, Mayil Orujov, Azer Orujov, Nermin Orujova FRAGMENTATION OF GLOBAL SOCIAL CAPITAL	7

Geographical sciences

Jafarov Rahil Maharram ECOLOGICAL BALANCE AND SUSTAINABLE DEVELOPMENT: GLOBAL CHALLENGES AND SOLUTIONS	17
--	----

Historical sciences

Arzu Huseynli A BRIEF OVERVIEW OF THE DEVELOPMENT OF THE PRESS IN AZERBAIJAN	19
--	----

Medical sciences

Arman Khozhayev, Almash Toguzbayeva, Rafael Rizayev, Zhuldyzay Kydyraliyeva, Kazybek Tokhtanov, Zhanar Altynbayeva, Assel Sakipkereyeva, Zhansaya Zhumabaeva, Sitara Badyrova SCIENTIFIC AND ANALYTICAL REVIEW OF ETIO-PATHOGENETIC AND CLINICAL-DIAGNOSTIC INDICATORS IN BREAST CANCER	22
Mirzamuratova Gulzhazira COMPARATIVE ANALYSIS OF THE EFFICACY AND SAFETY OF AB INTERNO CANALOPLASTY (ABIC) AND THE XEN GEL STENT IN THE SURGICAL MANAGEMENT OF PRIMARY OPEN-ANGLE GLAUCOMA	35

Pedagogical sciences

A. Tukhtakulov METHODS AND TOOLS FOR THE AUTOMATION OF OFFICE ACTIVITIES	40
Efi Analyti, Chrysi Travlou, Athina Spanou ARTIFICIAL INTELLIGENCE IN EDUCATION: THEORETICAL FOUNDATIONS, PEDAGOGICAL APPLICATIONS AND ETHICAL IMPERATIVES FOR TRANSFORMATIVE LEARNING	42
Efi Analyti, Chrysi Travlou, Athina Spanou ARTIFICIAL INTELLIGENCE IN GREEK PRIMARY EDUCATION: POLICY, PRACTICE, AND PEDAGOGICAL PERSPECTIVES	46
Nurizanova M.M., Tashkenbaeva S.Zh., Anas B., Dossymov Y., Tuyebayev M.K. ASSESSMENT OF LEARNERS' SOFT SKILLS: FORMATIVE AND SUMMATIVE EVALUATION	53

Philological sciences

Zarbaliyeva Ayshan Mahmud EXPRESSION OF THE NATIONAL SPIRIT IN THE VOCABULARY OF CHILDREN'S LITERATURE	64
--	----

Psychological sciences

Hennadii Tkachenko FEATURES OF THE CONTENT OF CIVIC IDENTITY ACCORDING TO GENDER CRITERION	67
Zhanna Dovbyk THE THERAPEUTIC POTENTIAL OF ART METHODS IN WORKING WITH ADULT CLIENTS	70
Kononenko Artem Ruslanovich FEATURES OF EXPERIENCING EMOTIONAL STATES IN THE PROCESS OF DECISION-MAKING BY AN INDIVIDUAL	72

Economic sciences

THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS SIGNIFICANCE

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Abstract

Artificial intelligence is a branch of computer science focused on creating intelligent machines that emulate human behavior. It enables machines to acquire new information, perform tasks, and operate similarly to humans. One primary goal of machine learning is to automate human tasks. Some of these tasks are simple and repetitive, but they become more interesting when a computer makes decisions about complex problems that are difficult to formalize.

As machine learning problems arise, there are steps to help solve them: selecting initial criteria for suitable data, cleaning the data, maximizing information content, choosing the best method to evaluate the complexity of the task, testing, and refining. Common challenges in implementing artificial intelligence include various development approaches, ensuring systems meet data learning requirements, and the lack of a clear vision regarding the purpose of the system.

A key factor for optimizing results is having an experienced team capable of writing or adapting publicly available algorithms, selecting the appropriate algorithm to achieve desired outcomes, and combining algorithms to produce optimal results.

The main aim of the paper is to define machine learning and artificial intelligence and explore their roles in future human development. Some argue that AI and ML are separate technologies. I see AI/ML as a series of successful stages of computer automation and analytics, built on a common platform involving the following core processes: input data; algorithmic prediction models; and accurate prediction directions, among others.

Keywords: Artificial intelligence, digital technology, digital economy, industrial robots.

Introduction

Modern scientific and technological progress has shaped the direction that business and society are heading today. The 21st century is the era of hybrid information warfare.

Most people in countries with advanced technologies use artificial intelligence in all areas, such as business, entertainment, education, medicine, art, and more. Artificial intelligence enables systems to understand their environment, relate to what they perceive, solve problems, and act toward specific goals. A computer receives data, processes it, and responds. AI systems can adapt their behavior by analyzing the outcomes of previous actions and work independently. Today, AI development is advancing rapidly, with systems capable of voice and fingerprint recognition, answering questions, solving problems, mimicking human behavior, and more.

Discussion

The term "artificial intelligence" was first coined by Marvin Minsky and was practically used by American scientist John McCarthy. He explained that it is a program capable of thinking like a human and making decisions. AI, or artificial intelligence, refers to systems that exhibit capabilities similar to the human brain, such as recognition, thinking, and learning, through computers and other devices. According to the Oxford dictionary, AI is defined as: "AI is an interdisciplinary field of study that includes psychology, philosophy, linguistics, computer science, and neuroscience." Researchers often describe AI as a set of algorithms capable of producing results. Essentially, AI is a computer system designed to

interact with the world. Artificial intelligence is drawing significant attention due to its related emerging technologies.

To implement AI technology, a large amount of data is required. A study by researchers at the University of Oxford found that at least 47% of jobs in the United States are at high risk of being replaced by AI. In Europe, 54% of jobs are at high risk of automation by intelligent machines, not in 100 years, but within the next 20 years. It's important to note that AI can also enhance human development potential. Using AI is now a necessity for leading companies worldwide. All devices, smartphones, computers, and other technological tools would not exist without AI.

Artificial intelligence is the capability of machines to perform tasks that typically require human talent and intelligence. Examples include visual perception, speech recognition, autonomous decision-making, medical diagnosis, language translation, and driverless cars. This field involves using computers to analyze and interpret digital images and videos. Applications range from self-driving cars to facial recognition and even medical image analysis. The ultimate goal is always the same: how can machines see as well as, or even better than, humans? While computer vision may still seem like science fiction to many, it is already transforming the world. Here are some examples of how this revolutionary technology is currently being used:

1. Nature Conservation: Using satellite imagery, it is possible to monitor and observe the entire Earth from space, including landscapes, forests, oceans, and vegetation in general. Analyzing and predicting weather changes, monitoring ice cover, and many other processes are now performed more efficiently and with minimal human intervention through computer vision.

2. Security: Computer vision is used to develop more advanced security systems that can detect everything from intruders to weapons.

3. Sales: Computer vision helps create dynamic pricing systems that automatically adjust prices based on demand, as well as various forms of monitoring and analyzing both products and consumer behavior.

4. Healthcare: Computer vision is used to develop early diagnosis systems for diseases like cancer. Healthcare organizations store large amounts of data about people's health, including health records, images, clinical trial results, and other data. Of course, sorting, comparing, and other similar activities without mistakes require a lot of time and effort from humans – sometimes, the process may take years. With artificial intelligence technologies, this data can be analyzed much faster and more accurately, enabling better medical decisions.

5. Manufacturing: Computer vision is used to develop robots that can assemble products with higher accuracy and speed.

Artificial intelligence involves the ability to make autonomous decisions and continually improve those abilities, such as updating software, self-driving cars, or examining medical samples. AI performs tasks previously done by humans, but more quickly and with higher quality. There are three main concepts of artificial intelligence:

Industrial robots: Robots are developing rapidly worldwide alongside technological advancements and AI. In some countries, robots with various functions are already in use. It's expected that the role of robots will grow even more in the next decade, with high demand in healthcare, mechanical engineering, and other fields. Robots are believed to perform surgeries and medical procedures with greater precision than humans.

Today, many factories operate in hazardous environments, yet workers still work tirelessly. Recently, industrial robots have been created to free people from working in dangerous conditions, where they often perform risky tasks. Robots represent a breakthrough technology of the 21st century.

What is a robot? For some, robots are loyal friends; for others, dangerous enemies, because they worry that intelligent machines will replace humans. However, many see robots as merely a part of scientific fiction. According to 2006 data from the International Federation of Robotics, there are about one million industrial robots worldwide, nearly half of which are in Asian countries.

What work do robots perform? Imagine a worker who can work tirelessly 24/7 without complaints. Industrial robots are just such workers, producing large quantities of mechanical and electrical equipment, as well as household items. The word "robot" comes from the Czech word "robota," meaning "slave labor." It is estimated that in 2005, there was one robot for every ten workers in the automotive industry.

Today, robots do much more than work in factories. Modern robots are equipped with voice recognition, gyroscopes, wireless communication, GPS, and various sensors to respond to temperature,

resistance, ultrasound, chemicals, or radiation. Robots have become much more powerful and multifunctional, performing tasks that seemed impossible just a few years ago.

In one UK hospital, a robot pharmacist uses mechanical arms to dispense medications and deliver them to patients in just a few seconds. The US Postal Service has many robots that pick, sort, and stack packages on racks. Snake-shaped robots can also inspect mechanisms in tight spaces, such as aircraft wings, to ensure everything is in order, and sometimes even repair them. In May 2019, a robot police officer was created in the US to help make the work of American police officers easier. It will act as an assistant police officer. The robot will be equipped with a video camera, display, and scanner, and will be able to communicate with drivers. If a ticket is necessary, it can print one. It will be provided not only to American police but also to law enforcement agencies in other countries if they are interested.

In a Japanese nursing home, elderly residents pet small, fluffy seal robots. These seal robots respond to touch, sound, temperature, and even how they are held. They move like authentic seals, croak, blink, and flap their fins. The seal robot helps meet a person's need for companionship and also calms the nervous system.

In the medical field, a three-armed robot stands over a patient's head. Nearby is a special control panel, through which the surgeon views a three-dimensional image of the patient's heart. The surgeon uses the robot to perform heart surgery to restore normal valve function. This system allows for minimal surgical cuts, as the robot works with high precision. The cuts are minor, blood loss is less, and recovery is quicker.

At home, press a button and the round-shaped robot will vacuum the room. The robot moves in a spiral and along the walls, remembering the furniture layout. It also recognizes the location of stairs and avoids them. When finished, it automatically shuts off and returns to its charging station. Today, over three million such robots are in use.

In space, a six-wheeled robot called "Spirit" explores the surface of Mars. It studies soil and rocks using an arm with special tools. With cameras on board, Spirit has taken more than 88,500 photos of the planet's surface, craters, clouds, dust storms, and sunsets. It's the second robot to explore Mars.

Scientists study the ocean depths with an autonomous underwater vehicle. This vehicle is self-propelled, has no crew onboard, and performs research and repairs. It inspects telecom cables, tracks whales, and searches for mines.

Robots in the future

NASA is working on a humanoid robot called "Robonaut" to perform dangerous tasks in space. Bill Gates, a leader in the personal computer industry, hopes that soon "robots will be able to provide physical help to the elderly and even offer companionship."

The Japanese government has made similar statements, saying that by 2025, people will have robots at home to care for the sick, act as babysitters, and do chores. Scientists hope that by 2050, no team will top a robot team in football. They also believe robots will develop intellectual abilities that surpass human ones within decades.

While these predictions sound realistic, not everyone agrees. As scientists face technical challenges, AI researcher Jordan Palak notes, "We tend to overlook the fact that nature is the best programmer." Animals can multitask and change their behavior. Robots are typically designed for specific tasks, like picking up a part or delivering it. There are high-end robots with advanced sensors and components, capable of moving in three dimensions and following commands from computers.

It is important to note that today, the world is experiencing large-scale production of new types of wide-profile industrial robots. The best example is that from 2020 to 2023, 7.2 million jobs in various enterprises will be occupied by industrial robots of different types, strengths, and equipped with high-quality sensors. This means the same number of people will be replaced by industrial robots in the healthcare and medical fields.

Specialists consider the creation of uncrewed vehicles to be one of the most important achievements of artificial intelligence, which is nearly impossible to accomplish today. Regarding the replacement of human workers, it is estimated that 75 million jobs will be eliminated, while approximately 58 million new, highly qualified jobs will be created.

Conclusion

In summary, artificial intelligence greatly enhances human capabilities. Furthermore, the rise of artificial intelligence and new technologies will inevitably alter the course of global development.

Most people in countries with advanced modern technologies use artificial intelligence across all sectors, such as business, entertainment, education, medicine, art, and others. AI allows systems to

understand their environment, connect with what they perceive, solve problems, and pursue specific goals. A computer receives data, processes it, and responds.

We believe it is crucial to strengthen efforts in this area in Georgia and to adopt artificial intelligence and new technologies into business promptly. This will help generate wealth within enterprises, improve product quality, and reduce entrepreneurial costs.

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FRAGMENTATION OF GLOBAL SOCIAL CAPITAL

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<https://orcid.org/0009-0007-1222-4238>**Abstract**

At the beginning of the 21st century, as a result of increasing geopolitical turbulence and intensifying competition between countries for dominance, the process of fragmentation of global social capital began, consisting in the rupture of interaction networks between competing countries against the background of its further accumulation within the framework of existing political alliances. The article examines the factors that determined the dynamics of accumulation of global social capital, and draws conclusions about the consequences of its fragmentation.

Keywords: social capital, geopolitical dynamics, sustainable development, economic policy, political risks.

Introduction

The modern economic system was formed during the first industrial revolution, when it acquired such a characteristic as long-term economic growth based on extensive and intensive factors. According to T. Piketty's calculations, the average annual growth of the world economy from 1 to 1700 was 0%. In the period from 1700 to 1820, it began to grow by an average of 0.1% per year, from 1820 to 1913 - 0.9% and from 1913 to 2012 - 1.6% [1]. If we consider the dynamics of the development of the leading countries, the changes were more indicative. Stable long-term growth was observed even against the backdrop of world wars and economic crises, which were the result of intra-system processes leading to the emergence of structural imbalances.

Discussion

Economic growth and social development have become the main criteria for the successful functioning of any state, and their factors have become actively researched topics. In the models of R. Solow, P. Romer, R. Harrod and E. Domar, labor, capital and technology are considered as the main factors of economic growth. Their influence is not the same: if the accumulation of labor resources and means of production using existing technologies leads to extensive economic growth, then the development of technologies embodied in new means of production leads to intensive growth. The ratio of the roles of factors changed: if in the 19th century the factors of extensive development were no less important than intensive ones, then by the end of the 20th century it was the development of technologies that became decisive.

Over time, it became clear that for economic growth, in addition to labor, capital and technology, a favorable institutional environment is necessary that can ensure the effective distribution and use of available resources [2, 3]. Research aimed at studying the role of political, social and economic institutions in the dynamics of development of countries and regions, as well as the influence of culture as a set of informal institutions on the process of making management decisions, have demonstrated the existence of such a factor in the socio-economic development of the state as social capital. Social capital is an epiphenomenon characterizing the level of trust in society, the number and intensity of formal and informal social networks of interaction, traditions in organizing collective interactions. Its level is determined, among other things, by the availability and dissemination of knowledge, interpersonal interactions, negotiation skills, as well as the educational level of society as a whole.

Social capital, on the one hand, is a reflection of the intensity of social interaction, and on the other hand, it determines the level of time and financial costs for the formation of new interaction networks. Unlike material capital, in the process of using social capital, it accumulates, rather than is spent [4]. The more actively it is used, the more it becomes.

The concept of social capital originated at the beginning of the 20th century in the works of the American sociologist L. Hanifan, who studied the connections between representatives of one community. Later, G. Lowry and J. Coleman turned to it to explain such phenomena as racism and inequality. The concept was developed by R. Bourdieu in 1979, who considered social capital as a set of social networks of interaction through which individual actors can gain power and status [8]. In further studies, it began to be considered to a greater extent as a public resource.

Nowadays, social capital is considered in the scientific literature mainly in two aspects: 1) as communication skills, the ability to empathize, knowledge of traditions; 2) as a set of formal and informal social ties between people and organizations [12, 13]. A number of researchers call trust its main component [14, 15, 16]. Developing the concept in the unity of the two noted aspects, R. Putnam substantiated the presence of a positive influence of social capital on the dynamics of economic growth, as well as a decrease in crime [17].

The role of social capital in the formation of positive dynamics of economic development is determined by its participation in the process of organizing transactions [18]. The more of it is accumulated, the easier it is for economic entities to interact, since less time and resources are spent on finding counterparties, conducting negotiations and concluding contracts, and monitoring the execution of transactions. In other words, social capital, helping to establish interpersonal interactions in organizing economic transactions, reduces the level of transaction costs and increases the intensity of economic activity, which leads to an increase in the efficiency of using existing factors of production. As noted by A.V. Buzgalin, only those social connections and norms of interaction that produce an economic effect can be fully called social capital [19].

Labor resources, capital and technology without a favorable institutional environment and social capital will not be distributed in the economic system in an optimal way leading to stable long-term economic growth. Optimal (or at least effective) distribution of resources implies achieving a positive level of return on invested capital, therefore the development of an institutional environment and / or the accumulation of social capital, being factors in the growth of the efficiency of using invested funds, lead, all other things being equal, to an increase in the return on capital. Thus, a relative change in the social capital of a country or region leads to a change in international capital flows. Capital flows to countries and regions that are less successful in terms of accumulated social capital will decrease against the background of its increase in more successful countries. Since at the global level production factors begin to move to those regions where social capital is being accumulated, the problem of the dynamics of its accumulation, in addition to theoretical, arouses practical interest in relation to conducting predictive studies of changes in global capital flows, as well as analyzing the prospects for economic development in different countries.

ACCUMULATION OF GLOBAL SOCIAL CAPITAL

The history of the emergence of social capital goes back to the primitive communal system, within which connections within individual groups played a key role in determining the status and access to resources of each individual. Throughout its history, humanity has accumulated social capital, as evidenced by examples of the formation and functioning of religious associations, guilds, trade unions, etc. This happened slowly, with significant setbacks during periods of wars and epidemics. A fundamental shift occurred during the first industrial revolution, which not only reformatted economic methods, but also launched socio-economic and technological processes that led to the formation and accumulation of global social capital.

Since then, the dynamics of the development of social capital can be correlated with the dynamics of the formation of commodity markets [20]. During the formation of industrial society, markets expanded not only intensively (due to the emergence of new types of goods and services), but also extensively (due to spatial expansion from local to national, and subsequently to a global scale). The expansion of markets was accompanied by the organization of new networks of interaction between participants in international transactions, which led to the transformation of social capital from a local to a regional, national, and then a global phenomenon. The differences between the levels lie in the scale of the organized networks of social interaction. At the global level, social capital is a set of international networks of interaction caused by the presence of common intercultural norms and rules of behavior, common values, as well as mutual trust between counterparties.

During the second half of the 19th and the entire 20th century, despite two world wars, the process of accumulation of global social capital was underway. Its intensification was due to the strengthening of globalization processes, expressed in the growth of international trade volumes, the emergence and development of international organizations, and an increase in migration flows. In addition to globalization processes, the accumulation of global social capital was facilitated by such factors as the revolutionary development of communication technologies, urbanization and an increase in population density, the involvement of more and more countries in international relations.

The formation of global social capital was uneven. In developed countries, accumulation was rapid, while in the Third World, growth was insignificant against the backdrop of a deficit of industrial capital. In addition, the existence of two economic systems – capitalist and socialist – prevented the formation of global social capital in the full sense. The collapse of the Soviet Union and the disappearance of the socialist bloc in the 1990s led to the formation of a world characterized by the economic and political dominance of the United States. The formation of a single global social capital occurred on the basis of the development of networks of international interaction based on the norms dictated by the United States.

FROM GLOBAL TO FRAGMENTED SOCIAL CAPITAL

Social capital at any level of organization (from local to global) accumulates faster when there is only one dominant model of building interaction networks within a given community. This is possible when there is one dominant player who, due to resource, administrative and power superiority over others, imposes its practices and norms of relations. Only with the formation of a new type of state (after the conclusion of the Peace of Westphalia in 1648) with sovereignty and centralization of political power did the rapid development of national social capital begin. The intensity of the formation of social interaction networks increases many times over against the background of the existence of a single system of norms of behavior, rules for resolving conflicts, a single system of goals, etc.

The unity of the space of norms, ideas and rules of interaction serves as a factor stimulating the process of accumulation of social capital at the global level. The presence of one superpower, which has disproportionately large economic, political and military influence, forms a unipolar world. The concept of unipolarity gives rise to discussions. Many of its aspects are discussed: from what specific parameters can be used to determine the beginning and end of the unipolarity period, to a discussion of its very possibility.

From the point of view of our analysis, the following is important: although within the framework of a unipolar system the leader builds a hierarchical structure of relations between countries based on his goals, this helps the process of accumulation of global social capital, since actors from different countries negotiate and carry out other actions in accordance with predetermined status positions, avoiding wasting time and money on political competition.

From the early 1990s to the late 2000s, the United States was the undisputed dominant force, forming a single global system of norms of behavior in the world space. In such conditions, the accumulation of global social capital was carried out at a rapid pace, but was not fair, since due to political and economic ties with the dominant player, only some countries received competitive advantages in the formation of social and financial capital. Moreover, the United States often used the opportunity to reduce the social capital of undesirable countries by introducing sanctions that disrupted existing international networks of interactions. However, with the rapid economic and political development of a number of countries (Russia, China, Brazil, etc.), the economic hegemony of the United States was disrupted. The example of China is particularly illustrative, with its share in the global economy in 2000 amounting to 3.56%, and in 2023 - 16.67%. At the same time, the share of US GDP in the global economy over the same period decreased from 30.27 to 25.98%.

In the 2010s, the process of forming a multipolar system began, allowing the existence of several leaders with their own sets of cooperation norms and goal systems. A multipolar world is not just the presence of several competing centers of economic and political power. It gives rise to different pictures of the world and its interpretations, world markets are divided, and cross-border production chains are broken. The concentration of social capital around competing global players is accompanied by its segmentation, the rupture of previous networks of interaction between actors included in different geopolitical alliances.

In the late 2010s and early 2020s, the fragmentation of the global space crystallized into clearly defined political alliances. Countries such as Russia and China reached a certain threshold level of concentration of geopolitical and global economic significance, which allowed them to offer their vision of the goals and instruments of national development to the countries of the Global South, which also

began to represent a significant economic force. The stress of COVID 19 has intensified internal contradictions in the international relations system. The escalation of the conflict in Ukraine led to an escalation of the geopolitical confrontation and a breakdown in economic ties between Russia and Western countries. The trade war between the United States and China that began in 2018 intensified competition for markets, led to a decrease in the growth rates of both countries and increased volatility in international markets. Israel's military operation in the Gaza Strip, which followed in response to a terrorist attack against its citizens, polarized the world community in terms of political and moral assessment of events in the Middle East.

By linking the above events into a single narrative that describes the internal logic of the process of fragmentation of global social capital, we can imagine the following key stages in the development of international cooperation at the beginning of the 21st century. Economic development has led to the emergence on the world stage of players with sufficient resources and political will to challenge the dominance of the United States. Washington's attempts to maintain its monopolistic dominant position are pushing it to exacerbate relations with new centers of power. Ros t geopolitical conflicts, on the one hand, radically increase the uncertainty of the future, and on the other hand, complicate the establishment of new and development of old social contacts between actors affiliated with different dominant players.

In such conditions, in order to reduce geopolitical uncertainty, countries follow the path of accumulating social capital within the framework of existing political alliances based on their own set of institutional norms and rules of interaction. Quantitative assessment of the dynamics of fragmentation of global social capital is a complex task. Nevertheless, there is evidence of an increase in the number of interaction networks within competing alliances.

The emergence of new and expansion of existing international organizations within the framework of established political alliances. The most obvious example is the expansion of NATO. Since the late 1990s, its new members have become Hungary, Poland, the Czech Republic, Bulgaria, Latvia, Lithuania, Romania, Slovakia, Slovenia, Estonia, Albania, Croatia, Montenegro, North Macedonia, as well as Finland and Sweden. Another example of strengthening international cooperation against the backdrop of increasing geopolitical confrontation is the expansion of the BRICS interstate association, which has been replenished with such new members as Egypt, Iran, the UAE and Ethiopia. The Regional Comprehensive Economic Partnership (RCEP), which initially strengthened business ties among the countries of Southeast Asia, has been expanded to include such countries as Australia, China, India, Japan, South Korea and New Zealand.

Changes in international capital flows. The movement of international financial capital is determined by many economic factors. At the same time, the political and social rapprochement of countries, expressed among other things in an increased propensity to finance projects in certain politically close countries, also plays a major role in shaping the structure of international financial flows. Increased economic activity within political unions has led to the regionalization of international capital flows, that is, to an increase in the volume of investment within certain regions. "Globalization is being replaced by the division of the world market into large segments united by economic and political interests, which leads to the localization of capital flows within certain unions and associations" [21, p. 12]. The regionalization of international capital flows is driven not only by rising geopolitical tensions, but also by the effects of the COVID 19 pandemic [22]. According to the US Bureau of Economic Analysis, in 2023, US companies made \$5.39 trillion in direct investments in almost every country in the world. At the same time, 65% of these investments were made in the economies of five countries within the US orbit of influence: the UK (\$1,057.6 billion), the Netherlands (\$980.4 billion), Luxembourg (\$532.5 billion), Ireland (\$491.2 billion), and Canada (\$451.6 billion).

Regionalization of economic activity. The change in capital flows is accompanied by the regionalization of foreign economic activity. It is not happening as a result of the division of the world along ideological lines, but as a result of the formation of competing political blocs [23]. Other reasons include, among other things, the weakening of the World Trade Organization and the effects of the 2008–2009 financial and economic crisis [24]. Regionalization implies an increase in foreign trade activities of states within political alliances and a reduction outside them.

Intensification of cultural exchange between countries within existing political alliances. Cultural exchange is a multidimensional phenomenon that includes such phenomena as trade in cultural goods, holding international events, translating and publishing foreign literature, tourism, foreign education, etc. Thus, as a result of the sanctions of the United States and European countries against Russia, there was an impoverishment of cultural exchange, expressed in a radical decrease in tourist flows, the number

of jointly held events, as well as interactions between educational organizations. Joint educational and research activities in the form of implementing dual diploma programs, student exchanges under academic mobility programs with universities in the United States and Europe have almost completely ceased against the background of intensified cultural exchange with Asian countries, primarily with China [25].

The situation with migration. Geopolitical turbulence did not fundamentally affect the main migration flows [26]. The main migration destinations remain the countries of Europe (received 94 million people in 2024) and North America (received 61 million people) [source 4]. At the same time, there is a tendency to tighten migration rules, which slows down the process of accumulation of global social capital and contributes to the concentration of interaction networks within the boundaries of political alliances. The expansion of interaction networks within a certain group of countries does not in itself indicate

CONSEQUENCES OF THE FRAGMENTATION OF GLOBAL SOCIAL CAPITAL

Fragmentation of global social capital, being a result of ongoing geopolitical processes, itself begins to determine the behavioral strategies of countries, and therefore the dynamics of global development. A closed cycle with positive feedback is formed: the growth of competition for geopolitical dominance triggers the processes of fragmentation of global social capital; fragmentation of global social capital due to the concentration of interaction networks within political alliances increases geopolitical competition for markets, limited resources, etc. Since it can be expected that the fragmentation process will continue at least in the medium term, the question of its economic and political consequences arises.

Fragmentation of global social capital primarily leads to a change in strategies for its accumulation. After the collapse of the USSR, when China was just embarking on the path of accelerated economic and technological development, and Russia was still facing the path of recovery, the United States, with the support of Europe, became the dominant political regulator of global processes. Under the unipolar structure of the world, the main instrument for accumulating national social capital was the expansion of interaction networks with the world leader (the United States) and/or the countries of the collective West. Such a policy was explained by rational considerations. The return on the growth of national social capital is not a constant value; it can vary greatly, as is the case with the return on invested financial capital. The growth of social capital through the expansion of interaction networks leads to an actual increase in well-being only when accompanied by an intensification of economic activity through an increase in the number and volume of economic transactions. Since the leading states possessed significant material and financial resources, as well as advanced technologies, the expansion of interaction networks with them led to a greater increase in investment and the influx of new technologies than cooperation with other countries.

With the rapid development of China, the restoration of Russia, and the expanding presence of India and Brazil in world markets, the structure of strategic interactions became more complex. New centers of power, possessing significant material and intellectual resources, declared their desire to participate in the formation of global flows of resources and technologies, as well as to propose their own norms and rules of international behavior. This has led to an intensification of geopolitical competition, which has necessitated the choice of a political alliance within which the accumulation of national social capital will continue, as is currently the case. In addition, with the transition from a unipolar to a multipolar world, the tasks of accumulating national social capital within the existing political alliances have expanded. If in the conditions of a unipolar world, the accumulation of social capital occurred to a greater extent to accelerate economic growth, now it is accumulated in order to strengthen the security and military power of the countries participating in this political alliance.

Slowdown in the implementation of sustainable development goals. The meaning of the SDGs formulated by the UN in 2015 is to achieve a state in which the current consumption of humanity will not reduce the consumption capabilities of future generations, which implies, among other things, minimizing the man-made impact on the environment, maximum refusal to use non-renewable natural resources, etc. The scale and complexity of modern challenges require strategic interaction at the global level, and their parrying requires significant financial resources and time.

The fragmentation of global social capital shifts the focus of governments from long-term strategic universal goals to medium- and short-term national tasks, slowing down the process of establishing a sustainable development economy. The promotion of such national goals as strengthening the country's defense capability, maintaining and strengthening technological leadership, and defending national interests in the global political space leads to a decrease in interest in the transition to a new

socio-economic organization. Against the backdrop of escalating geopolitical confrontation and growing political risks, governments are not ready to support expensive projects to promote sustainable development principles in the same volume [27].

Due to the high uncertainty of the outcome of current geopolitical and military conflicts in the world, it is currently difficult to assess how much the transition to sustainable development will be slowed down. At the same time, it can be argued that the slowdown will have virtually no effect on the transformation of the energy sector towards its "greening". The use of renewable energy sources is considered by Western countries not only from the standpoint of compliance with the principles of sustainable development, but also its importance as a tool for increasing national energy security in the context of escalating geopolitical conflicts (for more details, see [28]).

Increasing the use of renewable energy sources diversifies the national energy balance, reduces the dependence of Western countries on external supplies of energy resources, increases the reliability of energy supply, and allows for the development of remote settlements through the introduction of small-scale distributed generation. All of the above is consistent with the objectives of achieving energy sovereignty by energy-dependent countries, which is confirmed by the continued positive dynamics of the development of renewable energy sources. Considering the impact of growing geopolitical tensions on the dynamics of the development of sustainable energy, Chinese researchers come to a similar conclusion, citing, among other things, such a case as the conflict between Russia and Ukraine, which stimulates Western countries' investments in "green" energy [29].

Fragmentation of global social capital may strengthen the downward trend in global GDP growth. First, the breakdown of interaction networks between leading economies and the growth of trade barriers reduce the efficiency of the global economy. Secondly, the growth of military spending, all other things being equal, reduces the production of both consumer and investment goods and services, which slows down the reproduction processes in the economy. Thirdly, geopolitical turbulence and global fragmentation increase the risks for economic activity, which increases the required rate of return on invested capital, and this, in turn, reduces investment activity, resulting in a slowdown in the rate of economic development.

Despite the generally negative impact of the fragmentation of global social capital on the rate of global economic growth, at least two processes can be identified that have a beneficial effect on the development of the world economy. The aggravation of geopolitical competition between centers of power stimulates leading countries to intensify the expansion of interaction networks with developing countries, thereby increasing their negotiating positions. The process of growth of social capital in developing countries will accelerate their economic development, which, against the background of a slowdown in economic growth in leading countries, will lead to a decrease in the level of inequality in the world. In addition, the intensification of the struggle for global dominance will stimulate innovation activities necessary to maintain both the military and economic leadership of dominant countries. Increased innovation in the medium and long term can improve labor productivity and ensure economic growth.

Conclusion

The fragmentation of global social capital is a natural process caused by the reduction of the gap in the technological and economic development of countries. In the conditions of a unipolar world with significant inequality in the distribution of technology and financial capital between countries, there were economic and political incentives to intensify the accumulation of national social capital through the development of networks of interaction with the dominant player, which in a single world field formed global social capital. The accelerated development of a number of countries reduced or completely leveled the inequality in the distribution of resources, thereby exacerbating geopolitical competition for dominance and forming a multipolar world order.

The formation of a multipolar world and the intensification of geopolitical confrontation led to a partial rupture of interaction networks between actors belonging to competing centers of power, as well as to a change in the strategy of accumulation of national social capital, now based on the concept of increasing interactions with representatives of friendly countries, bearers of similar norms and rules of behavior and communication. The process of fragmentation of the geopolitical space, which launched the fragmentation of global social capital, is self-sustaining, since it leads to a change in the structure of comparative costs of forming new networks of interaction with different countries. If countries are part of one geopolitical alliance, these costs will decrease against the background of a radical increase in the time and financial costs of forming new networks of interaction with representatives of competing geopolitical unions.

Taking into account the ongoing fragmentation of global social capital, the national socio-economic strategy must be developed based on the prospects for further growth of the geopolitical confrontation between competing centers of power. At the same time, the existence of a dialectical cyclicity of the processes occurring in society allows us to assume that in the long term, against the background of overcoming ideological differences between countries participating in different geopolitical alliances, as well as the exhaustion of the potential for intensive growth of regional interaction networks, a new stage of accumulation of global social capital will begin.

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Geographical sciences

ECOLOGICAL BALANCE AND SUSTAINABLE DEVELOPMENT: GLOBAL CHALLENGES AND SOLUTIONS

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Abstract

The purpose of this article is to study ecological balance and sustainable development, global challenges, and their solutions. Climate change is one of the main threats to humanity. Due to the increase in greenhouse gases, surface temperatures rise, which negatively affects ecosystems and agriculture. The goal of the UNFCCC is to maintain these gas concentrations at a safe level. Plastic waste plays an important role in environmental pollution. Recycling and reuse of these wastes are regulated in many countries through legislation and tax mechanisms. In European countries, 60-70% of plastic packaging is already recycled. With population growth and industrial development, demand for energy resources also increases. The transition to renewable energy sources has become the main direction in ensuring sustainability in this area.

Keywords: Ecology, Ecological Balance, Natural Resources, Global Problem, Biodiversity, Ozone Layer, Global Warming

Introduction. In the modern era, the preservation of ecological balance, the efficient use of natural resources, and the protection of the environment from pollution have become global problems. Demographic growth, rising consumption, climate change, and the depletion of natural resources create serious pressures on the environment. [1, p. 1]

In response to these challenges, the sustainable development model is recognized as the main approach to ensuring balance between the economy, society, and the environment. At present, tools of cooperation at global and national levels are being applied in this field.

Air pollution remains a serious ecological and health risk. The World Health Assembly has approved a roadmap covering the expansion of information databases, monitoring, and international cooperation. To prevent transport-related pollution, many countries have moved to Euro standards and expanded the use of alternative energy sources [4, p.2].

The protection of water resources is also among the priorities. Their efficient management is reflected in the UN 2030 Sustainable Development Goals and the Paris Agreement. For this purpose, pollution prevention, diagnostic analyses of transboundary waters, and various projects are being implemented. To combat land degradation and desertification, awareness-raising among local communities, early warning systems, and afforestation measures are carried out. For biodiversity protection, protected areas are being expanded, rare species preserved, and projects implemented under international conventions [4, p.3].

Amid increasing urbanization, expanding green zones and preserving ecological balance are vital to preventing ecological problems. According to UN recommendations, green space per capita in cities should not be less than 9 m². [4, 4p].

The main part.

Ecological problems can pose serious threats. These can be divided into three groups by scale:

1. Global ecological problems (ozone layer changes, rising carbon dioxide, deforestation, etc.).
2. Regional and interregional problems (desertification, depletion of natural resources, etc.).
3. National problems that may expand beyond one country (pollution of internal waters and territories, population growth, and urban expansion) [2, p.90].

To assess the scale of the ecological crisis, one must examine the state of the earth's soil layer, atmosphere, biosphere, hydrosphere, and several related issues:

- Loss of arable land – In human history, about 20 million km² of agricultural land has been lost. This is linked to construction, mining, and other non-agricultural activities that release technogenic substances into the environment.

- *Air pollution and ozone depletion* – The rise in toxic gases weakens the ozone layer, leading to potential collapse. Ozone, the triatomic form of oxygen, forms in the upper atmosphere under solar UV radiation. Since free oxygen appeared in the atmosphere, ozone synthesis began in the upper layers. Its depletion is associated with solar activity, volcanic eruptions, and human activity. Industrial and transport pollution have caused a 5% decline in ozone levels in recent decades. The 1981 eruption of El Chichón also contributed. Chlorine, nitrogen, and carbon compounds are major ozone-depleting agents. Chlorine is the most dangerous catalyst, capable of destroying up to 100,000 ozone molecules during its atmospheric lifetime. The increase in chlorofluorocarbons (CFCs) used in refrigerators has accelerated this process [3, p.136].

- *Biodiversity loss* – Reduction of plant and animal populations, extinction of some species, and weakening of vegetation threaten oxygen levels and ecosystems.

- *Water pollution* – Due to industrial development and political ambitions, rivers, lakes, seas, oceans, and groundwater sources are being contaminated, often becoming unsuitable for use.

According to UN reports, humanity spent \$40 billion on environmental health measures in 1970, \$135 billion in 1980, \$150 billion in 1990, and \$250 billion in 2000. The 1992 UN Rio de Janeiro Conference on Environment adopted the "Agenda 21" document, recommending an annual average of \$600 billion for environmental protection and improvement.

Ecological problems can only be solved through the joint efforts of all nations. In addition to government measures, international and local organizations must play a greater role.

International organizations can contribute to solving global environmental problems by:

- Mobilizing existing resources of countries;
- Taking concrete steps at the global level;
- Sharing the latest environmental data with the public;
- Developing economic and legal frameworks for solutions;
- Redirecting military expenditures toward environmental defense measures;
- Expanding cooperation through organizations and conferences;
- Supporting COP initiatives (most recently hosted successfully by Azerbaijan in November 2024) and similar efforts.

Conclusion. It is hoped that by implementing the steps listed above, along with many others, our nature and planet can be saved from ecological crisis and disaster threats. Global warming may decrease, and our world will become more beautiful. Protecting the Earth is a duty and responsibility for every human being!

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Historical sciences

A BRIEF OVERVIEW OF THE DEVELOPMENT OF THE PRESS IN AZERBAIJAN

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Abstract

The press plays a pivotal role in shaping national identity, fostering political awareness, and promoting cultural development. Azerbaijan, a country with a rich history and diverse cultural tapestry, has experienced a dynamic evolution of its press from past times to the modern digital era. This article explores the development of the Azerbaijani press, highlighting key historical milestones, challenges faced, and its role in shaping Azerbaijani society.

The history of the press in Azerbaijan began with the publication of *Akinchi*, the country's first Azerbaijani-language newspaper, by Hasan bey Zardabi in the late 19th century, which laid the foundation for Azerbaijani journalism and emphasized cultural identity and social progress. Throughout the late 19th and early 20th centuries, the press served as a platform for intellectual discourse, demands for autonomy, and cultural rights, with publications like "Ziya" in Tbilisi and numerous outlets during the Azerbaijan Democratic Republic era promoting freedom of speech and civil rights. The post-Soviet period, particularly the 1990s and 21st century, witnessed a proliferation of newspapers, magazines, and television channels, with prominent outlets advocating for democratic reforms, transparency, and socio-economic development.

Keywords: publications, "Akinchi", newspaper, magazine, national journalism, mass media, national independence, ideas, democratic reforms.

Early Beginning

The roots of Azerbaijani journalism can be traced back to the early 19th century, during the period of Russian and Persian influence over the region. However, the dissemination of information and ideas predates formal newspapers, with oral traditions, poetry, and literary works serving as mediums for social commentary. The first printed materials in Azerbaijani language appeared during this period, often in the form of periodicals and pamphlets aimed at promoting cultural and political awareness. The late 19th and early 20th centuries marked a period of national awakening, with the press playing a crucial role.

The story of the press in Azerbaijan began with *Akinchi*, the first Azerbaijani-language newspaper, published by Hasan bey Zardabi in Baku between 1875 and 1877. This newspaper laid the foundation for Azerbaijani journalism, advocating for cultural identity and social progress. He sought agreement for publication of "Akinchi" newspaper in native language in the period of Tsar's colonial system, after a prolonged struggle. [1] Publishing of this newspaper drew a wide response in the Caucasus. At first editorial staff of the newspaper consisted of only one person. Zardabi was simultaneously the publisher, editor, corrector and typesetter of the newspaper. In 1875-1877, 56 issues of the newspaper were published. For the purpose of arousing interest of wide masses he ought to spread it gratuitously.

Zardabi's "Akinchi" was not merely a news outlet; it served as a platform for advocating education, enlightenment, and social reform. He emphasized the importance of literacy, modern education, and the need for Azerbaijani society to develop its cultural identity independent of foreign influences. His writings addressed issues such as the necessity of learning the Azerbaijani language, improving agricultural practices, and fostering national pride.

Moreover, Zardabi believed in the power of journalism as a tool for national awakening. His work inspired future generations of Azerbaijani journalists and intellectuals, helping to ignite a sense of unity and cultural revival. [2] Despite facing financial difficulties and opposition from conservative circles, Zardabi's dedication to the cause of education and journalism persisted.

His pioneering efforts created a blueprint for subsequent Azerbaijani press and played a crucial role in shaping the national consciousness. The establishment of *Akinchi* marked the beginning of a tradition of independent, socially conscious journalism in Azerbaijan, making Hasan bey Zardabi a

foundational figure in the history of Azerbaijani media and national identity. Publishing the newspaper *Hasan bey* first of all attempted to achieve the main goal – propagation of ideas of the nation's enlightenment. Publishing articles about country life, agriculture irrigation works he wanted to help peasants to overcome illiteracy in agricultural sphere. Creation of national unity was the main principle.

Other influential publications, such as *"Molla Nasreddin"* (1906), emerged as satirical periodicals that addressed societal issues and criticized political authorities, fostering a sense of national consciousness.

During this period, Azerbaijani intellectuals and journalists began to organize and articulate demands for autonomy and cultural rights, often through the press. The press became a platform for discussing issues like education, language preservation, and political reform. [3,5]

In January 1879, the Turkish-language newspaper *"Ziya"* began to be published in Tbilisi. Since 1880, this newspaper has been published under the name *"Ziyayi-Qafqaziyya"*. After publishing 104 issues, the newspaper was closed in 1884. In 1880, the newspaper *"Keshkul"* was published in Tbilisi. The publisher of the newspaper, Jalal Unsizadeh was well versed in European culture. The ideas of *"Keshkul"* were similar to those of *"Akinchi"*. Seyid Azim Shirvani, Firidun bey Kocharli and Mammad agha Shahtakhtinski also cooperated with the newspaper.

In the 1880s and 1890s, newspapers such as *"Kaspiy"*, *"Baku"*, and *"Bakinskiye izvestiya"* were published in Baku in the native language. [4] In connection with the increase in the number of newspapers published in the native language in Baku, Shamakhi, Ganja, and other cities, the first printing houses and lithographies were established. If in 1889 there were 5 printing houses and 1 lithography in Baku, in 1990 the number of printing houses reached 16.

The Democratic Era and the Azerbaijani Democratic Republic

The early 20th century was marked by political upheaval, culminating in the establishment of the Azerbaijani Democratic Republic (ADR) in 1918. The ADR's independence inspired a flourishing of press activity, with numerous newspapers, magazines, and journals emerging to support the newly formed state.

Publications such as *"Azerbaijan"* and *"Kavkaz"* played vital roles in promoting democratic ideals, national unity, and independence. The press also served as a tool for mobilization during the War of Independence and for advocating reforms in social and political spheres.

During the Azerbaijan Democratic Republic, numerous newspapers and magazines were published in various languages. The state's policy regarding the press was based on the principles of freedom of speech and conscience, as well as civil rights. Its legal norms were reflected in the *"Press Charter"* adopted by the parliament on October 30, 1919.

By the decree of the Government of the Azerbaijan Democratic Republic dated November 9, 1918, state control over the content, publication and distribution of mass media was abolished. The government of the republic considered freedom of the press to be one of the necessary conditions for the development of national consciousness and national culture.

In 1918-1920, dozens of newspapers and magazines were published in Baku, Ganja and other cities of the republic. The official publication of the Azerbaijani Government was *"Azerbaijan"* newspaper which was published in Turkish (Azerbaijani) and Russian languages first in Ganja then in Baku. The editor of the Turkish version of this socio-political, literary and economic daily newspaper was Jeyhun and Uzeyir Hajibeyli brothers, and the editor of the Russian version was Shafi bey Rustambeyli. *"News of the Azerbaijani Government"* newspaper published in Azerbaijani and Russian languages was semiofficial publication of the Government. Editions with ideas of the national independence such as *"Sovereignty"* (1918-1920), *"Azerbaijan"* (1918-1920), *"Graceful writings"* (1919), *"Muslimism"* (1917-19), *"Salvation"* (1920), *"Culture"* (1920), *"Land of youths"* (1918), *"Bugle"* (1918-19), *"Bee"* (1919) were published at the times of the Azerbaijan Democratic Republic. Publications of Musavat Party were *"Sovereignty"*, *"Open word"* newspapers in the Azerbaijani language and *"Our way"* in Russian. [5]

In general, the press at the times of the Azerbaijan Democratic Republic was one of the greatest achievements of those years. However, this period was short-lived, as Soviet power was established in Azerbaijan in 1920. The subsequent Soviet regime imposed strict controls on the press, emphasizing propaganda and ideological conformity.

Soviet Era

Under Soviet rule, the Azerbaijani press was transformed into a state-controlled instrument for disseminating communist ideology. Independent journalism was suppressed, and publications were subjected to censorship.

Despite these restrictions, Azerbaijani journalists found ways to subtly address social issues and cultural topics. Newspapers such as *"Kommunist"* and *"Bakı"* (Baku) became the official outlets for state policies, but underground and samizdat publications also circulated among intellectual circles.

The Soviet period saw the expansion of print media infrastructure, with increased literacy campaigns. However, the press's primary role was propagandistic, and independence was virtually nonexistent.

Post-Soviet Revival and Modern Challenges

The dissolution of the Soviet Union in 1991 marked a new era for Azerbaijani media. The country adopted independence, and the press experienced a renaissance characterized by increased pluralism, freedom of expression, and the growth of private media outlets.

The 1990s and early 2000s saw the emergence of numerous newspapers, magazines, and television channels. Notable publications like *"Zerkalo"* (Mirror) and *"Azerbaijan"* magazine became prominent voices advocating for democratic reforms, transparency, and socio-economic development. [6] Despite the challenges, the Azerbaijani press continues to evolve, embracing digital media, online news portals, and social media platforms, reflecting the country's ongoing efforts to balance state interests with freedom of expression.

Conclusion

The history of the Azerbaijani press mirrors the nation's complex political, social, and cultural transformations. From early literary publications to modern digital platforms, Azerbaijani journalism has played an essential role in fostering national identity, promoting social change, and navigating political transitions. Throughout the 19th and early 20th centuries, newspapers and journals became crucial tools for disseminating ideas about independence, modernization, and cultural revival. [7] During periods of political upheaval, the press served as a voice for reformers and revolutionaries, often risking censorship and repression to inform the public. In the Soviet era, Azerbaijani media was heavily influenced by state control, which limited journalistic independence but still allowed for the dissemination of cultural and ideological content aligned with official policies. With Azerbaijan's independence in 1991, the press experienced a resurgence of private and independent media outlets, fostering greater freedom of expression and diverse viewpoints. Today, the Azerbaijani press continues to evolve amidst technological advancements, embracing digital journalism to reach wider audiences both domestically and abroad. As Azerbaijan continues to develop, its press remains a vital instrument for informing the public, encouraging dialogue, and shaping the country's future. It also faces ongoing challenges related to press freedom, censorship, and misinformation, which require careful navigation to ensure a vibrant and responsible media landscape.

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Medical sciences

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SCIENTIFIC AND ANALYTICAL REVIEW OF ETIO-PATHOGENETIC AND CLINICAL-DIAGNOSTIC INDICATORS IN BREAST CANCER

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Abstract

This scientific and analytical work presents modern global and local-regional data on incidence, mortality, lethality and five-year survival of the most common oncological pathology, such as breast cancer. The issues of etiology and pathogenesis, features of distribution, modern principles of diagnostics, including screening, as well as prognosis, preventive measures of this formidable disease are covered in detail. The epidemiological characteristics of this pathology in our republic are given in the context of the regions of the country.

Keywords: oncology, breast cancer, phenotype, biological markers, risk factors, etiopathogenesis, diagnostics, ultrasound, treatment, epidemiology, incidence, mortality, lethality, five-year survival rate, prognosis, prevention.

Breast cancer (BC) is the most common global malignancy and the leading cause of cancer deaths [1]. There is much evidence showing the influence of life style and environmental factors on the development of mammary gland cancer (high-fat diet, alcohol consumption, lack of physical exercise), the elimination of which (primary prevention) may contribute to a decrease in incidence and mortality. Secondary prevention, comprising diagnostic tests (e.g. mammography, ultrasonography, magnetic resonance imaging, breast self-examination, as well as modern and more precise imaging methods) help the early detection of tumours or lesions predisposing to tumours. It is estimated that nearly 70% of malign tumours are caused by environmental factors, whereas in BC this percentage reaches 90-95%. There are national programmes established in many countries to fight cancer, where both types of prevention are stressed as serving to decrease incidence and mortality due to cancers. Cancer prevention is currently playing a key role in the fight against the disease. Behaviour modification, as well as greater awareness among women regarding BC, may significantly contribute towards reducing the incidence of this cancer [2].

Speaking about the diagnostic criteria for making a diagnosis, women complain about the presence of a formation in the mammary gland; enlarged axillary, supra- and subclavian lymph nodes; the presence of skin changes on the mammary gland; swelling of the mammary gland. The history is noteworthy of the presence of cancer in close relatives; early onset of menstruation; age of first pregnancy and first birth, taking oral contraceptives and/or hormone replacement therapy, gynecological diseases. During a physical examination, attention is paid to the symmetry of the location and shape of the mammary glands; level of position of the nipples and their appearance (retraction, deviation to the side); skin condition (hyperemia, swelling, wrinkling, retractions or protrusions on it, narrowing of the areolar field, etc.); presence/absence of pathological discharge from the nipples (quantity, color, duration); presence of swelling of the arm on the affected side. Palpation of the mammary glands is carried out in the vertical and horizontal positions of the subject; regional and cervico-supraclavicular lymph nodes are usually performed in a vertical position [3].

From laboratory tests, if metastatic BC is suspected, it is recommended to perform detailed clinical and biochemical blood tests, and a study of the blood coagulation system. In case of hormone-dependent BC in women under 50 years of age, to assess ovarian function and plan hormone therapy, it is recommended to study the level of follicle-stimulating hormone in the blood serum and the level of total estradiol in the blood. A cytological study is also carried out (an increase in the size of atypical cells up to giant ones, a change in the shape and number of intracellular elements, an increase in the size of the nucleus, its contours, different degrees of maturity of the nucleus and other cell elements, a change in the number and shape of nucleoli); histological examination: histological type of tumor, degree of differentiation (grade - ability to form tubes, nuclear polymorphism, number of mitoses), presence of necrosis, vascular invasion, tumor of infiltrating lymphocytes, presence of calcifications. Immunohistochemical study for key markers: 1) determination of estrogen and progesterone receptors, HER2, Ki67 - it is recommended to evaluate biological markers again at least once during metastasis, if clinically possible; 2) if the result of IHC analysis of HER2 is controversial, the HER2/neu gene amplification should be determined by in situ hybridization; 3) determination of PD-L1 in triple negative BC to decide on the prescription of immunotherapy; 4) if necessary - Cytokeratin 5/6, Calponin-1, E-Cadherin, GCDPF-15, Mammaglobin, p120 and Topoisomerase IIa.

Molecular genetic testing to determine germline BRCA1/2 mutations is indicated in all patients, regardless of age, family history, or type of BC with mBC and during progression to decide whether to prescribe PARP inhibitors (olaparib1 and talazoparib). In women with a positive germline mutation of the BRCA1 or 2 gene, the incidence of BC development before 70 years of age is 45-65%. More often detected: 1) with a burdened family history (close relatives have BC aged ≤ 50 years, BC in a man, ovarian cancer, metastatic prostate cancer, pancreatic cancer); 2) in patients under 45 years of age; 3) in patients under 60 years of age with a triple negative BC phenotype; 4) with primary multiple BC; 5) in patients with HER2 negative BC phenotype who have a high risk of relapse after surgical treatment and neoadjuvant or adjuvant therapy; 6) for BC in men. Comprehensive genomic profiling is carried out in patients with a severe clinical course, aggressive tumors, with a high risk of progression, lack of effect from traditional methods of antitumor treatment [in advanced BC (triple negative and progressive HER2+)] [3].

Instrumental studies: 1) ultrasound of the mammary glands, regional lymph nodes: the presence of a hypoechoic structure of the formation with large/small microcalcifications in the structure, the contours are uneven, stellate, there may be areas of mixed echogenicity, the structure of the node is heterogeneous, increased vascularization is possible; 2) mammography (mammograms in two projections

visualize shapeless heterogeneous compactions with multiple microcalcifications in the structure, pronounced deformation of the stroma, thickening of the skin, nipple-areolar complex, the nipple can be retracted, the presence of enclosed lymph nodes); 3) contrast-enhanced spectral mammography (CESM) method, which consists of performing mammography with soft and hard images after intravenous administration of an iodinated contrast agent. The CESM method is informative in the diagnosis of early forms of BC, allows you to detect pathology in the dense part of the mammary gland, and is used as a differential diagnosis of benign and malignant neoplasms; before the study, creatinine and urea levels in the blood are assessed, an iodine-containing contrast agent is administered intravenously in an amount of 1.0-1.5 ml per kg of the patient's weight; images are taken in two projections, craniocaudal (CC) and media-lateral (MLO), in a period of time from 2 to 7 minutes after administration of the contrast agent; 4) magnetic resonance imaging (MRI) of the mammary glands to assess the local spread of BC for the following indications: age up to 30 years; the presence of mutations in the BRCA1, BRCA2 genes; high radiological density of the mammary glands; the presence of breast implants when it is impossible to perform a high-quality mammographic examination; presence of lobular carcinoma in situ; 5) ductography (in the presence of an intraductal formation behind the nipple, it is carried out to clarify the size and distance of the formation from the nipple-areolar complex); 6) puncture biopsy of a tumor formation (cytological examination reveals an increase in the size of cells up to giant ones, a change in the shape and number of intracellular elements, an increase in the size of the nucleus and its contours, different degrees of maturity of the nucleus and other cell elements, a change in the number and shape of nucleoli); 7) trephine biopsy or sectoral resection of the mammary gland with express histology (histological verification of the tumor: histological type of tumor, degree of differentiation (grade - ability to form tubes, nuclear polymorphism, number of mitoses), absence of necrosis, vascular invasion, tumor of infiltrating lymphocytes, the presence of calcifications; 8) ultrasound of the abdominal organs and retroperitoneal space/ultrasound of the pelvis (with metastatic lesions of the liver, its structure is heterogeneous, rounded in shape with uneven clear contours, with single or multiple formations with a hypoechoic rim along the periphery); 9) computed tomography (CT) or MRI of the abdominal organs with intravenous contrast if the results of ultrasound of the abdominal organs are ambiguous or not very informative; 10) survey X-ray examination of the CT of the chest organs (in case of metastatic lesions of the lungs across all pulmonary fields or in a segment, multiple/single mid-focal shadows with clear contours, of various sizes are determined); 10) scintigraphy of skeletal bones (hyperfixation of an osteotropic drug in foci of pathological bone formation) if metastatic lesions of skeletal bones are suspected to assess the extent of BC prevalence; 11) positron emission tomography (PET) (accumulation of the drug by pathological foci), combined with CT with tumor-tropic radiopharmaceuticals (with or without contrast) (PET-CT) to assess the extent of BC spread in cases where standard methods of staging examinations are ambiguous, especially when locally advanced process, when the detection of metastases fundamentally changes treatment tactics; 12) MRI or CT scan of the brain with IV contrast to exclude metastatic lesions if the presence of metastases in the brain is suspected.

To standardize and simplify the criteria for assessing response to tumor therapy, the international Response Evaluation Criteria in Solid Tumors (RECIST) scale is used. According to RECIST 1.1, the following types of response are distinguished for targeted lesions.

1. Complete response – disappearance of all tumor foci.
2. Partial answer – a decrease in the sum of the largest diameters of each lesion by more than 30%.
3. Stabilization of the disease – reduction of the sum of the largest diameters of each lesions from 20 to 30% (for RECIST 1.0 from 25 to 50%).
4. Progression of the disease – an increase in the sum of the largest diameters of each lesion by more than 20% or the appearance of new tumor lesions.

The overall response of solid tumors to treatment is based on a combination of data on measurable lesions, non-measurable lesions and the appearance or absence of new tumor lesions. The duration of overall response is from the date of documentation of the disease until its progression. Relapse-free interval (time to progression) – from the end of treatment to the date of documented disease progression [3].

As part of outpatient drug therapy, it is recommended to use hormone therapy in the adjuvant mode for patients with hormone-positive BC for at least 5 years (tamoxifen, letrozole, anastrozole, goserelin, triptorelin) and with progression or metastatic luminal BC before progression (tamoxifen, letrozole, anastrozole, goserelin, triptorelin, toremifene, fulvestrant, exemestane, everolimus). The use of bisphosphonate therapy when metastatic bone lesions are detected is recommended for two years

(zoledronic and pamidronic acid, denosumab). CD 4/6 inhibitors (palbociclib, ribociclib, abemaciclib) are recommended for patients with HER2-negative metastatic luminal BC in combination with an aromatase inhibitor or fulvestrant, until progression or unacceptable toxicity develops; the use of monotherapy with Poly(ADP-ribose) polymerase inhibitors (olaparib or talazoparib) is recommended for patients with metastatic BC with germline BRCA1 or BRCA2 mutations, regardless of hormone receptor and HER2 status, as an alternative to chemotherapy. In patients with high-risk BRCA-associated BC, olaparib is prescribed as adjuvant therapy. The use of targeted therapy (trastuzumab) is recommended for patients with early and metastatic HER2-positive BC in combination with chemotherapy, targeted therapy or monotherapy (up to completion of 18 cycles). The use of targeted therapy (lapatinib) is recommended for patients with HER2-positive metastatic BC, either alone or in combination with capecitabine and/or trastuzumab, until progression or development of unacceptable toxicity. The use of capecitabine in the adjuvant treatment of chemo-resistant triple negative BC, or in metastatic BC in combination with lapatinib and hormone therapy.

Indications for radiation therapy: 1) morphologically established diagnosis of malignant neoplasm; 2) in case of relapses, continued growth of the tumor or progression of the disease after previously carried out combined or complex treatment. Methods of radiation therapy: 1) continuous radiation therapy; 2) single-fraction radiation therapy for SRS; fractionated radiation therapy for Single Focal Dose from 1.6 Gy to 12.0 Gy 2-5 fractions per week (standard fractionation, hypofractionation, hyperfractionation, accelerated fractionation, multifractionation). In this case, external beam radiation therapy is carried out 2D, 3D, IMRT, RapidArc, IGRT conformal irradiation Single Focal Dose 1.8-2.0-2.66, 2.67, 5.2 Gy 5 fractions per week up to Total Focal Dose 50 Gy, 42.56 Gy, 40.05 Gy, 25 Gy and 60-70 Gy in independent mode, Total Focal Dose 10-16 Gy ("Boost") in the postoperative mode after organ-sparing operations. A continuous course of radiation therapy is used, using γ -therapy devices or linear accelerators. Tomotherapy is used as a standard fractionation technique for administering single and total focal doses. The main advantage is hypofractionation in Single Focal Dose 2.5 Gy. Intraoperative radiation therapy is used in breast-conserving operations for T1-2N0-1M0. The bed of the removed tumor is irradiated with an electron beam at a dose of 10-20 Gy in order to devitalize the remaining malignant cells [3].

Now, regarding chemotherapy. There are several types of chemotherapy that differ in purpose: 1) neoadjuvant chemotherapy of tumors is prescribed before surgery, in order to reduce an inoperable tumor for surgery, as well as to identify the sensitivity of cancer cells to drugs for further use after surgery; 2) adjuvant chemotherapy is prescribed after surgical treatment to prevent metastasis and reduce the risk of relapse; 3) curative chemotherapy is given to shrink metastatic cancers. Depending on the location and type of tumor, chemotherapy is prescribed according to different regimens and has its own characteristics.

Indications for chemotherapy: 1) cytologically and histologically verified BC; 2) in the treatment of locally advanced tumors; 3) metastases in regional lymph nodes/distant organs - lungs, liver, brain, bone structure; 4) tumor recurrence; 5) a satisfactory blood picture in the patient: normal hemoglobin and hemocrit, the absolute number of granulocytes is more than 200, platelets are more than 100,000; 6) preserved function of the liver, kidneys, respiratory system and cardiovascular system; 7) the possibility of converting an inoperable tumor process into an operable one; 8) patient's refusal to undergo surgery; 9) improvement of long-term treatment results in unfavorable tumor phenotypes (triple negative, HER2-negative cancer).

Contraindications to chemotherapy can be divided into two groups: absolute and relative. Absolute contraindications: hyperthermia >38 degrees; disease in the stage of decompensation (cardiovascular system, respiratory system, liver, kidneys); the presence of acute infectious diseases; mental illness; the ineffectiveness of this type of treatment, confirmed by one or more specialists; tumor decay (threat of bleeding); the patient's serious condition according to the Karnofsky Performance Scale is 50% or less. Relative contraindications: pregnancy up to 16-18 weeks; intoxication of the body; active pulmonary tuberculosis; persistent pathological changes in blood composition (anemia, leukopenia, thrombocytopenia); cachexia.

The rationale for prescribing neoadjuvant systemic therapy for BC is: high probability of latent (micrometastatic) spread; the ability to reduce the amount of surgical intervention within the "clean" resection margins; the ability to evaluate the clinical response to therapy in vivo; availability of accurate pathomorphological assessment of the degree of tumor regression; the possibility of special studies of biopsy tumor material before, during and after completion of primary systemic treatment. For medullary carcinoma and adenoid cystic carcinoma, adjuvant chemotherapy may not be required (in the absence of lymph node involvement).

And a very important and decisive aspect when prescribing adjuvant/neoadjuvant systemic therapy is the molecular biological subtype of BC:

1. Luminal type A. In early BC (T1-2N0M0), hormone therapy is carried out only in the presence of severe concomitant diseases and/or there are absolute contraindications to surgical treatment until the maximum effect is achieved, followed by radiation therapy. For T2-4N1-3M0 locally advanced inoperable BC, it is recommended to prescribe hormone therapy with antiestrogens and aromatase inhibitors; it is advisable to carry out treatment until the maximum effect is achieved with clinical and instrumental assessment every 3 months. At the same time, in most cases, the appointment of adjuvant/neoadjuvant chemotherapy (in addition to hormonal therapy) is possible in the presence of at least two parameters: widespread process (≥ 4 regional lymph nodes affected by metastases; $\geq T3$); GIII; young age; presence of pregnancy; increase in initial Ki67 values during repeat biopsy/postoperative material after neoadjuvant hormone therapy.

2. Luminal B (HER2 negative). Hormone therapy + chemotherapy in most cases. For T1a (≤ 5 mm) and N0 - only adjuvant hormonal therapy. In other cases, chemotherapy with anthracycline- and taxane-containing regimens in addition to hormone therapy. Adding platinum drugs to adjuvant chemotherapy only in the presence of a BRCA1/2 gene mutation.

3. Luminal type B (HER2 positive). Chemotherapy + anti-HER2 therapy + hormone therapy. For T1a (≤ 5 mm) and N0: adjuvant hormone therapy only; chemotherapy and trastuzumab are not indicated. For T1b, c (> 5 mm but ≤ 20 mm) and N0: chemotherapy with paclitaxel (without anthracyclines) in combination with trastuzumab (followed by hormone therapy) is possible. For T2-T4 (> 20 mm) or N+: the first step is anthracyclines, then taxanes + trastuzumab \pm pertuzumab (followed by hormone therapy).

4. HER2 positive (non-luminal). Chemotherapy + anti-HER2 therapy. For T1a (≤ 5 mm) and N0: systemic therapy is not indicated. For T1b (> 5 mm but ≤ 10 mm) and N0: taxane chemotherapy (without anthracyclines) in combination with trastuzumab is possible. For T1c-T4 (> 10 mm) or N+: the first step is anthracyclines, then taxanes + trastuzumab \pm pertuzumab.

5. Triple negative (ductal). Chemotherapy including anthracyclines and taxanes. For T1a (≤ 5 mm) and N0, systemic therapy is not indicated. Adding platinum drugs to adjuvant chemotherapy only in the presence of a BRCA gene mutation. There are also features when prescribing adjuvant chemotherapy to patients who have received neoadjuvant chemotherapy in full.

Also, a very important section is the use of hormone therapy in the adjuvant or neoadjuvant mode. In the premenopausal period, hormone therapy is used as follows. After completion of systemic chemotherapy and continued menstrual function, bilateral oophorectomy or ovarian suppression with luteinizing gonadotropin releasing hormone agonists followed by an anti-estrogen for 5 years is indicated. When menstrual function ceases after receiving courses of chemotherapy and the level of estradiol in the blood is determined, an anti-estrogen is prescribed to confirm true menopause. The following regimens with tamoxifen are used: 1) tamoxifen 20 mg/day orally daily for 5 years; 2) tamoxifen 20 mg/day orally daily, for 10 years, in the presence of at least one unfavorable prognosis factor: age ≤ 35 years, preserved ovarian function after adjuvant chemotherapy, T3-4, involvement of ≥ 4 axillary lymph nodes, GIII, positive HER2, high Ki67; 3) tamoxifen 20 mg/day orally daily for 5 years, then aromatase inhibitors (letrozole 2.5 mg/day orally daily, or anastrozole 1 mg/day orally daily, or exemestane 25 mg/day orally daily) for 5 years. For patients who have achieved stable menopause by the time they stop taking tamoxifen, with at least one poor prognostic factor: age ≤ 35 years, preserved ovarian function after adjuvant chemotherapy, T3-4, involvement of ≥ 4 axillary lymph nodes, GIII, HER2 positive, high Ki67; 4) ovarian suppression 1 + tamoxifen 20 mg/day orally daily / aromatase inhibitors (letrozole 2.5 mg/day orally daily, or anastrozole 1 mg/day orally daily, or exemestane 25 mg/day orally daily) for 5 years, and also if there are indications for adjuvant chemotherapy and preserved ovarian function after completion of chemotherapy; 5) bismacliclib 150 mg 2 times a day in combination with endocrine therapy for the adjuvant treatment of hormone receptor positive (HR+) and human epidermal growth factor receptor type 2 (HER2) negative BC in early stages with involvement of regional lymph nodes and a high risk of relapse [3].

In pre- or perimenopausal women, endocrine therapy with aromatase inhibitors should be combined with a luteinizing hormone-releasing hormone agonist. To achieve ovarian suppression, it is possible to use the following methods: 1) surgical castration (bilateral oophorectomy); the most effective method, causes irreversible shutdown of ovarian function; 2) medicinal (analogues of luteinizing gonadotropic hormone: goserelin 3.6 mg intramuscularly once every 28 days or 10.8 mg subcutaneously once every 12 weeks; or buserelin 3.75 mg intramuscularly once every 28 days; or leuporelin 3.75 mg IM

1 time in 28 days): causes reversible suppression of ovarian function; does not always provide complete suppression of ovarian function, especially in young women; to confirm complete ovarian suppression, it is necessary to determine estradiol in the blood serum; determination of follicle-stimulating hormone during treatment with luteinizing gonadotropic hormone analogues is not informative; aromatase inhibitors should be started 6-8 weeks after the first administration of luteinizing gonadotropin hormone analogues; luteinizing gonadotropin hormone analogues are administered monthly; 3) radical; causes irreversible shutdown of ovarian function. The optimal method of ovarian suppression has not been determined; it is usually prescribed for a period of 2-5 years.

Hormone therapy for BC for menopausal patients is carried out in the following variations: 1) tamoxifen 20 mg/day orally daily for 5 years; 2) aromatase inhibitors (letrozole 2.5 mg/day orally daily, or anastrozole 1 mg/day orally daily, or exemestane 25 mg/day orally daily) for 5 years; in the presence of at least one unfavorable prognosis factor: preserved ovarian function after adjuvant chemotherapy, T3-4, involvement of ≥ 4 axillary lymph nodes, GIII, positive HER2, high Ki67; 3) tamoxifen 20 mg/day orally daily for 10 years; in the presence of at least one unfavorable prognosis factor: preserved ovarian function after adjuvant chemotherapy, T3-4, involvement of ≥ 4 axillary lymph nodes, GIII, positive HER2, high Ki67; 4) tamoxifen 20 mg/day orally daily for 5 years, then aromatase inhibitors (letrozole 2.5 mg/day orally daily, or anastrozole 1 mg/day orally daily, or exemestane 25 mg/day orally daily) for 5 years. For patients who have reached stable menopause by the time they stop taking tamoxifen, in the presence of at least one unfavorable prognosis factor: preserved ovarian function after adjuvant chemotherapy, T3-4, involvement of ≥ 4 axillary lymph nodes, GIII, positive HER2, high Ki67; 5) abemaciclib 150 mg 2 times a day in combination with endocrine therapy for the adjuvant treatment of hormone receptor-positive (HR+) and human epidermal growth factor receptor type 2 receptor-negative (HER2-) BC in the early stages with involvement of regional lymph nodes and a high risk of relapse - continuously for 2 years or until disease relapse or intolerable toxicity develops [3].

And, of course, the surgical method remains one of the leading methods in the treatment of this pathology, and in some cases, it is the only method of treatment (cancer in situ). For BC, the following types of surgical interventions are performed: 1) radical mastectomy according to Halstead - single-block removal of the mammary gland along with the pectoralis major and minor muscles and their fascia, subclavian, axillary and subscapular tissue with lymph nodes within the anatomical cases; 2) extended axillary-thoracic radical mastectomy, single-block removal of the mammary gland with the pectoral muscles, subclavian-axillary and subscapularis tissue, as well as a section of the chest wall with parasternal lymph nodes and internal mammary vessels; 3) functionally sparing operations (modified radical mastectomy - differs from Halstead mastectomy by preserving the pectoralis major muscle; modified Madden mastectomy - differs from Halstead mastectomy by preserving both pectoral muscles; 4) simple mastectomy - removal of the mammary gland with the fascia of the pectoralis major muscle (indications: decaying tumor, advanced age, severe concomitant diseases; 5) radical sectoral resection - removal of the sector along with the tumor, part of the underlying fascia of the pectoralis major and minor muscles, subclavian, axillary, subscapular tissue with lymph nodes in one block; 6) sectoral resection - removal of the breast sector to the underlying fascia (performed only for diagnostic purposes or in combination with radiation therapy for cancer in situ); 7) biopsy of the sentinel lymph node is carried out for diagnostic and therapeutic purposes in the early stages of the disease (1st level lymph nodes are removed with a histological express study to determine the presence of elements of a malignant tumor); detection of sentinel lymph nodes is possible using radioactive colloid and/or blue dye; a combined determination method is preferred.

Indications for performing organ-preserving operations: the presence of a nodular form of cancer up to 2.0 cm in size; absence of multicentricity and multifocality of tumor growth (on mammograms, ultrasound data, clinical examination); slow and moderate growth rate, doubling of tumor size no faster than 3 months (according to medical history); a favorable ratio of the size of the mammary gland and the tumor to obtain a good cosmetic result of the operation; absence of distant metastases; the presence of single metastases in the axillary region is acceptable; the patient's desire to preserve the mammary gland; satisfactory objective tumor response (partial and complete tumor regression) to previous neoadjuvant systemic treatment.

Reconstructive operations can be performed for stages I-III of BC at the request of the patient at any tumor location: 1) reconstruction (primary or delayed) of the mammary gland using an endoprosthesis (implant) (this type of operation involves the installation of a temporary (expander) or permanent prosthesis under the pectoralis major muscle, which allows compensation for the defect due to its volume, after mastectomy); 2) one-stage reconstruction: a skin-skin-sparing mastectomy is

performed with the fascia of the pectoralis major muscle (if tumor cells are detected in the tissue behind the nipple during express histological examination, the nipple with the areola is removed); 3) reconstruction (primary or delayed) of the mammary gland using one's own tissues (autoplasty); this type of reconstruction involves replacing the defect using one's own tissues; basically, 2 types of operations are used - breast reconstruction by replacing with a TRAM flap (using a flap based on the rectus abdominis muscles) and breast reconstruction by replacing with a thoracodorsal flap, which is used in combination with an endoprosthesis.

Types of surgical interventions for metastatic BC: 1) sanitary/simple mastectomy (if there is a threat of bleeding for health reasons); 2) open liver biopsy (diagnostic surgery for suspected liver metastases); 3) other diagnostic manipulations on the liver (liver resection in the presence of single metastatic foci in the liver); 4) excision of the affected area or tissue of the meninges (in the presence of solitary metastatic foci of the meninges); 5) other types of excision or destruction of the damaged area or brain tissue (in the presence of solitary metastatic foci in the brain); 6) precision resection of a segment of the lung (in the presence of solitary metastatic foci in the lungs); 7) laparoscopic salpingo-oophorectomy (prophylactic bilateral removal of appendages for hormone-dependent BC tumors in premenopausal patients); 8) total hysterectomy with appendages (for metastatic lesions of the ovaries, uterine body); 9) electrochemotherapy for intradermal metastatic lesions (combination treatment that uses the administration of chemotherapeutic drugs in association with electroporation of the cell membrane).

Contraindications to surgical treatment for BC: the patient has signs of inoperability and severe concomitant pathology; distant metastases, the presence of a disseminated tumor process; synchronously existing and widespread inoperable tumor process of another localization, for example lung cancer, etc.; chronic decompensated and/or acute functional disorders of the respiratory, cardiovascular, urinary system, gastrointestinal tract; allergy to drugs used in general anesthesia.

Also, a very important point is preventive measures for BC. Primary prevention of BC is the prevention of the disease by studying the etiological and risk factors (normalization of family life, timely implementation of childbearing, breastfeeding the baby, avoiding marriages in cases of mutual cancer). Secondary prevention of BC is the early detection and treatment of precancerous diseases of the mammary glands. Tertiary prevention is prevention, early diagnosis and treatment of relapses and metastases; using a nutritious diet rich in vitamins and proteins, giving up bad habits (smoking, drinking alcohol), preventing viral infections and concomitant diseases, regular preventive examinations with an oncologist, regular diagnostic procedures (radiography of the lungs, ultrasound of the liver, kidneys, neck lymph nodes).

Prophylactic mastectomy - risk-reducing surgeries, such as mastectomy with reconstruction, may be offered to women at risk. The risk of developing BC is reduced by approximately 90-95%, however, absolute guarantees regarding the occurrence of BC in the future are impossible. Indications for performing bilateral prophylactic mastectomy in women who do not currently have BC (in order to reduce the risk of developing primary BC): mutations of the BRCA1 and BRCA2 genes; family history (presence of BC in first- and second-line relatives) without a proven mutation; histological risk factors are atypical ductal or lobular hyperplasia. Indications for performing prophylactic contralateral mastectomy in women with current or past BC: newly diagnosed unilateral BC stage I-II, or a history of stage I-II BC (in order to reduce the risk of developing cancer in the contralateral mammary gland and achieving symmetry with the operated mammary gland); lobular carcinoma in situ. Contraindications for use: age over 70 years; general contraindications to surgical treatment; synchronous and metachronous malignant tumors, with the exception of skin cancer [3].

Next, of course, it is necessary to discuss in detail the issue of BC screening. The key concept of BC screening is the detection of oncological pathology in the early stages, when the prognosis is most favorable and allows you to get the best long-term treatment results. A preventive examination always has advantages over a diagnostic examination when symptoms of the disease are already present. At the same time, upon receipt of the M2 and M3 indices according to the BI-RADS classification, it is possible to timely additionally examine these patients and, if necessary, take them to the dispensary record by a district mammologist with effective dispensary examinations and treatment of precancerous breast diseases. Along with this, it must be understood that the main conditions for screening for BC are the availability of trained personnel and a standardized approach to identifying the trait under study and evaluating the results. The methods used should be sufficiently simple, reliable and reproducible, and also have sufficient sensitivity and high specificity. Such qualities are fully possessed by modern digital mammography [4,5,6].

Now, regarding this pathology in our country at the republican level. BC ranks first in the structure of the frequency of malignant neoplasms in both sexes in the population with a share of 14.9% (14.7% in 2022). This situation has been stable since 2004, in addition, BC ranks first and stably remains in this position in the structure of female oncopathology.

The incidence of BC in 2023 as a whole in the country increased to 27.7 per 100 thousand of the population with a growth rate of 4.3% compared to the previous year (in 2022 - 26.5). In the structure of cases, BC ranks first in the absolute majority of regions and cities of the country [7].

The incidence of BC in 12 regions of the country is higher than the national average (27.7 per 100 thousand of the population). The top three regions by this indicator are North Kazakhstan - 45.1; East Kazakhstan - 41.7 and Karaganda - 40.4. Next come: Kostanay - 39.1; Abay - 38.1; Pavlodar - 37.5; the city of Almaty - 36.2; Akmola - 35.9; the city of Astana - 34.3; Ulytau - 33.4; West Kazakhstan - 28.7 and Aktobe - 28.4 regions. This indicator is below the national average in 8 regions: Turkestan - 11.4 (the lowest level); Zhambyl - 15.8; Mangistau - 16.7; the city of Shymkent - 17.9; Almaty - 20.0; Kyzylorda - 20.2; Atyrau - 22.5 and Zhetysu - 22.8 per 100 thousand population. Mortality from this pathology was 5.3 per 100 thousand population. In the structure of causes of death in women in 2023, this pathology continues to occupy a leading position (1st rank place), amounting to 17.3% or 1056 people (17.2% and 1060 women, respectively).

The regions with the BC mortality rate above the national average (5.3 per 100,000 population) are: East Kazakhstan - 9.6 (maximum level); Pavlodar - 8.2; the city of Almaty - 7.8; Abay - 6.7; the city of Astana - 6.5; West Kazakhstan - 6.2; Kostanay - 6.1; Karaganda and North Kazakhstan - 5.6 and Akmola - 5.5 regions of the country. The lowest rates were recorded in Turkestan - 2.3 (minimum level); Ulytau - 3.2; Aktobe - 3.4; Atyrau - 3.6; Zhetysu - 3.7; Mangistau - 4.0; Kyzylorda - 4.3; Almaty - 4.6; in the city of Shymkent - 4.7; in Zhambyl - 4.8 regions per 100 thousand population [7].

The number of deaths from BC, not registered with oncology organizations and established posthumously in the Republic of Kazakhstan in 2023 amounted to 4 people; at the same time, the specific weight was 0.1% and this is the 22nd ranking place, as in the previous year.

At the same time, the one-year mortality rate was 3.4%. At the same time, the ratio between one-year mortality and neglect (stage IV) was, as in 2022, 0.7. At the same time, we recall that the farthest from "1" is the worst ratio between the indicators of one-year mortality and neglect.

Now, regarding preventive examinations. It should be noted that during large-scale preventive examinations of the population in 2023, significantly more patients with malignant neoplasms were actively identified than in 2022. This is 25,193 patients against 23,623 patients identified in 2022, i.e. +6.6%. This is due to the further abatement of the epidemiological situation with coronavirus and the increased availability of preventive care for the population. The proportion of patients identified during routine examinations increased from 62.0% to 62.4% of the total number of patients identified per year.

The number of newly identified BC patients registered with oncology organizations in 2023 amounted to 5,426 people (5,101 in 2022).

As for preventive examinations. The absolute number of BC patients identified during routine examinations amounted to 3,072 people (2,822 a year earlier). At the same time, the proportion of those identified during routine examinations increased from 55.3% in 2022 to 56.6% in 2023. At the same time, despite the fact that the absolute number of people diagnosed with this pathology increased from 2474 to 2636 people, the proportion of patients diagnosed with BC at early (I, II) stages decreased from 87.7% to 85.8%. Of course, when analyzing the epidemiological situation, early diagnostic indicators are very important issues.

The regions where the proportion of patients with early stage I of the pathology in question is above the national average (35.8% and 9th place) include the following: Ulytau - 56.8% (the best indicator); Kyzylorda - 50.3%; Turkestan - 47.3%; the city of Shymkent - 46.0%; West Kazakhstan - 45.4%; the city of Astana - 44.6%; Mangistau - 44.2%; North Kazakhstan - 41.4%; Karaganda - 38.7%; Almaty - 38.5%; Pavlodar - 38.1% and East Kazakhstan - 36.1%. The lowest rates of early diagnosis were recorded in the Zhambyl region - only 14.0%; Atyrau - 24.4%; Akmola - 25.2%; the city of Almaty - 26.2%; Kostanay - 27.4%; Zhetysu - 31.4%; Aktobe - 35.0% and Abay - 35.7% regions of the country [7].

The average indicator in the country for detecting patients with BC at early (I and II) stages was 88.4%, and this is a high 4th rank place among all nosological forms of malignant neoplasms.

The regions where the proportion of patients with BC detected at stages I-II is above the average in the republic include the following regions: Atyrau - 94.2%; Aktobe - 92.4%; Kyzylorda - 92.3%; Pavlodar - 92.1%; the city of Shymkent - 92.0%; West Kazakhstan - 91.8%; North Kazakhstan - 91.6%; the city of Astana - 91.3%; Turkestan - 90.9; Ulytau - 90.5%; Almaty and the city of Almaty - 89.0%; Abay - 88.5%.

Mangistau region is on par with the national average. Below the national average are: Karaganda - 79.8%; Kostanay - 81.1%; Akmola - 82.4%; Zhetysu - 86.2%; East Kazakhstan - 86.6%; and Zhambyl - 87.6% of the regions [7].

As can be clearly seen from the above data, there is a very wide range in early diagnosis rates (at stage I of the disease) across the country, from very good to dismal. Of course, it is necessary to take into account migration processes and other factors affecting the early diagnostic rates, but nevertheless, the obtained results give a reason not to stop there, both for oncologists and mammologists, obstetricians-gynecologists, radiologists, and, naturally, for general practitioners, since improving the early diagnostic rates of malignant tumors, as one of the main postulates and one of the main tasks of medicine in general, continues to be relevant today. Among the visual localizations of malignant tumors in the reporting year, the proportion of seven main forms determines the picture of late diagnostics (stages III-IV) and amounts to 13.3% in total, with a decrease compared to the level of the previous year (2022 - 14.2%). At the same time, with BC, the neglect rate was 11.6% (13.8% - in 2022).

The proportion of stage IV BC among all nosological forms of malignant neoplasms was 4.3%. The following indicators were noted by regions of our country: in East Kazakhstan - 8.4% (the worst result); Karaganda - 7.4%; Mangistau - 6.2%; Kyzylorda - 5.9%; Almaty - 5.3%; Atyrau - 5.1%; Akmola and Kostanay - 5.0%. At the same time, the lowest neglect of this cancer localization was established in the West Kazakhstan region - 2.1% [7].

The morphological verification rate of the disease in the country was 99.4%. At the same time, the leaders in this aspect with a 100% indicator are Almaty, Zhambyl, Mangistau, North Kazakhstan, Ulytau regions and the city of Shymkent. Next come: the city of Astana and the Karaganda region (99.8%); East Kazakhstan (99.7%); the city of Almaty, Turkestan and Abay regions (99.6%); West Kazakhstan (99.5%). At parity with the national average are Kostanay and Atyrau regions. Then come: Aktobe (98.9%); Pavlodar (98.2%); Zhetysu (98.1%); Akmola (97.8%); Kyzylorda (97.0% - the worst indicator in the republic) regions.

The total number of patients with malignant neoplasms registered with specialized oncology organizations of the republic continued to grow and by the end of 2023 amounted to 218,186 people, with an increase of 6.0% compared to the level of the previous year (2022 - 205,822, +5.8%). The overall incidence rate of malignant neoplasms increased by 3.9%, from 1055.3 to 1096.4 per 100 thousand people. The growth of this indicator is due to both the increase in the incidence and detection of pathology, and the increase in the survival rate of cancer patients. In addition, statistical data on patients diagnosed with malignant neoplasms, who have been under observation for 5 years or more, and continue to be observed in 2023, showed that the number of patients under observation by oncological organizations in Kazakhstan for over five years continued to grow and at the end of the reporting year amounted to 117,616 people, with an increase of 6.2% (2022 - 110,790 people, +6.6%) (form. No. 7).

It is impossible to ignore such an important clinical aspect as the coverage of patients with a diagnosis of BC in the Republic of Kazakhstan with special treatment.

In 2023, the number of hospitalizations for all nosological forms of malignant tumors in the country's oncology organizations amounted to 108,252 cases (2022 - 101,095), with an increase of 7.1% compared to the previous year, which is associated with a constant increase in the number of cancer patients, improved standardization of oncology care, and the development of palliative and rehabilitation services.

At the end of 2023, the absolute number of BC patients who completed specialized treatment amounted to 3,419 people, continuing treatment - 1,729 patients. The following results were obtained in percentage terms by methods and types of treatment: 40.9% of patients received complex treatment, 21.8% received only surgical treatment, 20.0% received only drug treatment, 12.6% received combined treatment, 1.1% received only radiation treatment, 0.7% received chemoradiation treatment.

Next, regarding the five-year survival rate of patients. As for BC, at the end of 2023, 48,496 people were registered with the dispensary, or 243.7 per 100 thousand of the population. At the end of 2022, there were 45,728 patients, or 234.5 per 100 thousand of the population, respectively.

At the same time, the lethality of the observed contingents decreased slightly from 2.3% in 2022 to 2.2 in 2023.

The five-year survival rate of patients with BC was 57.7% in 2023 and 57.1% in 2022 [7].

Mass screening to identify BC patients should mainly involve healthy women without any signs of the disease or symptoms. Screening not only helps to detect hidden forms of cancer that can be treated, but also has psychological value for women. As a result of screening, women are convinced that they do not have BC, and this is the most important potential success of such programs. While the ultimate goal

of screening is to reduce BC mortality, its immediate goal is to detect cancer before clinical manifestation. However, BC is a heterogeneous disease, which can significantly affect the effectiveness of screening. Screening models for BC are usually based on the fact that the majority of detected tumors are invasive cancers in the early stage of progression. In addition, it must be taken into account that the detection of cancer (or its precursors) before clinical manifestation increases the risk of false positive diagnosis [8,9].

Mammography has a sensitivity of 95% and a specificity of 97%. These indicators decrease when examining women with denser mammary glands (young age, use of hormone therapy), with low quality mammography, and also with insufficient qualifications of the radiologist. Detection of high-grade invasive cancer by screening, when the tumor is not yet detected by clinical examination (palpation), means the possibility of reducing mortality from BC [10].

Preventive screening for early detection of BC in the Republic of Kazakhstan includes [11]:

1) mammography of both mammary glands in two projections - direct and oblique in the mammography room of the city, district polyclinic (mobile medical complex). All digital mammograms in the presence of a system for archiving and transferring medical images are copied to CDs and other electronic media and transferred to the server of the mammography room of the Cancer Center using specialized licensed software integrated between medical organizations; in case of impossibility of digital transmission - they are printed on X-ray film at a scale of 1:1 - 100% (1 patient - 1 set - 2 or 4 mammograms) with subsequent transfer to the mammography room of the Cancer Center;

2) interpretation of mammograms according to the BI-RADS classification (M0t, M0d, M1, M2, M3, M4, M5) by two or more independent radiologists of the same medical organization - double reading or different medical organizations: a radiologist of the mammography room city, district polyclinic (mobile medical complex) - the first reading, and the radiologist of the mammography room of the Cancer Center - the second reading;

3) in-depth diagnostics - targeted mammography, ultrasound examination (hereinafter - ultrasound) of the mammary glands, trepanobiopsy, including under ultrasound or stereotaxic control for histological examination, which is carried out in case of detection of pathological changes on mammograms (M0d) in the mammography room of the Cancer Center.

✓ An average medical worker or a responsible person of the organization of outpatient care sends the patient for mammography to the district, city polyclinic.

✓ The X-ray laboratory assistant of the mammography room of the city, district polyclinic (mobile medical complex) performs mammography, fills out a referral for double reading of mammograms and transmits the referral through information interaction.

✓ Radiologist of the mammography office of the city, district polyclinic (mobile medical complex): fulfills the requirements for the safety and quality of mammographic examinations; evaluates the quality of the images provided and the correctness of the installation; performs repeated mammography in the M0t category (technical errors of mammography); determines the radiological density of the mammary glands on the ACR scale (A, B, C, D) indicating this parameter in the study protocol; conducts the first reading of mammograms with interpretation of the BI-RADS classification results. In the M0d category (undetermined or suspicious radiological changes requiring additional examination), the study protocol indicates the predominant pathology: education, asymmetry, violation of architectonics, microcalcifications; sends mammograms, electronic copies of mammograms through the archiving system and transfer of medical images to the workplace of the mammography office of the Cancer Center together with directions for double reading of mammograms; directs low-dose CT images through the system of archiving and transferring medical images to the workplace of the CT office of the Cancer Center together with copies of images recorded on CD-ROMs or other electronic media and directions for double reading.

✓ The radiologist of the mammography room of the Cancer Center: evaluates the quality of the provided images and the correctness of the styling. Viewing digital X-ray images transferred to the server or on digital media (CD, DVD) is carried out on a monitor for interpreting digital X-ray images with a resolution of at least 5 megapixels, which has a certified grayscale transmission in accordance with the DICOM standard; conducts a double (second) reading of mammograms with the interpretation of the results according to the BI-RADS classification, using, if necessary, archival images. Organizes the third reading according to indications. With double reading, an independent interpretation of the images is carried out (blinding method - the second radiologist does not know the results of the first reading); in the M0m category (technical errors in mammography), recommends repeat mammography; in the M0d category (uncertain or suspicious radiographic changes requiring additional examination), the study

protocol indicates the predominant pathology: education; asymmetry, violation of architectonics, microcalcifications; recommends that the outpatient care organization, according to indications, invite the patient for in-depth diagnostics (targeted mammography, ultrasound of the mammary glands, trephine biopsy, including under ultrasound or stereotaxic control, followed by histological examination of the material); collects and archives all mammograms (films and electronic media) made as part of the examination. The shelf life of mammograms is at least 3 years after leaving the age subject to a screening study; the results of the double (second) reading are transferred to the outpatient care organizations through information exchange.

✓ Indications for in-depth diagnostics are the conclusions of double reading mammograms M0d (uncertain or suspicious X-ray changes requiring additional examination).

✓ In-depth diagnostics is carried out in two stages. At the first stage, ultrasound is performed, according to indications, targeted mammography, possibly with an increase (with asymmetry, violation of architectonics and the presence of microcalcifications). When visualizing a suspicious pathology (M4 and M5), the second stage is performed - trepanbiopsy, including under ultrasound control and stereotaxic control for histological examination.

✓ Histological examination is carried out in the laboratory of pathomorphology or pathological bureau. Morphological interpretation of the biopsy is carried out in accordance with the recommendations of the World Health Organization.

✓ Physician or responsible person of the outpatient care organization:

1) upon receipt of a mammography result according to the BI-RADS classification:

- in case of M0t (technical errors in mammography) - sends the patient for a second X-ray examination to the mammography room of the city, district polyclinic (mobile medical complex);

- with M0d (undefined or suspicious X-ray changes requiring additional examination) - sends the patient for in-depth diagnostics to the mammography room of the Cancer Center;

- with M1 (no changes detected) - recommends that the patient undergo a follow-up mammography examination after 2 years. With radiological density of the mammary glands, C and D are sent for ultrasound of the mammary glands to exclude a false-negative result of mammography;

- with M2 (benign changes), refer the patient for a consultation with an oncologist (mammologist) of the clinical diagnostic department, followed by a screening mammography examination after 2 years;

- with M3 (probable benign changes) - sends the patient for short-term dynamic radiation observation to the local doctor with the recommendation of control mammography or ultrasound in 6 months;

- with M4 (signs that cause suspicion of malignancy), M5 (practically reliable signs of malignancy) and if it is technically impossible to perform a trepanbiopsy or a biopsy is refused, a referral to an oncologist (mammologist) of the clinical diagnostic department for dynamic observation and decision on the verification of the identified pathology;

2) upon receipt of the result of a histological examination:

- benign education - refers the patient to an oncologist (mammologist) of the clinical diagnostic department for dynamic monitoring, followed by a screening mammography examination after 2 years;

- formation with an indeterminate malignant potential or carcinoma in situ - refers the patient to the Cancer Center for consultation and treatment, followed by dynamic observation by an oncologist (mammologist) of the clinical diagnostic department at the place of her attachment;

- malignant neoplasm - refers the patient to the Cancer Center for treatment and follow-up;

3) communicates the results of the screening examination to the patient in any available way (by telephone, in writing, through electronic means of communication);

4) enters the results of double reading, in-depth diagnostics, histological examination, recommendations of the radiologist of the Cancer Center mammography room into the information system.

Establishing the size of the primary tumor is especially important in screening. Tumor size is an important criterion for evaluating the quality of screening and determining the ability of X-ray mammography to detect non-palpable tumors. Therefore, it is extremely important that pathologists measure tumor diameter as accurately as possible. The smaller the size of the primary tumor, the greater the likelihood of error in determining its size.

In 2023, the number of patients identified during screening examinations increased by 22.5%, from 2,230 to 2,731 people, as a result, the detection rate during screenings increased from 5.9 to 6.8%. During mammographic screening for BC in 2023, 918,464 women of the target group aged 40 to 70 were examined (a year earlier - 808,503 women). During mammographic screening in 2023, 1,875 cases

of BC were detected (2022 - 1,570 cases). The cancer detection rate increased from 1.94 to 2.04 per 1,000 examined. The best result is in the North Kazakhstan region - 3.11 per 1,000 examined women (2022 - 2.31). High detection rates of BC were observed in Aktobe, Almaty, Atyrau, West Kazakhstan, Karaganda, Kostanay regions and in two megacities - the cities of Astana and Almaty. Low detection rates per 1000 examined, compared with the national average, were observed in Abay, Akmol, East Kazakhstan, Zhambyl, Kyzylorda, Mangistau, Pavlodar, Turkestan, Ulytau regions and the city of Shymkent. The lowest result was in Zhambyl region - 0.96 per 1000 examined women (2022 - 0.58). Compared to 2022, an increase in the detection of BC was noted in all regions, with the exception of Akmol (from 2.42 to 1.99), East Kazakhstan (from 2.21 to 1.93), West Kazakhstan (from 2.29 to 2.28), Karaganda (from 2.63 to 2.15), Pavlodar (from 2.15 to 1.51) regions, where a deterioration in results was allowed [7].

Summarizing the above, we can conclude that BC, along with lung cancer, continues to firmly occupy a leading place from year to year among all existing malignant tumors of other localizations. At the same time, taking into account a number of factors, the indicators of early diagnostics do not allow oncologists to "sleep peacefully". Despite the attitude to visually accessible localizations, the percentage of locally advanced forms of this type of tumors still remains quite high. The variability and veiled nature of symptoms, their similarity with various non-core processes (for example, the mastitis-like form of BC, often imitating mastitis), leads to the neglect of the disease. All this requires oncologists, and first of all, primary health care workers and, of course, mammologists, obstetricians and gynecologists, as well as radiologists to increase the level of oncological alertness, inform the population about early symptoms that may indicate this pathology or the onset of proliferative changes and conduct high-tech diagnostic measures, including for the purpose of differential diagnosis and, as a result, timely treatment.

Patients registered with various forms of so-called mastopathy need to regularly visit specialized specialists and, if necessary, undergo examination.

An epidemiological assessment of the situation with BC in our country allows us to say that in the regions there are sometimes significant differences not only in morbidity rates, but also in the parameters of early diagnosis and mortality from this pathology. In connection with the above, this pathology continues to be a serious problem of modern clinical oncology.

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COMPARATIVE ANALYSIS OF THE EFFICACY AND SAFETY OF AB INTERNO CANALOPLASTY (ABiC) AND THE XEN GEL STENT IN THE SURGICAL MANAGEMENT OF PRIMARY OPEN-ANGLE GLAUCOMA

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Abstract

Primary open-angle glaucoma (POAG) is a chronic, progressive disease that represents one of the main causes of irreversible blindness worldwide. Reduction of intraocular pressure (IOP) remains the only proven strategy to delay disease progression, and surgical treatment is considered when conservative therapy fails. In recent years, minimally invasive glaucoma surgery (MIGS) has emerged as an attractive alternative to trabeculectomy, offering a balance between efficacy and safety. Two of the most relevant techniques are the implant-based XEN gel stent and the implant-free ab interno canaloplasty (ABiC), which restore aqueous outflow through different mechanisms. Despite their increasing clinical use, direct comparative data remain limited, particularly in the context of Kazakhstan, where these procedures are not yet widely implemented.

This study provides a comparative analysis of the efficacy and safety of ABiC and XEN implantation in patients with POAG. A systematic review of twenty studies published between 2015 and 2025 was performed, including twelve focused on the XEN gel stent and eight on ab interno canaloplasty. Outcomes were assessed in terms of postoperative IOP reduction and the frequency of complications. The findings demonstrate that both techniques effectively reduce IOP, with the XEN gel stent achieving a slightly greater hypotensive effect, especially in moderate and advanced glaucoma. However, this benefit is accompanied by a higher incidence of complications, most notably hypotony, which varied from transient to clinically significant cases and was occasionally associated with maculopathy or choroidal effusion. Device-related adverse events such as implant exposure, migration, and conjunctival erosion were reported less frequently but represent important safety considerations.

By contrast, ABiC was associated with a more favorable safety profile. The most common complication, microhyphema, occurred in a significant proportion of cases but was transient and resolved spontaneously without additional interventions. A rare but specific event, localized Descemetolysis, was also observed, though it followed a benign course. These characteristics make ABiC particularly suitable for early-stage glaucoma, where safety and preservation of physiological structures are priorities.

The analysis supports the hypothesis that XEN implantation is advantageous for patients with advanced disease requiring substantial IOP lowering, while ABiC may be preferred in earlier stages due to its safety and minimally destructive nature. These results emphasize the importance of individualized surgical planning and may guide the development of treatment algorithms. For Kazakhstan, the study carries particular scientific relevance, providing baseline evidence on two modern techniques that are still underrepresented in local practice and literature. The findings can inform future clinical trials and support the integration of MIGS into national ophthalmology protocols.

Keywords: open-angle glaucoma, ab interno canaloplasty, ABiC, XEN implant, MIGS, intraocular pressure, ophthalmic surgery, complications, hypotony.

Introduction

Primary open-angle glaucoma (POAG) is one of the leading causes of irreversible blindness worldwide. Elevated intraocular pressure (IOP) remains the main modifiable pathogenic factor, and its reduction has been proven effective in slowing the progression of the disease. When medical therapy and laser treatments fail to achieve adequate control, surgical intervention becomes necessary.

In recent years, minimally invasive glaucoma surgery (MIGS) has gained increasing popularity as an alternative to traditional trabeculectomy. These techniques aim to lower IOP with less surgical trauma, shorter recovery times, and a more favorable safety profile. Among them are implant-based approaches,

such as the XEN gel stent, and implant-free procedures, such as ab interno canaloplasty (ABiC), which restores physiological outflow through Schlemm's canal.

Despite the widespread use of both approaches, the literature contains a limited number of comparative studies assessing their efficacy and safety within a unified study design. Direct comparison of MIGS methods with and without an implant, in terms of IOP control and postoperative complication rates—key indicators of surgical success—remains particularly relevant.

Materials and Methods

This meta-analysis included 20 studies: 12 on the use of the XEN gel stent and 8 on ab interno canaloplasty (including the iTrack system) for the treatment of primary open-angle glaucoma (POAG). The analysis evaluated postoperative intraocular pressure (IOP) outcomes, as well as the frequency and nature of complications.

A literature search was performed in the following scientific databases: PubMed, Cochrane Library, Google Scholar, Web of Science, and Scopus. Search queries included the following keywords and their combinations: open-angle glaucoma, ABiC, XEN, MIGS, intraocular pressure, surgery, complications, hypotony.

The review included clinical studies of various designs, predominantly retrospective, observational, and comparative works. Both single-center and multicenter studies were analyzed, including non-interventional and open-label projects. Additionally, case reports and case series, both prospective and retrospective, were reviewed. This comprehensive coverage allowed for a broad assessment of the efficacy and safety of the XEN gel stent and ab interno canaloplasty in the treatment of POAG.

Inclusion criteria were: primary research studies published between 2015 and 2025; patients aged over 18 years with a confirmed diagnosis of POAG according to international or national standards; no history of previous glaucoma surgery; and a minimum postoperative follow-up of at least 6 months.

Exclusion criteria were: studies involving secondary glaucomas (neovascular, uveal, pseudoexfoliative, etc.), angle-closure glaucoma; prior anterior segment surgery (including trabeculectomy or drainage devices); studies published before 2015; studies without full-text availability or lacking a detailed methodology description. Also excluded were patients with a history of corneal refractive surgery, corneal deposits or opacities, progressive age-related macular degeneration, or hypersensitivity to porcine products or glutaraldehyde.

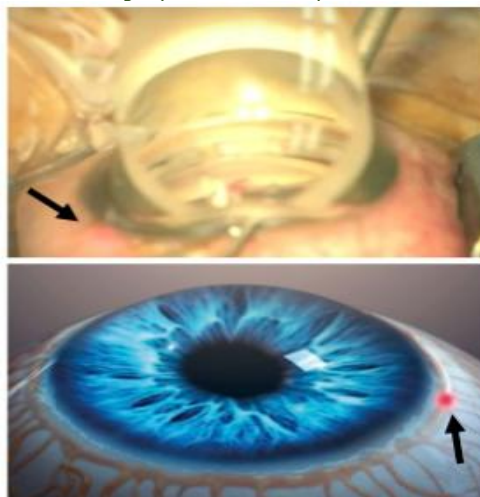


XEN Gel Stent (Allergan, Ireland) — is a novel microinvasive device for the management of open-angle glaucoma. It was officially approved by the U.S. Food and Drug Administration (FDA) on November 28, 2016. In Europe and several other countries, the stent is widely used in cases where medical therapy is ineffective or previous surgical interventions have failed to achieve the desired outcome.

The XEN gel stent is a miniature device measuring 6 mm in length, made from porcine gelatin crosslinked with glutaraldehyde. Its internal lumen diameter is 45 μm , and its external diameter is 150 μm . After implantation, the stent material slightly swells due to hydration, which helps stabilize it within the tissues.

The device is supplied preloaded in a sterile, single-use injector with a 27G needle. Implantation is performed through a clear corneal incision, with the needle passing through the trabecular meshwork and sclera into the subconjunctival space. Once in the correct position, the stent is released by advancing the injector's slider, thereby creating an outflow pathway for aqueous humor from the anterior chamber into the subconjunctival space.

To prevent scarring and improve filtration efficacy, mitomycin C is typically administered subconjunctivally either before or immediately after stent implantation.



Ab Interno Canaloplasty (ABiC) was first described in 2015 as a minimally invasive modification of traditional canaloplasty. The iTrack microcatheter used for this procedure received FDA approval in 2008, while its upgraded version — the iTrack Advance — was FDA-approved in 2023 and has held CE marking since 2022.

Ab interno canaloplasty (ABiC) is performed using the iTrack microcatheter system (Ellex iScience, Fremont, CA, USA), a device approximately 250 μm in diameter, equipped with fiber-optic illumination that allows visualization of the catheter within Schlemm's canal during the procedure. Following a nasal goniotomy, the catheter is inserted into Schlemm's canal and advanced circumferentially for 360 degrees. During withdrawal, stepwise viscodilation of the canal and the distal aqueous outflow system is performed.

This approach enables restoration and enhancement of the physiological aqueous humor outflow pathway without tissue destruction. In addition, it is believed that the procedure reduces prolapse of the inner wall of Schlemm's canal into the collector channels, thereby improving drainage function.

Result

The meta-analysis included 20 studies, 12 of which evaluated the use of the XEN gel stent and 8 of which examined ab interno canaloplasty (including the iTrack system) in the treatment of primary open-angle glaucoma (POAG). The analysis assessed changes in intraocular pressure (IOP) following the procedures, as well as the frequency and types of complications.

The mean postoperative IOP for the XEN group was 13.41 mmHg, with a range from 12.15 to 24.01 mmHg. For canaloplasty (including iTrack), the mean IOP was 14.72 mmHg, ranging from 11.38 to 21.75 mmHg.

Table 1. Mean intraocular pressure by surgical method.

Method	Min IOP	Max IOP	Mean IOP
Overall	11.95	23.41	14.91
XEN	12.15	24.01	13.41
iTrackAb-Interno	11.38	21.75	14.72

The most common complication after XEN implantation was hypotony, defined as an IOP ≤ 5 mmHg. The reported incidence varied widely, from 1.9% (clinically significant) to as high as 90% for transient hypotony observed during the first postoperative week. In some cases, hypotony was accompanied by choroidal effusion, hypotonic maculopathy, and other related disorders.

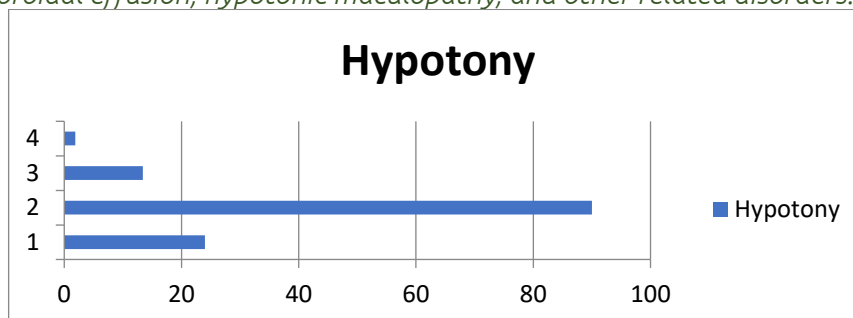


Figure 1. Incidence of hypotony after XEN implantation according to different authors.

Table 2. Rare complications specific to the XEN implant.

Complication	Incidence (%)
Seidel's sign (leakage)	0.9–2.9
Implant exposure / extrusion	1.7–1.9
Conjunctival erosion	1.4
Stent migration or fracture	0.9–1.1

The most common complication of *ab interno* canaloplasty was hyphema or microhyphema, reported in several studies:

- The highest incidence — up to 47% — was reported in the study by Peng Y. [18];
- In the studies by Gallardo M., Jaime M., and Kodoms kaya L. [13; 16; 19; 20], microhyphema and cells in the anterior chamber were noted, predominantly transient in nature.

A rare but specific complication is Descemetolysis (localized detachment of Descemet's membrane), reported as isolated cases in studies [14; 15; 17]. In all cases, the course was favorable and did not require surgical intervention.

Discussion

This review analyzed data from 20 studies on XEN and canaloplasty. The findings confirmed the initial hypothesis: both *ab interno* canaloplasty (ABiC) and XEN gel stent implantation effectively reduce intraocular pressure (IOP) in patients with primary open-angle glaucoma. However, XEN showed a more pronounced IOP reduction, particularly in patients with moderate and advanced disease. This may be due to the creation of an alternative aqueous outflow pathway into the subconjunctival space, which provides a stronger hypotensive effect.

At the same time, ABiC demonstrated a better safety profile, with fewer serious complications such as hypotony, maculopathy, or tissue erosion. The most frequent but reversible complication after canaloplasty was microhyphema. These results are consistent with previously published data, where ABiC has been recommended as a gentler method, particularly in the early stages of glaucoma.

The results of this review increase the clinical relevance of implementing both techniques in ophthalmic practice in Kazakhstan, where data on XEN and *ab interno* canaloplasty have not yet been presented.

This analysis serves as a practical guide for:

- Developing recommendations on the choice of surgical method depending on glaucoma stage and risk profile.
- Planning local clinical studies and clinical trials.
- Creating national treatment protocols that take into account international practice, adapted to the conditions of domestic ophthalmology.

Thus, the review highlights the importance of an individualized approach to surgical decision-making. For more advanced disease, XEN implantation may be considered, while in earlier stages, *ab interno* canaloplasty may be preferred as a less invasive and safer technique.

Conclusion

This review demonstrated that both the XEN gel stent and *ab interno* canaloplasty (including the iTrack system) are effective minimally invasive surgical approaches for lowering intraocular pressure (IOP) in patients with primary open-angle glaucoma.

The XEN technique showed a slightly greater IOP reduction but was more frequently associated with hypotony, including both transient and clinically significant forms. In addition, XEN carries a number of rare but potentially serious complications, such as implant extrusion, Seidel's sign, and endophthalmitis.

In contrast, *ab interno* canaloplasty exhibited a favorable safety profile, with the main complication being hyphema or microhyphema, which were generally benign and self-limiting. A unique but rare complication of canaloplasty was localized Descemetolysis.

Therefore, the choice of surgical approach should consider not only the IOP-lowering efficacy but also the individual risk of complications, patient profile, surgeon's preference, and expected outcomes. The data obtained may help guide a more informed selection of a microinvasive approach in glaucoma management.

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Pedagogical sciences

METHODS AND TOOLS FOR THE AUTOMATION OF OFFICE ACTIVITIES

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Paperless technology requires not only highly efficient methods for processing documents but also advanced capabilities for registering, classifying, and searching them. The methods of storing, navigating, and retrieving documents play a crucial role in ensuring the effectiveness of document management. Documents may be stored in a simple file system, where a directory structure serves as a tool for grouping and navigating documents. Modern operating systems, such as Windows 2010/2012, facilitate navigation by allowing long names for folders and documents. In addition to the file system, document libraries containing document records with attributes and keywords stored in databases are used. Relational DBMS developers (for example, ORACLE) offer other approaches, such as text-based and universal databases [1].

Recently, web technology has been widely used for storing electronic documents. An information repository consists of a set of hypertext pages distributed across nodes of a global (Internet) or corporate (Intranet) network. Each page contains text structured in HTML.

Information processing methods and tools include text editing, spreadsheets, graphics for business and presentations, scheduling of tasks and meetings, generating reports from databases, and multimedia. Information output is achieved through printing documents, publishing them on web servers, in network folders, or on electronic bulletin boards, as well as sending them via telecommunication channels.

In today's information technology market, software solutions for institutional automation can be classified into several categories: functional and integrated office automation packages, group collaboration systems, document workflow management tools, and electronic document management systems (EDMS). Organizing and automating collaborative work with documents is based on groupware and workflow technologies. Groupware methodology focuses on small workgroups and supports a single common task through various means, including network access to files and databases, email, terminal access with file transfer and electronic bulletin boards, and hypertext viewing and interpretation (hypermedia).

Workflow-based automated business process management systems have recently gained particular popularity. They are designed to automate the flow of documents and task assignments, encompassing departments and employees. Such systems are characterized by multi-user support for numerous tasks simultaneously, clear role-based sequencing of task and document execution, and performance monitoring. Workflow technology enables electronic document circulation, task execution tracking, and workload control within an organization. These systems aim not to completely eliminate paper documents but to minimize their internal circulation. Well-known workflow products include Action Workflow (Action Technologies) and Staffware (FCMC plc.).

Electronic Document Management Systems (EDMS) are specialized software solutions that enable the storage, retrieval, selection, and protection of documents throughout their entire life cycle within corporate networks. Document management systems are based on electronic archiving technologies, covering document creation, input, storage, and search within an electronic archive. It should be noted that the classification of automation tools is conditional, as there is a growing trend toward integrating software product functionalities, leading to the "overextension" of traditional concepts.

The primary function of EDMS is to significantly reduce the use of paper documents while ensuring the capability to manage both structured and unstructured electronic information. In some cases, the object of management in EDMS may still be paper documents. In such cases, the system records the document's registration details, brief content, storage location, and other attributes. This registration record can then serve as an electronic counterpart to the actual paper document. The main purpose of using electronic document management technology is to ensure initial access to information for all users who require it.

The core objective of automated document management systems is not merely to account for documents but to control various aspects of organizational activity through them. Documents provide

managers with the information needed for decision-making and serve as a channel for communicating those decisions to executors. Search capabilities in document circulation systems are essential, as they play a critical role in filtering out unnecessary information and accurately finding the required data.

Implementing a new document workflow automation system requires hiring a specialist in the new software platform or training an existing employee. In such systems, document registration is typically carried out by personnel responsible for handling documents before automation. When optical character recognition (OCR) tools are used, the process of filling in registration card fields becomes much easier. A well-structured supporting dictionary system saves registrars time for performing other tasks.

One of the main advantages of using automated systems is the increased speed of information retrieval, which in turn accelerates the management process. Although it is difficult to quantify, its impact is significant. Beyond automating core administrative functions, such systems can also be used to create electronic archives of documents and to establish decision-support systems. Document management systems solve problems related to working with large volumes of information in a network environment and significantly improve user productivity.

Document management systems create a convenient, user-friendly structure for all data stored on the network. As a result, there is no longer a need to repeatedly address issues related to storing documents, protecting them, or defining access rights.

Integrating document management systems into an organization's existing network environment can significantly improve both the efficiency of document handling and overall labor productivity. These systems help address the issues and tasks outlined above, strengthen employee discipline, and ultimately have a positive impact on the quality of management.

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ARTIFICIAL INTELLIGENCE IN EDUCATION: THEORETICAL FOUNDATIONS, PEDAGOGICAL APPLICATIONS AND ETHICAL IMPERATIVES FOR TRANSFORMATIVE LEARNING

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Abstract

The emergence of Artificial Intelligence (AI) within the educational sector has initiated a paradigmatic shift in pedagogical theory and practice. Moving beyond the foundational contributions of Information and Communication Technologies (ICT), AI offers dynamic, data-driven, and context-aware systems capable of tailoring instruction, automating complex assessments, and predicting learner performance. This study examines AI's integration into education, situating it within theoretical learning frameworks and exploring its diverse applications—ranging from adaptive learning platforms and intelligent tutoring systems to predictive analytics and AI-supported accessibility tools. Benefits include enhanced personalization, expanded access to high-quality educational resources, and real-time feedback mechanisms, while challenges involve addressing the digital divide, mitigating algorithmic bias, ensuring data privacy, and preparing educators for meaningful adoption. By applying evidence-based strategies, AI can act as a catalyst for innovation, equity, and lifelong learning in 21st-century classrooms, equipping students with the cognitive and digital skills required for active participation in a technologically complex world [1–4].

1. Introduction

The acceleration of Artificial Intelligence technologies in recent years has had far-reaching implications across all sectors of society, with education increasingly emerging as a priority domain for AI integration. Unlike earlier educational technologies—often limited to static information delivery—AI systems possess the ability to simulate aspects of human cognition, process large-scale data, and generate adaptive responses in real time. These capabilities have the potential to transform curriculum design, instructional delivery, and assessment practices [1].

Globally, educational institutions are confronting challenges that AI is uniquely positioned to address: the demand for differentiated learning pathways, the need for predictive tools to identify at-risk learners, and the expectation for scalable solutions that uphold quality while expanding access [2–4]. However, the adoption of AI in education must be grounded in pedagogical integrity, ensuring that technology serves as an enabler of human learning rather than a substitute for the relational and contextual dimensions of teaching.

The purpose of this paper is to examine the theoretical foundations, practical applications, and ethical considerations of AI in education, drawing upon the lessons learned from ICT integration while addressing AI's unique affordances and challenges. Through a structured analysis, the study highlights how AI can contribute to more inclusive, engaging, and effective learning environments.

2. Foundations of Artificial Intelligence in Modern Educational Practice

2.1 Historical Evolution

The integration of technology in education has evolved from early audiovisual aids to networked learning environments, culminating in the development of AI-driven platforms capable of complex decision-making [1]. Initial AI applications in education during the late 20th century—such as expert systems and basic intelligent tutoring—offered limited interactivity and narrow domain focus. The convergence of machine learning, natural language processing, and cloud computing in the 21st century expanded AI's potential, enabling it to adapt dynamically to individual learner profiles [2–4].

2.2 Defining AI in the Educational Context

In educational settings, AI can be understood as a suite of computational techniques that enable systems to perform tasks traditionally requiring human intelligence—such as understanding language, recognizing patterns, generating recommendations, and making predictions—within pedagogical

frameworks [1]. AI's educational value lies not merely in automation but in its ability to support deep learning processes, enhance teacher decision-making, and foster self-regulated learning among students.

2.3 Alignment with Learning Theories

- **Constructivism:** AI-powered simulations and virtual environments enable experiential, inquiry-driven learning, allowing students to test hypotheses and engage in authentic problem-solving scenarios [5].

- **Connectivism:** Intelligent systems facilitate networked knowledge construction by linking learners to curated, contextually relevant resources and communities [6].

- **Mastery Learning:** Adaptive algorithms support individualized progression, ensuring learners achieve competency before advancing [6].

3. Integrating AI in Education: Pedagogical Advantages and Implementation Challenges

3.1 Pedagogical Advantages

Personalized Learning

Adaptive learning platforms utilize machine learning to analyze learner data and customize instructional content to individual needs, supporting varied paces, preferences, and styles [5].

Enhanced Assessment and Feedback

AI facilitates immediate formative feedback through automated grading and intelligent feedback mechanisms, enabling teachers to intervene promptly [6].

Collaborative Learning

AI tools integrate social learning features, connecting students for group tasks, discussions, and peer review, even in geographically dispersed contexts [5–6].

Teacher Support

By automating administrative tasks—such as attendance tracking, grading, and scheduling—AI frees educators to focus on high-value pedagogical activities [6].

3.2 Implementation Challenges

Digital Divide

Access to AI-enhanced learning remains uneven, with socio-economic disparities limiting device availability, connectivity, and digital literacy [7].

Teacher Preparedness

Without targeted professional development, educators may lack the skills to interpret AI-generated insights and integrate them into pedagogically sound practices [7].

Ethical Concerns

Algorithmic bias, data privacy, and the risk of over-reliance on automation are pressing concerns requiring policy safeguards [8].

4. Categories of AI Tools in Education: Learner-Facing, Teacher-Facing, and System-Facing Applications

Building on ICT's classification into hardware, software, and web-based resources [9–11], AI applications in education can be categorized as follows:

- **Learner-Facing AI:** Intelligent tutoring systems, adaptive learning platforms, AI-enhanced simulations, automated language translation, and accessibility tools.

- **Teacher-Facing AI:** Lesson-planning assistants, grading automation, learning analytics dashboards, and curriculum recommendation engines.

- **System-Facing AI:** Predictive enrollment models, institutional performance analytics, and AI-driven resource allocation systems.

These categories reflect AI's capacity to operate across multiple levels of the educational ecosystem [11].

5. The Transformative Role of AI in 21st-Century Learning Environments

AI fosters a shift toward **learner-centered, competency-based education**, enabling flexible pathways and global collaboration [12–13]. Intelligent platforms support self-paced learning, multilingual content delivery, and the development of higher-order skills such as critical thinking and problem-solving [14].

By extending high-quality learning opportunities to underserved populations, AI can help address systemic inequities. Predictive analytics enable institutions to deploy early interventions, improving retention and success rates [14].

6. Integrating AI Tools in Classroom Practice: Intelligent Content and Adaptive Learning Resources

AI transforms traditional digital resources into dynamic, adaptive learning experiences [15–16]. Intelligent tutoring systems provide personalized guidance and remediation [17]. AI-powered simulations

allow students to manipulate variables and explore complex phenomena in safe, virtual environments [17].

These tools promote active learning, encourage curiosity, and support differentiated instruction, enhancing both engagement and learning outcomes [17].

7. Assessing and Enhancing Learning through AI-Enabled Formative and Summative Evaluation

AI enhances assessment practices by integrating adaptive testing, automated grading, and e-portfolios [18–19]. Digital feedback tools allow educators to deliver personalized commentary through text, audio, or video [20]. Learning analytics identify gaps and strengths, supporting targeted interventions [21].

8. Evaluating the Impact of AI Integration on Student Learning Outcomes

Assessing AI's effectiveness requires a combination of **quantitative metrics** (achievement scores, completion rates, engagement levels) and **qualitative insights** (learner perceptions, teacher feedback) [22–24]. Contextual factors—access, teacher competence, and content quality—must be considered in evaluation design [25–27].

9. Conclusions

AI's integration into education offers unprecedented opportunities for personalization, inclusion, and pedagogical innovation. However, successful adoption depends on equitable access, continuous teacher training, and strong ethical safeguards. Strategic implementation can position AI as a force for educational transformation, equipping learners with the skills and dispositions required for active participation in an interconnected, technology-driven society [1–4].

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ARTIFICIAL INTELLIGENCE IN GREEK PRIMARY EDUCATION: POLICY, PRACTICE, AND PEDAGOGICAL PERSPECTIVES

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Abstract

The integration of Artificial Intelligence (AI) technologies into the context of Greek primary education constitutes a pivotal development within the broader trajectory of digital transformation in contemporary pedagogical environments. This study critically examines the multifaceted dimensions through which AI is currently being embedded into primary schooling in Greece, including national educational policy initiatives, classroom pedagogical practices, professional development of educators, and resultant student learning outcomes. Grounded in an interdisciplinary framework that synthesizes policy analysis, educational technology research, and pedagogical theory, this article elucidates how recent legislative reforms—such as the "Greece 2.0" Recovery and Resilience Plan and the comprehensive 2022 curriculum reform—signal a strategic shift toward the incorporation of AI competencies and intelligent digital tools. Despite promising preliminary applications, including adaptive learning platforms and automated formative assessments, the diffusion of AI within Greek classrooms remains inconsistent, constrained by infrastructural limitations, variable teacher preparedness, and unresolved ethical concerns regarding data privacy and algorithmic bias. The paper advocates for a sustained, systemic approach emphasizing infrastructural investment, ongoing, context-sensitive teacher training, and a critical alignment of AI tools with established pedagogical objectives to harness the full transformative potential of AI-enhanced education in Greece's primary schools.

1. Introduction

The rapid proliferation of Artificial Intelligence (AI) technologies across multiple sectors presents profound implications for contemporary education systems worldwide. In particular, primary education, the foundational stage of formal schooling, stands at a critical juncture for integrating AI-driven innovations that may redefine teaching and learning processes. Within the Greek educational landscape, the initial incorporation of Information and Communication Technologies (ICT) over previous decades has laid the foundational groundwork for digital transformation. However, AI's potential extends beyond the capabilities of traditional ICT, offering qualitatively novel affordances such as adaptive content delivery, predictive analytics, natural language processing, and personalized learner support. These capabilities suggest a paradigm shift towards more individualized, data-informed pedagogical models, which could significantly enhance educational equity, engagement, and efficacy [1].

Recognizing these transformative possibilities, Greek national strategic initiatives including the 2020–2025 Digital Strategy and the European Union's National Recovery and Resilience Plan under the "Greece 2.0" framework explicitly foreground the digital transformation of education as a critical priority. These policy documents articulate a vision for embedding AI and other emerging technologies as integral components of teaching and learning infrastructures. Furthermore, the 2022 reform of the national primary curriculum explicitly advocates for the comprehensive utilization of advanced digital technologies to foster research skills, creativity, and critical thinking among learners [2]. Nonetheless, despite these policy imperatives and the enthusiasm of certain educational actors, the actual implementation of AI in Greek primary classrooms remains nascent and uneven, constrained by infrastructure limitations, varying teacher readiness, and ethical concerns [3].

Key barriers persist, including disparities in digital infrastructure across urban and rural schools, varying levels of teacher digital literacy and readiness, and ethical concerns surrounding data privacy, algorithmic transparency, and equitable access. Moreover, there exists a critical need to ensure that AI tools are not adopted as mere technological add-ons but are meaningfully integrated within pedagogical frameworks that prioritize learner-centered education and inclusive practices [4].

This paper aims to provide a comprehensive, multidisciplinary review of AI integration in Greek primary education, analyzing its evolution and current state through four interrelated dimensions:

- (a) national policy developments,*
- (b) classroom practices and AI-enhanced pedagogy,*
- (c) teacher training and professional development and*
- (d) student learning outcomes.*

Drawing upon an extensive review of Greek and European policy documents, international case studies, and prior research on ICT integration, this study situates AI adoption within the broader context of digital transformation in education and educational change theory [1–3]. Through this analysis, the article seeks to elucidate the opportunities, challenges, and critical success factors for embedding AI in primary education in Greece, with implications for policymakers, practitioners, and researchers alike.

2. National Policy Developments in AI for Education (Expanded)

The evolution of national policy frameworks in Greece concerning Artificial Intelligence (AI) in education is deeply embedded within the broader governmental agenda of digital transformation and innovation. Over the past decade, the Greek state has progressively formulated legislative measures and strategic plans aimed at enhancing digital competencies among learners and educators, thereby setting the stage for AI integration in schools. Initially, policies predominantly focused on the incorporation of Information and Communication Technologies (ICT), which provided critical infrastructural and pedagogical foundations. More recently, there has been a discernible shift toward explicitly acknowledging the potential of AI to transform educational processes.

*A pivotal legislative milestone is **Law 4692/2020**, which established “Skills Labs” across primary and secondary educational institutions. These labs are envisioned as experimental spaces designed to cultivate computational thinking, digital skills, and creative problem-solving among students. Importantly, the legislation anticipates that Skills Labs could incorporate AI literacy activities, fostering early-stage understanding of algorithmic principles, ethical considerations surrounding automated decision-making, and practical engagement with AI-powered educational tools [4]. This initiative aligns with global educational trends emphasizing STEM (Science, Technology, Engineering, and Mathematics) and STEAM education, thereby positioning AI as an interdisciplinary catalyst.*

*Further policy development is embodied in **Law 4823/2021**, which mandates curriculum upgrades aimed at cultivating robust digital skills within the student population. This law implicitly endorses the integration of AI-related competencies, framing digital literacy not merely as operational knowledge of devices but as a sophisticated understanding of emerging technologies and their societal implications. Complementing this, **Law 4509/2022** introduced in-school digital clubs, which provide structured extracurricular environments for students to engage with robotics, coding, online safety, and importantly, AI projects. For example, these clubs facilitate hands-on activities such as designing basic AI chatbots or employing image-recognition software in scientific inquiry, thereby nurturing experiential learning and digital creativity [5].*

*Although Greece has yet to promulgate AI-specific legislation tailored exclusively to primary education, policy rhetoric increasingly intertwines “digital competencies” with advanced technological literacies. This conceptual evolution reflects the alignment of national strategies with the European Union’s **Digital Education Action Plan (2021–2027)**, which advocates for the embedding of AI education to promote inclusive, high-quality, and innovative learning environments across member states [6].*

*The strategic plan “**Greece 2.0**”, part of the EU’s Recovery and Resilience Facility, allocates significant funding aimed at upgrading school infrastructure, thereby enabling the development of AI-ready environments. Such investments include the provision of high-speed internet connectivity, acquisition of modern digital devices, and implementation of cloud-based learning management systems capable of integrating AI-driven plugins. These infrastructural enhancements are critical for overcoming the technical barriers that have historically impeded the widespread adoption of advanced educational technologies in Greek schools.*

Looking ahead, national strategies envisage the gradual curricular integration of AI concepts, following UNESCO’s guidelines on AI literacy, which advocate for the inclusion of ethical, technical, and societal dimensions of AI from early educational stages. This strategic foresight emphasizes the importance of equipping future generations not only with operational skills but also with critical awareness to navigate the increasingly AI-mediated world.

Nonetheless, while these policy frameworks establish a promising foundation, the translation of legislative intent into practical, classroom-level implementation remains a complex challenge. Effective policy enactment will require coordinated efforts to address disparities in infrastructure, teacher

training, and pedagogical innovation, ensuring that AI integration is equitable and educationally meaningful.

3. Classroom Practices and AI-Enhanced Pedagogy (Expanded)

The practical application of Artificial Intelligence within Greek primary classrooms remains predominantly in an emergent and experimental phase, yet early indicators suggest promising pedagogical transformations. Traditionally, digital education in Greece has relied heavily on established Information and Communication Technologies (ICT) such as desktop computers, interactive whiteboards, and multimedia projectors to support lesson delivery and student engagement [1]. However, AI introduces a qualitatively distinct paradigm by enabling adaptive, learner-centered environments that respond dynamically to individual needs and preferences.

In recent years, a subset of educators has begun to pilot AI-powered tools, thereby exploring their potential to augment classroom instruction and student learning experiences. Among these innovations, adaptive learning platforms have garnered particular attention. These platforms utilize AI algorithms to analyze students' performance data in real-time, enabling the customization of exercises and learning pathways to match individual proficiency levels. Such personalization has been linked to enhanced motivation and differentiated instruction, which is especially beneficial in heterogeneous classrooms with diverse learner profiles [7].

Complementing adaptive platforms are AI-driven language learning applications that incorporate speech recognition and pronunciation feedback. These tools provide instantaneous, tailored corrections, supporting the development of oral language skills through continuous, individualized practice. Furthermore, automated quiz generators, underpinned by AI, facilitate formative assessment by enabling teachers to efficiently create diverse evaluation instruments that provide immediate feedback, thereby promoting iterative learning cycles [7].

Innovative AI applications extend to subject-specific domains, such as the use of image and object recognition tools to enrich science education. For example, AI-enabled visual recognition software assists students in identifying plant species or geological formations during fieldwork, thus fostering inquiry-based and experiential learning approaches. These applications exemplify the potential for AI to act as a catalyst for active exploration and knowledge construction, aligning closely with constructivist pedagogical theories [8].

Notwithstanding these developments, the deployment of AI in Greek classrooms is not uniform. Schools located in rural or socioeconomically disadvantaged areas often contend with limited access to the necessary technological infrastructure, thereby constraining their ability to fully harness AI functionalities. In such contexts, even modest AI features embedded within educational software can yield meaningful benefits by providing differentiated learning tasks within a single lesson, thus supporting inclusivity and catering to special educational needs [8].

From a pedagogical standpoint, AI tools complement progressive teaching models that emphasize active learning, student autonomy, and collaborative inquiry. For instance, digital storytelling platforms enhanced with AI-assisted editing functionalities allow learners to engage in creative narrative construction, fostering language development and digital literacy simultaneously. Similarly, simulation games powered by machine learning offer interactive environments where students can experiment with scientific phenomena, test hypotheses, and receive personalized guidance, thereby embodying experiential learning principles [9–11].

Moreover, cross-curricular applications of AI are emerging, illustrating its versatility across diverse subjects. AI-assisted translation tools support language acquisition by enabling students to comprehend and produce content in multiple languages, while AI-driven math tutoring bots provide scaffolded practice in arithmetic and problem-solving skills. Science education benefits from AI-powered simulations that dynamically respond to learner inputs, facilitating deeper conceptual understanding through interactive experimentation [12].

Despite these pedagogical affordances, widespread AI adoption in classrooms faces challenges related to teacher preparedness, curricular integration, and ethical considerations. Without comprehensive professional development and curricular frameworks that embed AI as a meaningful pedagogical resource, there is a risk that AI use may remain superficial or fragmented. Thus, advancing AI-enhanced pedagogy requires a systemic approach that aligns technological innovation with educational theory, curriculum design, and classroom realities.

4. Challenges in AI Integration

The integration of Artificial Intelligence (AI) within Greek primary education is accompanied by a constellation of complex challenges that span infrastructural, pedagogical, ethical, and organizational

domains. Addressing these multifaceted barriers is imperative for the successful and equitable deployment of AI technologies in classrooms.

4.1 Infrastructure and Access

A primary impediment to AI adoption concerns the variability and often insufficiency of digital infrastructure across Greek primary schools. Despite national investments aimed at enhancing connectivity and hardware availability, disparities persist—particularly between urban centers and remote or socioeconomically disadvantaged areas. Many schools continue to operate with outdated computer equipment, limited broadband bandwidth, and insufficient access to modern digital devices, all of which constrain the capacity to implement AI applications that frequently demand high computational power and stable internet connectivity [14].

Moreover, the computational demands of real-time adaptive AI systems and cloud-based services present additional technical challenges. Without robust infrastructure, the performance and responsiveness of AI tools degrade, negatively impacting user experience and limiting pedagogical effectiveness. Consequently, infrastructural deficits constitute a significant structural barrier that must be addressed to ensure inclusive access to AI-enhanced education.

4.2 Time and Curriculum Pressures

Primary educators in Greece frequently navigate intensive teaching schedules with limited temporal flexibility, constraining opportunities to integrate new technologies such as AI meaningfully. The absence of explicit curriculum guidelines that embed AI-related activities often relegates such initiatives to extracurricular or supplementary status, thereby undermining their potential to transform mainstream pedagogy [1].

Without systemic curricular alignment, AI applications risk being perceived as peripheral “add-ons” rather than integral components of instructional design. This diminishes teachers’ motivation to invest time and effort into learning and implementing AI tools effectively. The challenge is thus twofold: to recalibrate curricular frameworks to accommodate AI-enabled pedagogies and to allocate sufficient instructional time for their deployment.

4.3 Ethical and Pedagogical Concerns

Ethical considerations present a critical dimension of the AI integration discourse among Greek educators. Teachers express concerns regarding data privacy, especially relating to the collection, storage, and use of student information by AI systems. The opacity of AI algorithms often described as “black boxes” further exacerbates apprehensions about the transparency and fairness of AI-generated feedback and decisions [15].

Additionally, questions arise about the reliability and validity of automated assessments, with some educators skeptical of the pedagogical appropriateness of AI-mediated evaluations. Without clear ethical guidelines and transparent algorithmic design, there is a risk that AI adoption may perpetuate biases, undermine trust, and inadvertently marginalize vulnerable student populations [16].

To navigate these concerns, the development of comprehensive ethical frameworks is essential, incorporating principles of data protection, algorithmic accountability, and inclusivity. Furthermore, integrating AI literacy within teacher training can empower educators to critically evaluate AI tools and advocate for responsible use.

5. Teacher Training and Professional Development for AI (Expanded)

The efficacy of AI integration in primary education is inextricably linked to the preparedness and professional development of teachers. Greece’s historical engagement with ICT training programs, such as the widely recognized “B-level” certification, provides a foundational model for capacity building in digital competencies [19–21]. However, the transition to AI-specific pedagogical skills requires targeted interventions that extend beyond technical proficiency to encompass pedagogical integration, ethical awareness, and ongoing professional support.

Current AI-related training offerings in Greece are limited and sporadic. Workshops and seminars primarily emphasize operational knowledge—such as coding with AI modules or navigating AI-powered assessment tools—without sufficient focus on aligning these technologies with curriculum goals and classroom realities [22–25]. The lack of continuity and follow-up support post-training further hampers sustained adoption.

Moreover, teacher motivation to embrace AI remains mixed. While some educators recognize AI’s potential to enhance engagement and personalization, others remain skeptical regarding its added value and express concerns about increased workload or technology replacing human interaction [26–27].

To address these challenges, policy measures could emulate the successful establishment of ICT coordinators by appointing designated AI coordinators within schools. These individuals would serve as

mentors and facilitators, providing ongoing guidance and fostering a community of practice around AI pedagogy [28–30].

In addition, participation in EU-funded initiatives such as eTwinning and Erasmus+ could enable Greek teachers to engage in international knowledge exchange, collaborative projects, and professional networks focused on AI in education. Embedding AI literacy comprehensively into initial teacher education and continuous professional development curricula is paramount to cultivate a workforce capable of leveraging AI effectively and ethically.

6. Student Learning Outcomes in AI-Supported Environments

Preliminary evidence from both Greek and international contexts indicates that AI-supported learning environments can positively influence student engagement, motivation, and academic achievement, particularly when instructional design effectively incorporates adaptive and interactive technologies.

AI's capacity for **personalized learning** enables tailored remediation and enrichment, allowing learners to progress at their own pace and focus on areas of difficulty. This is particularly advantageous for students with special educational needs, who benefit from differentiated support that traditional pedagogies may not consistently provide [38–39].

Beyond subject-specific knowledge, AI integration facilitates the development of **AI literacy** a critical 21st-century skill encompassing understanding of algorithmic processes, recognition of AI's applications and limitations, and critical evaluation of AI-mediated information [40–41]. Introducing these competencies by Grade 6 complements existing curricula in coding and digital safety, thereby fostering holistic digital citizenship.

However, large-scale empirical research assessing the direct impact of AI on learning outcomes remains nascent. As observed in previous ICT integration efforts, positive gains are contingent on the synergy between AI tools, pedagogical strategies, adequate resourcing, and teacher expertise [37]. Without this alignment, AI risks reinforcing existing educational inequities or becoming a technologically-driven distraction rather than a learning enhancer.

Longitudinal studies and rigorous evaluation frameworks are necessary to ascertain the long-term effects of AI on cognitive, socio-emotional, and metacognitive dimensions of learning, thereby informing evidence-based policy and practice.

7. Conclusion

The integration of Artificial Intelligence within Greek primary education is at a formative yet promising stage, characterized by growing policy interest, emergent classroom innovations, and increasing educator awareness. The legislative and infrastructural groundwork laid over the past decade, primarily through ICT initiatives, provides a critical springboard for AI adoption. Nevertheless, substantial challenges related to infrastructure disparities, teacher preparedness, ethical considerations, and curriculum alignment persist.

To transition from isolated experimentation to systematic, equitable, and effective AI integration, Greece must prioritize:

- Bridging the digital and AI readiness gap through sustained investments in infrastructure and equitable access across all schools.
- Embedding AI pedagogy within national curriculum frameworks, ensuring alignment with broader educational goals and learner-centered methodologies.
- Providing comprehensive, continuous, and context-sensitive teacher professional development focused on both technical skills and pedagogical integration.
- Establishing robust ethical guidelines and regulatory frameworks addressing data privacy, algorithmic transparency, and bias mitigation.

If these conditions are met, AI holds considerable potential to act as a transformative enabler of personalized, inclusive, and future-oriented education in Greek primary schools. This will not only enhance immediate learning experiences but also prepare young learners to navigate and contribute meaningfully to an increasingly AI-mediated society.

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ASSESSMENT OF LEARNERS' SOFT SKILLS: FORMATIVE AND SUMMATIVE EVALUATION**Nurizinova M.M.***PhD, Senior Lecturer, Sarsen Amanzholov East Kazakhstan University,
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In the modern education system, the development and assessment of soft skills are considered an essential part of improving the quality of learning. These skills enable learners to communicate effectively, engage in collaborative activities, think critically, and enhance their creativity during the learning process. Formative assessment provides opportunities for continuous monitoring of learners' progress and offers personalized support, while summative assessment allows for a systematic evaluation of outcomes at the end of a learning period. The integration of these two assessment types is crucial for increasing the efficiency of the educational process.

This study aims to establish a comprehensive system for assessing learners' soft skills by comparing formative and summative assessment methods and determining their effectiveness. Data for formative assessment (10-point scale, classroom activity, self- and peer-assessment, teacher's immediate feedback) and summative assessment (midterm and final test results, third-quarter outcomes) were collected. A sample of 20 students was analyzed using Pearson correlation in the Jamovi software. In the literature review, databases such as Scopus, Web of Science, and Google Scholar were used to analyze scientific articles describing methods of soft skills assessment and their impact on educational quality.

The statistical analysis revealed a very strong positive correlation between formative and summative assessment ($r = 0.972$, $p < 0.001$). This finding indicates that formative assessment has a significant influence on students' summative outcomes. Moreover, formative assessment

provided clear insights into learners' classroom engagement and the dynamics of their soft skills development. The results demonstrate that integrating formative and summative assessment contributes to the effective development and evaluation of learners' soft skills. Such a comprehensive approach fosters active student participation in the learning process and enhances their potential for future professional and personal success.

Аңдатпа

Қазіргі білім беру жүйесінде *soft skills* дағдыларын қалыптастыру мен бағалау оқыту сапасын арттырудың маңызды бөлігі болып саналады. Бұл дағдылар – білім алушылардың оқу процесінде тиімді қарым-қатынас жасауына, бірлескен әрекетке қатысуына, сыни тұрғыдан ойлауына және шығармашылық қабілеттерін дамытуына мүмкіндік береді. Қалыптастырушы бағалау оқу барысында білім алушының даму деңгейін үздіксіз бақылауға және жекелеген қолдау көрсетуге жағдай жасаса, жиынтық бағалау оқу кезеңі соңында алынған нәтижелерді жүйелі түрде талдауға мүмкіндік береді. Осы екі бағалау түрін үйлестіріп қолдану оқыту үдерісінің тиімділігін арттыруда өзекті болып табылады. Бұл зерттеу - білім алушылардың *soft skills* дағдыларын кешенді түрде бағалау жүйесін қалыптастыру, қалыптастырушы және жиынтық бағалау әдістерін салыстырып, олардың тиімділігін анықтауды көздейді. Зерттеу барысында қалыптастырушы бағалау (10 балдық шкала, сабақ барысындағы белсенділік, өзін-өзі және өзара бағалау, мұғалімнің жедел кері байланысы) және жиынтық бағалау (БЖБ, ТЖБ нәтижелері, 3-тоқсан қорытындысы) деректері алынды. 20 оқушыдан құралған іріктеме бойынша Latoni бағдарламасында Пирсон корреляциялық талдау жүргізілді. Әдебиеттерді іздеу процесінде Scopus, Web of Science және Google Scholar дерекқорлары қолданылып, *soft skills* бағалау әдістері мен олардың білім беру сапасына әсерін сипаттайтын ғылыми мақалалар талданды. Статистикалық талдау нәтижесінде қалыптастырушы бағалау мен жиынтық бағалау арасында өте күшті оң корреляция анықталды ($r = 0.972$, $p < 0.001$). Бұл дерек қалыптастырушы бағалаудың оқушылардың жиынтық нәтижелеріне елеулі ықпал ететінін көрсетті. Сонымен қатар, қалыптастырушы бағалау арқылы алынған деректер оқушылардың сабақ барысындағы белсенділігі мен *soft skills* дамуының динамикасын айқын бақылауға мүмкіндік берді. Зерттеу нәтижелері қалыптастырушы және жиынтық бағалауды үйлестіру білім алушылардың *soft skills* дағдыларын тиімді дамыту мен бағалауға ықпал ететінін дәлелдейді. Мұндай кешенді тәсіл оқушылардың оқу процесіне белсенді қатысуын қамтамасыз етіп, олардың болашақта кәсіби және жеке жетістіктерге жету әлеуетін арттырады.

Keywords: *soft skills, flexible skills, formative assessment, summative assessment, assessment methodology*

Кілт сөздер: *soft skills, икемді дағдылар, қалыптастырушы бағалау, жиынтық бағалау, бағалау әдістемесі*

Kіріспе

Қазіргі білім беру жүйесінде білім алушылардың оқу жетістіктерін бағалау тек академиялық біліммен шектелмей, олардың *soft skills* деп аталатын икемді дағдыларын да қамтуы қажет. *Soft skills* – бұл адамның кәсіби және әлеуметтік өмірінде тиімді әрекет етуіне мүмкіндік беретін әмбебап қабілеттер жиынтығы, оған коммуникация, командамен жұмыс, сыни тұрғыдан ойлау, креативтілік, эмоционалдық интеллект және өзін-өзі реттеу жатады [1]. Бұл дағдылардың қалыптасуы мен дамуы тек пәндік білім нәтижесінде ғана емес, сонымен қатар оқу процесінде қолданылатын бағалау әдістерінің сапасына да тікелей байланысты.

Бағалау жүйесінде екі негізгі тәсіл бар: қалыптастырушы (*formative*) және жиынтық (*summative*) бағалау [2]. Қалыптастырушы бағалау – оқу процесі барысында үздіксіз жүргізілетін, білім алушыға нақты әрі жедел кері байланыс беретін әдіс [3]. Ол білім алушының ағымдағы деңгейі мен күтілетін нәтижелері арасындағы алшақтықты анықтап, оны жетілдіру жолдарын көрсетеді [4]. Мысалы, өзара бағалау (*peer assessment*), өзін-өзі бағалау (*self-assessment*), және оқытушының егжей-тегжейлі кері байланысы – қалыптастырушы бағалаудың кең тараған құралдары. Бұл тәсіл білім алушыға өзінің күшті және әлсіз тұстарын көруге, оқу барысында қателерін түзетуге және дағдыларын біртіндеп жетілдіруге мүмкіндік береді.

Ал жиынтық бағалау – оқу кезеңінің соңында немесе белгілі бір модуль аяқталғанда жүргізілетін, білім алушының қол жеткізген нәтижелерін қорытындылауға бағытталған бағалау түрі [5]. Ол білім алушының белгілі бір кезеңдегі жетістігін объективті көрсетіп, дағдыны меңгеру деңгейін ресми түрде құжаттандырады [6]. Жиынтық бағалау әдетте тесттер, жобалық жұмыстардың қорытындылары, портфолио немесе емтихан нәтижелері арқылы жүзеге асады.

Зерттеулер көрсеткендей, қалыптастырушы және жиынтық бағалау арасындағы айырмашылықтар тек уақытпен немесе өткізу кезеңімен шектелмейді [7]. Олар сенімділікке қойылатын талаптары, бағалау критерийлерінің сипаты және ақпараттық мазмұны бойынша да ерекшеленеді. Қалыптастырушы бағалау білім алушылардың оқу мотивациясын арттырып, өзін-өзі реттеу қабілетін дамытады, ал жиынтық бағалау олардың белгілі бір дағдыларды қаншалықты меңгергенін объективті түрде айқындайды. Осы себепті жиынтық бағалауды қалыптастырушы бағалау нәтижелерінің жиынтығы ретінде қабылдау қате түсінік болып табылады [8].

Soft skills дағдыларын толыққанды бағалау үшін бұл екі тәсілді бір-бірінен бөлек емес, өзара интеграцияланған жүйе ретінде қарастыру қажет. Мұндай интеграция білім алушылардың даму динамикасын толық әрі объективті бағалауға, оқу сапасын арттыруға және оқытудың тиімділігін жоғарылатуға мүмкіндік береді. Нәтижесінде, білім беру процесі білім алушының тек академиялық жетістіктерін ғана емес, сонымен қатар оның тұлғалық және әлеуметтік қабілеттерін жан-жақты дамытуды қамтамасыз етеді.

Әдеби шолу

Білім алушылардың soft skills дағдыларын бағалау әдістерін жетілдіру мәселесі соңғы жылдары білім беру саласында кеңінен талқыланып келеді. Әртүрлі зерттеулер бұл бағыттағы бағалау тәсілдерінің алуан түрлілігін, олардың тиімділігін және оқыту процесіне ықпалын айқындайды.

Портфолио бағалау тәсілі білім алушылардың оқу жетістіктерін кешенді бағалаудың тиімді құралы ретінде қарастырылады. Индонезиядағы ерекшеленген мектептерде жүргізілген зерттеу бұл әдістің оқушылардың оқу нәтижелерін толық әрі жүйелі түрде көрсетуге, олардың жеке оқу траекториясын айқындауға мүмкіндік беретінін көрсеткен [9]. Портфолио арқылы бағалау білім алушының белгілі бір кезеңдегі академиялық және тұлғалық дамуын құжаттандыруға жағдай жасайды.

Компьютерлік тестілеу нәтижелерін оқу процесімен байланыстыру мәселесі де өзекті. Learning analytics технологиялары мұғалімдерге бағалау деректерін тиімді пайдаланып, сабақ құрылымын жетілдіруге көмектеседі [10]. Бұл тәсіл қалыптастырушы бағалаудың сапасын арттырып, оқыту процесінде жедел түзету енгізуге мүмкіндік береді. Білім алушылардың өздері әзірлеген тест материалдарын қолдану дағдыларды дамытуда тиімді екені анықталған. Мұндай әдіс білім алушылардың белсенді қатысуын арттырып, олардың сыни тұрғыдан ойлау және өзіндік бағалау қабілеттерін жетілдіреді [11].

Boud білім алушылардың болашақта дағдыларын үздіксіз жетілдіруіне бағытталған "тұрақты бағалау" (sustainable assessment) тұжырымдамасын ұсынады. Бұл тәсіл білім алушыларды өмір бойы білім алуға дайындау үшін бағалауды оқыту процесінің ажырамас бөлігі ретінде қарастырады [12].

XXI ғасырдың құзыреттері мен дағдыларын қалыптастыру және бағалау үшін инновациялық технологияларды қолдану қажеттілігі де ерекше атап өтіледі [13]. Мұндай технологиялар бағалау үдерісін дербестендіріп, әрбір білім алушының ерекшеліктерін ескере отырып, дағдылардың даму динамикасын тиімді бақылауға мүмкіндік береді.

Thornhill-Miller және әріптестері шығармашылық, сыни ойлау, коммуникация және ынтымақтастық секілді 21 ғасыр дағдыларын бағалау, сертификаттау және ілгерілету мәселелерін зерттей отырып, бұл дағдылардың болашақ жұмыс нарығы мен білім беру жүйесінде шешуші рөл атқаратынын көрсетеді. Авторлар кешенді бағалау құралдары мен халықаралық деңгейде танылатын сертификаттау жүйесін құрудың маңыздылығын атап өтеді [14].

Жалпы, қарастырылған зерттеулер soft skills дағдыларын бағалауда әртүрлі әдіснамалық тәсілдердің тиімділігін дәлелдеп, оларды интеграциялау білім алушылардың даму траекториясын жан-жақты бағалауға және оқыту сапасын арттыруға мүмкіндік беретінін көрсетеді.

Зерттеу әдістері

Зерттеу барысында әдебиеттерді іздеу бірнеше кезеңнен тұрды. Алдымен, *soft skills* ұғымын, олардың бағалау тәсілдерін, қалыптастырушы және жиынтық бағалау әдістерін қамтитын негізгі ғылыми дереккөздер анықталды. Іздеу жұмыстары халықаралық және отандық деректер қорында жүргізілді. Халықаралық дереккөздер үшін Scopus, Web of Science және Google Scholar платформалары пайдаланылды. Іздеу кілтсөздері ретінде «*soft skills*», «икемді дағдылар», «қалыптастырушы бағалау», «жиынтық бағалау», «бағалау әдістемесі» - сияқты кілт сөздер қолданылды.

Бұл зерттеу білім алушылардың *soft skills* дағдыларын қалыптастырушы және жиынтық бағалау әдістері арқылы бағалауды мақсат етті. Зерттеу барысында деректер жинау үшін аралас әдіс (*mixed-methods*) қолданылды, ол сандық және сапалық талдауды біріктірді.

Қалыптастырушы бағалау оқу процесі бойында жүзеге асырылды және ол 10 балдық шкала бойынша бағаланды. Бағалау көрсеткіштері оқушылардың сабақтағы белсенділігі, топтық жұмысқа қатысуы, өз ойын нақты жеткізуі, мәселені шешу қабілеті және ынтымақтастық дағдыларына негізделді. Әр сабақта мұғалім тарапынан жедел кері байланыс беріліп, оқушылардың өзара және өзін-өзі бағалау элементтері енгізілді.

Жиынтық бағалау деректері 9-сынып оқушыларының 3-тоқсандағы нәтижелері негізінде алынды. Жиынтық бағалауға БЖБ (біріңғай жиынтық бағалау) және ТЖБ (тоқсандық жиынтық бағалау) көрсеткіштері енгізілді. Бұл бағалау оқу кезеңінің соңында жүргізіліп, оқушылардың *soft skills* дағдыларының жалпы деңгейін анықтауға мүмкіндік берді.

Статистикалық талдау Jamovi бағдарламасында жүргізілді. Қалыптастырушы және жиынтық бағалау нәтижелері арасындағы байланыс Пирсон корреляциясы арқылы анықталды. Алынған мәліметтер деректер жиынтығы ретінде Excel форматында өңделіп, әрбір оқушының қалыптастырушы бағалау ұпайлары мен жиынтық бағалау нәтижелері енгізілді.

Осы әдіс арқылы екі бағалау түрі арасындағы өзара байланыс деңгейі анықталып, қалыптастырушы бағалаудың жиынтық нәтижеге ықпалы сандық тұрғыда дәлелденді.

Зерттеу нәтижелері

Білім алушылардың *soft skills* дағдыларын бағалау бойынша халықаралық зерттеулердің салыстырмалы талдау

Soft skills дағдыларын бағалау қазіргі білім беру жүйесінде маңызды рөл атқарады, себебі олар болашақ мамандардың кәсіби бәсекеге қабілеттілігін және еңбек нарығында табысты бейімделуін қамтамасыз етеді. Білім алушылардың бұл дағдыларын тиімді бағалау үшін қалыптастырушы және жиынтық бағалау әдістерін кешенді қолдану қажет. Қалыптастырушы бағалау оқу процесі барысында үздіксіз кері байланыс беріп, білім алушының дағдыларын жетілдіруге бағытталса, жиынтық бағалау оқу кезеңінің соңында қол жеткізілген нәтижені қорытындылауға мүмкіндік береді.

Халықаралық тәжірибелерде өзін-өзі бағалау құралдары, көп дереккөзді (360°) бағалау, қалыптастырушы бағалау рубрикалары, жобалық оқыту әдістері және заманауи цифрлық технологиялар кеңінен қолданылады. Мұндай әдістер *soft skills*-тің әртүрлі компоненттерін – коммуникация, командалық жұмыс, мәселе шешу, креативтілік, кәсібилік, этика және т.б. – жан-жақты бағалауға жағдай жасайды.

1-кестеде білім алушылардың *soft skills* дағдыларын бағалау бойынша әртүрлі зерттеулердің негізгі сипаттамалары жинақталған. Бұл кесте зерттеуіміздің әдістемелік негізін нақтылап, қалыптастырушы және жиынтық бағалау арасындағы байланыс пен олардың оқу нәтижелеріне әсерін түсіндіруге мүмкіндік береді.

Кесте 1. Білім алушылардың *soft skills* дағдыларын бағалау бойынша халықаралық зерттеулердің салыстырмалы талдауы

Авторлар, жыл	Бағалау түрі	Бағаланған дағдылар	Бағалау әдісі	Зерттеу контексті
Rieschardi және Emanuel, 2018	Өзін-өзі бағалау құралы (PassporTest)	Мәселе шешу, шешім қабылдау, уақытты басқару, өзін-өзі дамыту, эмоционалды өзін-өзі реттеу, командалық жұмыс, коммуникация, қақтығысты басқару	Сандық (онлайн өзін-өзі бағалау сауалнамасы)	Турин университеті, Италия; әртүрлі мамандықтағы бакалавр студенттері [15]

Maitra және Gopalram, 2016	Қалыптастырушы бағалау рубрикасы	Этикалық дағдылар, жазбаша/ауызша коммуникация	Аралас (сандық бағалау, сапалық плагиат тексерісі)	Инженерия кафедрасы, Үндістан; соңғы курс студенттері [16]
Davlin-Pater, 2023	Көп дереккөзді (360) бағалау құралы	Soft skills	Сандық (құрылымданған сауалнама, сенімділікті талдау	АҚШ, жоғары оқу орнынан кейінгі атлетикалық дайындық бағдарламасы [17]
Guerrero-Sosa және т.б. 2025	Мультимодальды жасанды интеллект негізіндегі құрал	Шешім қабылдау, коммуникация, креативтілік	Аралас (бейне/аудио/мәтін бойынша машиналық оқыту, үлкен тілдік модель арқылы жасалған есептер)	Кастилья-Ла-Манча университеті (Испания) [18]
Choque-Soto және Sosa-Jauregui, 2024	Аралас әдістер (жобалық оқыту)	Командалық жұмыс, коммуникация, кәсібилік, этика	Аралас (информатика және есептеу бағдарламалары үшін аккредитация критерийлері)	Ақпараттық жүйелер бағдарламасы, жоба негізінде оқыту [19]
Alt және т.б. 2023	Қалыптастырушы бағалау бойынша кері байланыс	Жеке, әлеуметтік, әдіснамалық soft skills	Сандық (жартылай least squares құрылымдық теңдеу моделін қолдану, құрылымданған кері байланыс)	Израиль университеті/колледжі, денсаулық сақтау, әлеуметтік жұмыс салалары [20]

Жиналған деректер soft skills дағдыларын бағалау тәжірибесінің мазмұны мен тәсілдері бойынша айтарлықтай алуан түрлі екенін көрсетті. Бірқатар зерттеулерде қалыптастырушы бағалау әдістері басым қолданылып, білім алушылардың оқу процесінде дағдыларын біртіндеп жетілдіруіне жағдай жасалған. Ал Davlin-Pater мен Ingols және Shapiro сияқты жұмыстарда көп дереккөзді (360°) бағалау тәсілдері пайдаланылып, бағалаудың жан-жақтылығы қамтамасыз етілген.

Бағаланған soft skills құрамына коммуникация, командалық жұмыс, шешім қабылдау, креативтілік, этика, өзін-өзі реттеу және уақытты басқару дағдылары жиі енгізілген. Сондай-ақ, Guerrero-Sosa және әріптестері көрсеткендей, жасанды интеллект пен мультимодальды талдау әдістерін қолдану бағалау сапасын арттырып, дағдыларды кешенді қадағалауға мүмкіндік береді.

Жалпы, кестеде берілген зерттеулер білім алушылардың soft skills деңгейін анықтау үшін қалыптастырушы және жиынтық бағалау тәсілдерін өзара толықтыра қолданудың тиімділігін айқындайды. Мұндай сабақтастыру бағалаудың дәлдігін арттырып қана қоймай, оқу процесінің өзінде дағдыларды дамытуға жағдай жасайды.

Білім алушылардың soft skills (әлеуметтік-коммуникативтік) дағдыларын бағалау

Білім алушылардың soft skills (әлеуметтік-коммуникативтік) дағдыларын бағалау – бұл олардың сыни ойлау, командалық жұмыс, уақытты басқару, стрессті басқару, коммуникация және лидерлік сияқты әмбебап дағдыларын анықтау және дамыту үшін маңызды процесс. Бұл дағдылар кәсіби табыстылықтың негізгі факторларының бірі болып саналады, сондықтан оларды оқу барысында жүйелі түрде бағалау қажет.



Сурет 1. Soft skills дағдыларын бағалау әдістерінің моделі

Бақылау және практикалық тапсырмалар – топтық жобалар арқылы білім алушылардың бірлесіп жұмыс істеу қабілетін, рөлдерді тиімді бөлуін және ұйымдастыру шеберлігін анықтауға бағытталған. Рөлдік ойындар нақты жағдаяттарды модельдеу арқылы коммуникация, шешім қабылдау және эмоцияны басқару дағдыларын тексереді. Презентациялар мен пікірталастар сөйлеу мәдениетін, аудиториямен байланыс орнату және ойды дәлелді жеткізу қабілетін бағалайды.

Өзін-өзі бағалау және өзара кері байланыс – анкеталар мен сауалнамалар арқылы білім алушы өз дағдыларын белгілі бір шкала бойынша бағалайды. Рефлексия кезеңінде оқытушы мен топ мүшелері тарапынан берілетін ауызша немесе жазбаша пікірлер білім алушының өзін-өзі дамытуына мүмкіндік береді.

Психологиялық тесттер және кейс-әдістер – EQ (эмоционалды интеллект) тесттері білім алушының эмоцияларды басқару, эмпатия және әлеуметтік бейімделу деңгейін анықтайды. Кейс-зерттеулер өмірлік жағдайларды талдау арқылы сыни ойлау, логикалық шешім қабылдау және креативтілік деңгейін бағалайды.

Жазбаша жұмыстар және портфолио – эссе мен рефлексивті журналдар білім алушының ойлау стилін, өзін-өзі талдау және жазбаша сөйлеу қабілетін көрсетеді. Портфолио білім алушының жетістіктерін, қатысқан іс-шаралары мен жобаларын жинақтайды.

Бұл модель *soft skills* дағдыларын бағалауда әртүрлі әдістерді кешенді түрде қолданудың маңыздылығын көрсетеді және қалыптастырушы бағалау мен жиынтық бағалау кезеңдерінде де тиімді пайдалануға мүмкіндік береді.

Қазіргі заманғы білім беру жүйесінде *soft skills* – яғни, әлеуметтік-коммуникативтік және тұлғалық-ұйымдастырушылық дағдыларды дамыту ерекше маңызға ие. Бұл дағдылар тек кәсіби біліммен шектелмей, білім алушылардың өмірлік және еңбек нарығындағы табыстылығын қамтамасыз етеді. *Soft skills*-ты тиімді бағалау оқыту процесінің ажырамас бөлігі болып табылады, себебі ол білім алушылардың жеке әлеуетін айқындауға, даму бағытын белгілеуге және қажетті түзетулер енгізуге мүмкіндік береді.



Сурет 2. *Soft skills* дағдылары

Коммуникация дағдысы білім алушының ойды анық әрі түсінікті жеткізуі, белсенді тыңдауы және пікір алмасу кезінде туындаған қайшылықтарды конструктивті шешу қабілеті арқылы бағаланады. Бұл көрсеткіш тиімді қарым-қатынастың барлық негізгі элементтерін қамтиды.

Командалық жұмыс барысында ынтымақтастыққа бейімділік, ортақ міндеттерді орындауда жауапкершілік алу және рөлдерді тиімді бөлу қабілеті ескеріледі. Бұл дағды ұжымдық нәтижеге жетуде маңызды рөл атқарады.

Сыни ойлау дағдысы мәселелерді терең талдай алуымен, логикалық тұрғыдан ой қорытуымен және дәлелді, негізделген шешімдер ұсына алуымен бағаланады. Ол күрделі жағдайларда тиімді шешім қабылдауға мүмкіндік береді.

Уақытты басқару дағдысы жоспар құра білу, белгіленген мерзімдерді сақтай алу және басымдықтарды дұрыс қою қабілеті арқылы анықталады. Бұл көрсеткіш оқу және жұмыс процесстерін тиімді ұйымдастыру үшін маңызды.

Лидерлік дағды басқаларды ынталандыру, маңызды шешімдерді қабылдау және топ алдында жауапкершілік алу мүмкіндігімен өлшенеді. Бұл қабілет топты мақсатқа бағыттап, нәтижеге жетелеуге ықпал етеді.

Аталған бағалау критерийлері білім алушылардың *soft skills* дағдыларын жүйелі түрде талдап, олардың дамуын бақылауға және нәтижесін бағалауға мүмкіндік береді.

Бағалау кезеңдері

Икемді дағдыларды (*soft skills*) бағалау үдерісі екі негізгі кезеңнен тұрады: қалыптастырушы және жиынтық бағалау. Екі кезең де өзара байланысқан және білім алушының дағдыларын жан-жақты бағалауға мүмкіндік береді.

Қалыптастырушы бағалау (*Formative assessment*)

Қалыптастырушы бағалау – оқу процесі барысында икемді дағдылардың даму деңгейін үздіксіз бақылау және жетілдіруді көздейтін әдіс. Оның басты мақсаты – білім алушыға оқу барысында жедел және дамытушы кері байланыс беру, дағдыны жетілдіру бойынша нақты ұсыныстар ұсыну.

Бұл кезеңде оқытушы білім алушының сабақтағы белсенділігін, топтық жұмысқа қатысуын, рөлдік ойындардағы әрекетін және өзін-өзі бағалау қабілетін үнемі қадағалап отырады. Мысалы, топтық жұмыс кезіндегі бақылау, өзін-өзі және өзара бағалау парақтары, қысқа рефлексия жазбалары мен пікір алмасулар, рөлдік ойындардағы белсенділік – қалыптастырушы бағалаудың негізгі құралдары болып табылады. Бұл тәсіл білім алушыға тек нәтижеге емес, сонымен қатар дағдыны қалыптастыру үдерісіне назар аударуға мүмкіндік береді.

Жиынтық бағалау (*Summative assessment*)

Жиынтық бағалау – оқу кезеңінің соңында білім алушының икемді дағдыларын қорытынды бағалау және оны құжаттау үдерісі. Оның басты ерекшелігі – білім алушының белгілі бір кезеңдегі (семестр, курс немесе оқу жылы) жетістігін нәтижеге бағытталған өлшемдер арқылы анықтау.

Жиынтық бағалау барысында білім алушының жинаған портфолиосы, финалдық презентациялардағы сөйлеу және ойды жеткізу шеберлігі, кейс-тапсырмалар шешімінің сапасы, сондай-ақ жазбаша эссе арқылы көрсеткен аналитикалық және рефлексиялық қабілеті бағаланады. Бұл кезең білім алушының алған дағдыларын қаншалықты меңгергенін және оларды нақты жағдайда қолдана алу деңгейін анықтауға мүмкіндік береді.

Қалыптастырушы және жиынтық бағалау арасындағы байланыс

Зерттеу жұмысының маңызды кезеңдерінің бірі – білім алушылардың *soft skills* дағдыларын бағалауда қолданылған қалыптастырушы және жиынтық бағалау нәтижелері арасындағы өзара байланысты талдау. Бұл мақсатта Пирсон корреляция коэффициенті (*Pearson's r*) есептелді.

Қалыптастырушы бағалау көрсеткіштері оқу процесі барысында білім алушылардың коммуникативтік қабілеті, бірлесіп жұмыс істеу дағдылары, көшбасшылық қасиеттері, жауапкершілігі және шығармашылық ойлау қабілеті сияқты *soft skills* компоненттерін күнделікті бақылау мен тапсырмаларды орындау нәтижелеріне сүйене отырып анықталды. Бұл бағалау түрі 10 балдық шкала бойынша жүргізіліп, оқушылардың сабақ барысындағы белсенділігі мен дағдыларын кешенді түрде көрсетеді.

Жиынтық бағалау көрсеткіштері тоқсандық білім жетістіктерін бағалау жүйесіне сәйкес, үш рет өткізілген бөлім бойынша жиынтық бағалау (БЖБ1, БЖБ2, БЖБ3) және тоқсандық жиынтық бағалау (ТЖБ) нәтижелерінен алынды. Бұл бағалау түрлері оқу бағдарламасының бөлімдері бойынша білім, білік және дағдылардың меңгерілу деңгейін өлшейді.

Алынған деректер *Jatovi* статистикалық бағдарламалық қамтамасыз етуінде өңделіп, қалыптастырушы бағалау мен әрбір жиынтық бағалау түрінің арасындағы өзара байланыс дәрежесі мен бағыты анықталды. Корреляция коэффициентінің (*r*) мәні екі айнымалы арасындағы сызықтық байланыстың күшін және бағытын сипаттайды:

– $r > 0$ – оң корреляция (бір айнымалы артқанда екіншісі де артады);

– $r < 0$ – теріс корреляция (бір айнымалы артқанда екіншісі азаяды);

– $|r| \geq 0.70$ – өте күшті байланыс; $0.50 \leq |r| < 0.70$ – күшті байланыс; $0.30 \leq |r| < 0.50$ – орташа байланыс; $|r| < 0.30$ – әлсіз байланыс.

Маңыздылық деңгейі (*p-value*) арқылы байланыс статистикалық тұрғыдан сенімді екені тексерілді. Егер $p < 0.05$ болса, корреляция мәні статистикалық тұрғыдан мәнді деп есептеледі.

Бұл талдау арқылы қалыптастырушы бағалаудың оқушылардың жиынтық бағалау нәтижелеріне ықпалы, яғни күнделікті дағды мен белсенділік деңгейінің тоқсандық қорытынды жетістіктермен байланысы анықталды. Мұндай әдіс *soft skills* дамуы мен академиялық жетістіктер арасындағы тікелей байланысты нақтылау үшін тиімді құрал болып табылады.

Зерттеу нәтижесінде қалыптастырушы бағалау мен жиынтық бағалаудың барлық компоненттері арасында оң және күшті корреляциялық байланыс анықталды. Пирсон корреляция коэффициенті (r) мәндері барлық жұптасқан айнымалылар үшін жоғары, ал маңыздылық деңгейі (p -value) < 0.001 болып шықты, бұл байланыстардың статистикалық тұрғыдан сенімді екенін көрсетеді.

Кесте 2. Қалыптастырушы және жиынтық бағалау көрсеткіштері арасындағы Пирсон корреляция матрицасы

		Қалыптастырушы бағалау	БЖБ1	БЖБ2	БЖБ3	ТЖБ
Қалыптастырушы бағалау	Pearson's r	—				
	df	—				
	p -value	—				
БЖБ1	Pearson's r	0.784	—			
	df	18	—			
	p -value	<.001	—			
БЖБ2	Pearson's r	0.899	0.781	—		
	df	18	18	—		
	p -value	<.001	<.001	—		
БЖБ3	Pearson's r	0.905	0.791	0.854	—	
	df	18	18	18	—	
	p -value	<.001	<.001	<.001	—	
ТЖБ	Pearson's r	0.972	0.742	0.836	0.895	—
	df	18	18	18	18	—
	p -value	<.001	<.001	<.001	<.001	—

Атап айтқанда, қалыптастырушы бағалау мен БЖБ1 арасында $r = 0.784$ ($p < 0.001$), қалыптастырушы бағалау мен БЖБ2 арасында $r = 0.899$ ($p < 0.001$), қалыптастырушы бағалау мен БЖБ3 арасында $r = 0.905$ ($p < 0.001$) деңгейінде күшті оң корреляция байқалды. Ең жоғары байланыс қалыптастырушы бағалау мен ТЖБ арасында анықталды — $r = 0.972$ ($p < 0.001$), бұл қалыптастырушы бағалау нәтижелерінің тоқсандық жиынтық бағалауға айтарлықтай әсер ететінін айғақтайды.

Сонымен қатар, жиынтық бағалаудың ішкі компоненттерінің өзара байланысы да жоғары болды:

БЖБ1 мен БЖБ2 арасында $r = 0.781$ ($p < 0.001$),
 БЖБ1 мен БЖБ3 арасында $r = 0.791$ ($p < 0.001$),
 БЖБ1 мен ТЖБ арасында $r = 0.742$ ($p < 0.001$),
 БЖБ2 мен БЖБ3 арасында $r = 0.854$ ($p < 0.001$),
 БЖБ2 мен ТЖБ арасында $r = 0.836$ ($p < 0.001$),
 БЖБ3 пен ТЖБ арасында $r = 0.895$ ($p < 0.001$).

Бұл нәтижелер қалыптастырушы бағалаудың оқушылардың аралық және қорытынды білім жетістіктерімен тығыз байланысты екенін, яғни оқу процесіндегі үздіксіз бағалау жүйесі жиынтық нәтижелердің сенімді болжамшысы бола алатынын дәлелдейді.

Бұл зерттеуде білім алушылардың *soft skills* дағдыларын бағалауда қалыптастырушы бағалау нәтижелері мен жиынтық бағалау нәтижелері арасындағы өзара байланысты анықтау мақсатында Пирсон корреляция коэффициенті есептелді. Қалыптастырушы бағалау деректері оқу процесі барысында күнделікті, жүйелі түрде жиналған ұпайларға негізделді, ал жиынтық бағалау деректері тоқсандық БЖБ және ТЖБ нәтижелерінің жиынтығынан алынды. Корреляцияны анықтау үшін *Lamovi* бағдарламасы қолданылып, байланыс күшін (r) және маңыздылық деңгейін (p) анықтауға мүмкіндік берді.

Кесте 3. Қалыптастырушы және жиынтық бағалау нәтижелері арасындағы корреляция матрицасы

	Қалыптастырушы бағалау	Жиынтық бағалау
Қалыптастырушы бағалау	Pearson's r	—
	df	—
	p -value	—
Жиынтық бағалау	Pearson's r	0.972
	df	18
	p -value	< .001

Корреляция матрицасы қалыптастырушы бағалау мен жиынтық бағалау арасындағы өте жоғары және оң бағыттағы байланысты көрсетті ($r = 0.972$, $p < 0.001$). Бұл нәтиже қалыптастырушы бағалауда жоғары көрсеткішке ие болған білім алушылардың жиынтық бағалауда да жоғары нәтижеге қол жеткізетінін айқындайды. Мұндай күшті және статистикалық тұрғыдан маңызды байланыс қалыптастырушы бағалаудың білім алушылардың дағдыларын дамытуда және қорытынды нәтижеге жетуде тиімді құрал екенін дәлелдейді.

Қалыптастырушы бағалау оқушылардың оқу барысындағы жетістіктерін үздіксіз бақылап, дер кезінде кері байланыс беруге мүмкіндік береді, ал жиынтық бағалау олардың белгілі бір кезеңдегі жалпы жетістігін қорытындылайды. Екі әдісті үйлестіріп қолдану білім алушылардың *soft skills* дағдыларын кешенді дамытуға, олардың өзін-өзі бағалау, коммуникация, ынтымақтастық және сын тұрғысынан ойлау қабілеттерін арттыруға ықпал етеді.

Сондықтан да білім беру тәжірибесінде қалыптастырушы және жиынтық бағалауды бір-бірін толықтыратын өзара байланысты жүйе ретінде қарастыру қажет. Мұндай тәсіл оқушылардың тек пәндік білімін ғана емес, сонымен қатар ХХІ ғасыр дағдыларын меңгеру деңгейін объективті әрі тиімді бағалауға мүмкіндік береді.

Талқылау

Бұл зерттеу нәтижелері білім алушылардың *soft skills* дағдыларын бағалауда қалыптастырушы және жиынтық бағалау әдістерін үйлестіріп қолданудың маңыздылығын көрсетеді. Пирсон корреляциясы бойынша алынған өте жоғары оң байланыс ($r = 0.972$, $p < 0.001$) қалыптастырушы бағалау нәтижелері мен жиынтық бағалау көрсеткіштері арасында тығыз өзара байланыс бар екенін дәлелдейді. Бұл дерек қалыптастырушы бағалаудың тек ағымдағы оқу жетістігін бақылау құралы ғана емес, сонымен қатар қорытынды нәтижеге тікелей әсер ететін маңызды фактор екенін көрсетеді.

Қалыптастырушы бағалау оқу процесі барысында үздіксіз жүргізілетіндіктен, ол оқушыларға дер кезінде кері байланыс беруге, қателерін түзетуге және дағдыларын жетілдіруге мүмкіндік береді. Мысалы, Kutz және Stiltner қалыптастырушы бағалау шеңберінде жүйелі түрде берілетін кері байланыстың қарым-қатынас пен ынтымақтастық сияқты негізгі *soft skills* дағдыларын дамытуда маңызды рөл атқаратынын атап өтеді [21]. Сондай-ақ, Ngamskulrungraj зерттеуі белсенді оқыту әдістері мен өзара бағалаудың білім алушылардың *soft skills* көрсеткіштерін едәуір арттырғанын дәлелдейді [22].

Жиынтық бағалау болса, оқу кезеңінің соңында білім алушылардың белгілі бір уақыт аралығындағы жинақталған жетістігін өлшейді. Franco-Angel және әріптестері жүргізген зерттеуде қатты (*hard*) және икемді (*soft*) дағдыларды үйлестіре меңгерген түлектердің кәсіби ортада табысты болу ықтималдығы жоғары екені анықталған [23]. Ал жұмыс берушілердің түлектердің *soft skills* деңгейіне берген бағалары жиынтық бағалаудың объективтілігін арттыруға көмектеседі [24].

Бұл екі тәсілді бірге қолдану – бір жағынан оқу барысында білім алушылардың дағдыларын дамытуға, екінші жағынан олардың дайындық деңгейін нақты анықтауға мүмкіндік береді. Dzhyrlyo және әріптестері атап өткендей, *soft skills* – уақыт өте қалыптасатын, әр сала мен контекстке бейімделетін “*wicked competences*”, сондықтан оларды бағалау стандартталған және жүйелі болуы тиіс [25]. Осыған байланысты David және Saeiroog білім беру бағдарламаларында *soft skills* дағдыларын бағалау критерийлерін айқын белгілеу қажеттігін ұсынады [26]. Ал Balcar және әріптестерінің еңбегі түлектердің *soft skills* деңгейі жоғары болған сайын еңбек нарығында бәсекеге қабілеттілігі де арта түсетінін көрсетеді [27].

Осылайша, қалыптастырушы және жиынтық бағалауды кешенді түрде қолдану білім алушылардың *soft skills* дағдыларын толық әрі әділ бағалауға мүмкіндік береді. Бұл тәсіл оқытудың тиімділігін арттырып қана қоймай, білім алушыларды ХХІ ғасырдың қарқынды өзгеретін кәсіби ортасына дайындайды.

Қорытынды

Бұл зерттеу білім алушылардың *soft skills* дағдыларын бағалауда қалыптастырушы және жиынтық бағалау тәсілдерінің өзара байланысын анықтауға бағытталды. Жүргізілген статистикалық талдау нәтижелері, атап айтқанда Пирсон корреляциясы ($r = 0.972$, $p < 0.001$), екі бағалау түрі арасында өте күшті және оң корреляция бар екенін көрсетті. Бұл дерек қалыптастырушы бағалау жүйелі түрде жүргізілген жағдайда, оның жиынтық бағалау нәтижелерін айтарлықтай жақсартуға ықпал ететінін дәлелдейді.

Қалыптастырушы бағалау оқу процесінің әр кезеңінде оқушылардың жетістіктерін қадағалап, нақты уақыт режимінде кері байланыс беруге мүмкіндік береді. Бұл әдіс оқушылардың өз қателерін түзетуіне, дағдыларын жетілдіруіне және өзін-өзі бағалау қабілетін дамытуға әсер етті. Ал жиынтық бағалау оқу кезеңінің соңында алынатын нәтижелерді қорытындылап, дағдылардың қалыптасу деңгейін кешенді түрде бағалайды.

Зерттеу нәтижелері көрсеткендей, *soft skills* дағдыларын дамытуда қалыптастырушы бағалаудың тиімділігі зор, себебі ол оқушыны белсенді оқу үдерісіне тартады, ынталандырады және дағдыларды біртіндеп қалыптастыруға жағдай жасайды. Жиынтық бағалау бұл процесінің соңғы нәтижесін бекітіп, оқушының дағдыларды меңгеру деңгейін анықтайды.

Осылайша, қалыптастырушы және жиынтық бағалау бір-бірін толықтыратын, өзара тәуелді екі бағалау әдісі болып табылады. Оларды бірге қолдану *soft skills* дағдыларын дамытудың тиімді жолы болып саналады. Бұл тәсіл оқушылардың ХХІ ғасыр талаптарына сай, бәсекеге қабілетті, кәсіби және тұлғалық қасиеттері дамыған азамат ретінде қалыптасуына ықпал етеді.

Алғыс

Бұл зерттеу Қазақстан Республикасы Ғылым және жоғары білім министрлігінің Ғылымкомитеті тарапынан қаржыландырылды (BR28713097 «Креативті тәрбие мен STEM білімді интеграциялау негізінде оқушылардың икемді дағдыларын қалыптастыру: теориялық-әдіснамалық негіздері, инновациялық-практикалық іске асыру тәсілдері»)

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Philological sciences

EXPRESSION OF THE NATIONAL SPIRIT IN THE VOCABULARY OF CHILDREN'S LITERATURE

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UŞAQ ƏDƏBİYYATI LEKSİKASINDA MİLLİ RUHUN İFADƏSİ

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Children's literature in the modern era differs sharply from that of previous periods, both in terms of themes and stylistic-linguistic characteristics. This is an inevitable and natural process. In today's globalized world, where science and technology are advancing rapidly, creating works that meet the interests and demands of children is quite challenging. This is because the younger generation, who are well acquainted with modern technology and communication tools and who often master information technology better than adults, require literature that will spark their curiosity and align with their interests. From the weakening of Soviet rule and the rise of independence, the country's leadership paid special attention and care to children's literature. This care stems from the concern for the development of our native language by our national leader Heydar Aliyev and his worthy successor, President Ilham Aliyev. As a national value, children's literature differs from adult literature in its language and style. From a conceptual point of view, children's literature also arouses interest today. The study of the cognitive features of modern children's literature is one of the current issues. Therefore, the topic of this study stands out for its relevance and modernity. With the requirements of the independence period, the awakening of national consciousness among people and the formation of feelings of freedom and independence had a direct impact on the use of linguistic units in children's literature. Studying the entire lexical composition of the children's literary language that formed in such an environment makes the topic particularly relevant. In this article, the toponyms used in the language of textbooks during the independence period are selected and analyzed. The processes in the toponymic system began even before the official declaration of Azerbaijan's independence on October 18, 1991. First of all, changes were made to the names of large settlements. This process was completed in 1992. Toponyms are widely used in the literary style of the literary language. In children's literature during the years of independence, after anthroponyms, toponyms are the most commonly used onomastic unit. The use of toponyms in artistic language is significant both for the history of linguistics and stylistics. The abundance of geographical names – toponyms, oronyms, and hydronyms – in literary works is related to the author's broad knowledge. The events described by the author are directly reflected in toponyms, hydronyms, and oronyms. Writers attach special importance to toponyms, hydronyms, and oronyms in literary works. In literary style, the place where the events occur is considered an active toponym, while places mentioned only incidentally are passive toponyms depending on their usage. Depending on the features of the literary style, the author's use of various forms of toponymic units becomes more interesting. This is related to the worldview, thinking level, etc., of the characters in children's literature. The author reflects their attitude towards the toponyms used in poems and stories and creates a connection between the characters and the toponyms. The plot of part of children's literature is taken from real life. The setting of the events reflects the linguistic rules of the time. Sometimes, authors based on historical facts use ancient forms of toponyms by changing the setting of events. Often, the setting in literary works is conditional and serves stylistic functions only. In such cases, a toponym may not play a significant role in the work. The place where the events occur is closely related to the character's personality. Sometimes, place names are fictional, and the events taking place there reflect the characters' spiritual traits and worldview. These fictional toponyms are products of the writer's imagination and reflect the social origin, status in life, and key characteristics of the characters. Such toponyms add emotionality and expressiveness to the literary style and serve only the image. Toponyms in our language are classified into three types by structure: simple, derived, and compound. Toponyms formed by lexical means include simple words that do not accept any morphological markers, such as names of tribes, clans, or

settlements (e.g., Baku, Russia, Sheki). Some toponyms in this group were historically compound structures whose components and suffixes were lost over time and are now used as root words in the modern language (e.g., "We are in the land of Shirvanshahs, the capital city of Baku"). Morphologically derived toponyms are created using various lexical suffixes. Some suffixes enhance the appellative nature of a word, accelerate the dropping of secondary components, and contribute to the stabilization of the main component as an independent toponym. For example: "From neighboring countries that worshipped fire such as Afghanistan, India, and Pakistan, after hearing about this miraculous event, the fire-worship ended." (G. Ibrahimova, p. 38) "This village is blooming, its name is Baharlı." (Yusifoglu R., "Our Village", p. 8) Syntactically derived toponyms are complex lexical units formed in accordance with first and second type adjective-noun phrases. For example: "My father became a martyr in the Karabakh war." (M. Chamanli, "Qurban Bayram", p. 209) — Summary The socio-political processes such as the collapse of the Soviet Empire in the late 1980s and early 1990s and Azerbaijan's attainment of independence had a significant impact on the development of children's literature. Azerbaijan's liberation from Russian imperial rule, the events of January 20, and Armenia's occupation policy regarding Karabakh became central themes in children's literature. Naturally, these topics introduced a new lexical layer into the language. New trends also emerged in onomastics and word formation. The toponyms that appeared during this period were particularly distinctive.

Keywords: Revival period, lexical resource, textbooks, care for the language, toponyms

Müasir uşaq ədəbiyyatı istər mövzu, istərsə də dil- üslub xüsusiyyətlərinə görə əvvəlki dövrlərdən kəskin fərqlənir. Bu da qarşısıalınmaz, təbii bir prosesdir. Qloballaşan dünyamızda, elm və texnikanın belə sürətlə irəlilədiyi bir dövərdə uşaqların maraqlarına, tələblərinə cavab verən əsərlər yaratmaq olduqca çətindir. Çünki müasir texnika, kommunikasiya vasitələri ilə yaxından tanış olan, informatika texnologiyalarını böyüklərdən yaxşı mənimsəyən gənc nəsildə kitaba, nəsr və nəzm əsərlərinə maraq yaratmaq üçün onların təəccübünə səbəb olacaq, maraq dairəsinə uyğun gələcək əsərlər yazmaq lazımdır.

Sovet hakimiyyətinin zəiflədiyi müstəqilliyimizin dirçəldiyi ərəfələrdən etibarən ölkə rəhbərliyinin xüsusi diqqət və qayğısı ilk növbədə uşaq ədəbiyyatına olmuşdur. Bu qayğı və diqqət ümummilli liderimiz Heydər Əliyevin və onun layiqli davamçısı prezidentimiz İlham Əliyevin ana dilimizin inkişafına olan qayğısından irəli gəlir. Milli dəyərlərimiz sayılan uşaq ədəbiyyatı dil və üslub xüsusiyyətlərinə görə böyüklər üçün yazılan ədəbi nümunələrdən fərqlənir. Konseptlər baxımından da uşaq ədəbiyyatı müasir günümüzdə maraq doğurur. Müasir uşaq ədəbiyyatının koqnitiv xüsusiyyətlərinin öyrənilməsi də bu gün aktuallıq kəsb edən məsələlərdən sayılır. Ona görə də tədqiqat işi öz aktuallığı və müasirliyi ilə seçilir.

Müstəqillik dövrünün tələblərinə uyğun olaraq insanların milli mənlilik şüurunun oyanması, onlarda yeni azadlıq və müstəqillik hisslərinin formalaşması dil vahidlərinin uşaq ədəbiyyatında istifadəsinə birbaşa təsir göstərirdi. Belə bir mühitdə formalaşan uşaq ədəbiyyatı dilinin bütöv leksik tərkibinin öyrənilməsi mövzunu kifayət qədər aktual edir. Məqalədə müstəqillik dövründə uşaq ədəbiyyatının xüsusən də dərsləklərin dilində işlənən toponimlər seçilərək təhlil edilmişdir. Toponimik sistemdə gedən proseslər Azərbaycanın dövlət müstəqilliyinin rəsmən elan edildiyi 1991-ci ilin 18 oktyabrından daha əvvəl başlanmışdır. İlk növbədə iri yaşayış məntəqələrinin adlarında dəyişmələr başlanmışdır. Bu proses 1992-ci ildə başa çatır.(6.59s.)

Toponimlərdən ədəbi dilin bədii üslubunda geniş istifadə olunur. Müstəqillik illəri uşaq ədəbiyyatında antroponimlərdən sonra toponimlər ən işlək olan onomastik vahiddir. Bədii dildə toponimlərdən istifadənin həm dilçilik tarixi üçün, həm də üslubiyyət üçün böyük əhəmiyyəti var. Bədii əsərlərdə istifadə olunan coğrafi adların – toponimlərin, oronimlərin, hidronimlərin çoxluğu sənətkarın bilik dairəsinin genişliyi ilə bağlıdır. Müəllifin təsvir etdiyi hadisələr toponimlərdə, hidronimlərdə, oronimlərdə bilavasitə özünü göstərir. Bədii əsərlərdə toponimlərə, hidronimlərə və oronimlərə sənətkar xüsusi əhəmiyyət verir.(5.54s.)

Bədii üslubda hadisələrin cərəyan etdiyi məkan aktiv, əsərdə təsadüfən adı çəkilən yer adları isə işlənmə məqamına görə passiv toponimlərdir.(3.76s.) Bədii üslubun xüsusiyyətlərindən asılı olaraq, sənətkarın toponimik vahidlərin müxtəlif variantlarından istifadə etməsi daha maraq doğurur. Bu hal uşaq əsərlərindəki obrazların dünyagörüşü, düşüncə səviyyəsi və s. ilə bağlıdır. Müəllif şeir və hekayələrdə işlətdiyi toponimlərə öz münasibətini bildirərək, personajlarla toponimlər arasında əlaqə yaradır. (2.99s.)

Uşaq ədəbiyyatının bir qisminin süjeti həyatdan alınır. Hadisənin baş verdiyi məkan dövrün dil qanunauyğunluqlarını özündə əks etdirir. Bəzən tarixi faktlara əsaslanan müəllif hadisələrin cərəyan etdiyi yeri dəyişməklə toponimlərin qədim dövrlərdə işlənmiş variantından istifadə edir. Çox zaman

bədii əsərlərdəki məkan şərti, yalnız üslubi xüsusiyyətlərə malik olur. Toponimlərin verilməsi şərti olur. Bədii dildə hər hansı bir toponim müəyyən rol oynamır.

Bədii əsərdə baş verən məkan obrazın xarakteri ilə sırf əlaqədədir. Bəzən yer adları uydurma olur, orada baş verən hadisələr isə daha çox obrazların mənəvi cəhətlərini, dünyagörüşünü işıqlandırır. Bədii dildə uydurma toponimlər yazıçı təxəyyülünün məhsuludur. Uydurma toponimlər personajların sosial-ictimai mənşəyi, həyatda tutduğu mövqeyi, xarakterinin əsas cəhətlərini əks etdirir. Uydurma toponimlər bədii üslubda daha çox emosionallıq və ekspressivlik yaradır. Yalnız obraza xidmət edir. (4.109s.)

Dilimizdəki toponimlər quruluşuna görə 3 yerə bölünür: sadə, düzəltmə, mürəkkəb. Müasir dilimizdə də işlənən, heç bir morfoloji əlamət qəbul etməyən, sadə sözlərlə ifadə olunan qəbilə, tayfa, yer-yurd adları leksik yolla yaranan toponimlərdir. Məsələn: Bakı, Rusiya, Şəki və s. Bu qrupa daxil olan toponimlərin bir qismi tarixən mürəkkəb quruluşlu olmuşdur, zaman keçdikcə həmin toponim və etnonimlərin komponentləri, şəkilçiləri öz ilkin variantlarını itirmiş, müasir dilimizdə kök söz şəklinə düşmüşdür. Məsələn, Biz uzaq Şirvanşahlar diyarı, paytaxt Bakı şəhərindəyik(Ə. Səmədova "Əli və Zümrüdün sehirli xalçası", s. 49).

Morfoloji yolla düzələn toponimlər düzəltmə quruluşlu olub, müxtəlif leksik şəkilçilər artırılmaqla yaranmışdır. Toponim yaradıcılığında istifadə olunmuş bir qrup sözlərdə şəkilçilər yalnız sözün apelyativliyini aktivləşdirir, ikinci komponentin düşümünü sürətləndirir və düzəltmə sözlə ifadə olunmuş əsas komponentin tezliklə müstəqil şəkildə toponim kimi sabitləşməsinə təmin edir. Məsələn, Oda səcdə edən qonşu ölkələrdən Əfqanıstan, Hindistan, Pakistan məmləkətlərində də bu möcüzəli hadisəni eşidəndən sonra oda sitayışı dayandırdılar(G. İbrahimova s. 38);

Bu kənd axar-baxarlıdır

Adı isə Baharlıdır.

(Yusifovlu R. Bizim kənd, s. 8)

Sintaktik yolla düzələn toponimlər birinci və ikinci növ təyini söz birləşmələrinə uyğun mürəkkəb leksik vahidlər şəklində formalaşmışdır.(1.99 s.) Məsələn, Atam Qarabağ savaşında şəhid olmuşdur(M. Çəmənli "Qurban bayramı", s. 209).

Açar sözlər: *Dirçəliş dövrü, leksik mənbə, dərsliklər, dilə qayğı, toponimlər*

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Psychological sciences

FEATURES OF THE CONTENT OF CIVIC IDENTITY ACCORDING TO GENDER CRITERION

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ОСОБЛИВОСТІ ЗМІСТУ ГРОМАДЯНСЬКОЇ ІДЕНТИЧНОСТІ ЗА КРИТЕРІЄМ СТАТІ

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Динамічні зміни у соціально-політичному житті українців зумовили появу різних ідентичностей: етнічної, громадянської, національної, релігійної, громадянської та процесів ідентифікації. Як двобічний динамічний процес ідентифікація виявляється на рівні особистості у формі стильових і типологічних особливостей її поведінки.

Мета – розкрити змістовні характеристики громадянської ідентичності особистості за критерієм статі.

Вибірка. Всього у дослідженні взяло участь 74 особи, студентів, серед них 48 осіб – дівчата, 26 осіб – юнаки віком 16 до 24 років.

Методи. У дослідженні використано такі психодіагностичні методики: Тест «Велика п'ятірка BFI-10» (адаптація О.О. Сердюк, Б.О. Базима) - для діагностики п'яти основних факторів особистості; Методика дослідження рівня суб'єктивного контролю / РСК (Дж. Роттер) – для оцінки наявних в особистості особливостей, власне рівня її суб'єктивного контролю над різними життєвими ситуаціями; Методика «Шкала для вимірювання рівня самоповаги (М. Розенберг) - для визначення рівня самоповаги особистості; Методика «Портрет цінностей» / PVQ (Ш. Шварц, адаптація Семків І.) - для з'ясування динаміки зміни цінностей груп, які зумовлені трансформаціями в суспільстві, життєвими проблемами особистості. Методи математично-статистичної обробки даних – коефіцієнт альфа Кронбаха - для перевірки якості адаптації методик; тест Шапіро-Уїлка – для перевірки статистичних даних на нормальність розподілу по кожній з методик з метою вибору і визначення коректних методів подальшого статистичного аналізу; t-критерій Ст'юдента та U-критерію Манна-Уїтні – для здійснення порівняльного аналізу отриманих емпіричних даних; критерій Пірсона – для обробки даних з нормальним розподілом.

Виклад основного матеріалу. У результаті попарної перевірки груп досліджуваних (за t-критерієм Ст'юдента, при $p < 0,01$ і за критерієм Мана-Уїтні) встановлено середні та медіальні значення, які свідчать про суттєві відмінності за такою сталою характеристикою як стать. Серед значущих відмінностей між дівчатами і юнаками встановлено особливості громадянської ідентичності у результатах показників, а саме: дівчата ($M=19$) мають дещо більшу самоповагу порівняно з юнаками ($M=17,5$) тобто вони мають більше проявлене у самооцінці почуття власної гідності, їм також властиве ставлення до себе як до цінності.

При порівнянні груп за базовими особистісними рисами, з'ясувалося, що за параметром «екстраверсії» вони мають однаковий показник ($M=8$), тоді як за параметрами доброзичливості дівчата ($M=6$) відрізняються від юнаків ($M=5$), що свідчить про їхню більшу схильність до згоди іншими людьми, до толерування інакшості, врахуванні інтересів інших. Вони більш схильні до підтримки групової єдності, цінують мир і злагоду у міжособистісній взаємодії, виявляючи більшу ніж у юнаків схильність вбачати в інших переважно конструктивні і позитивні риси. Водночас, юнакам ($M=5$), властива дещо менша толерантність до інших. Їхнє «Я» здебільшого переважає над колективним «ми», тому вони насамперед зважають на свої потреби і на своє цілепокладання, що має вияв у не такому узгодженні властивих їм міри соціоцентризму (альтруїзму) з егоцентризмом порівняно з дівчатами.

За параметром «усвідомленості» дівчата ($M=7$) також мають переваги над юнаками ($M=6$), що свідчить про властивий їм більш свідомий самоконтроль стосовно своєї поведінки та діяльності. Їм притаманне більш розвинене порівняно з юнаками самовладання, наполегливість, дисциплінованість, організованість, скрупульозність, відповідальність, спрямованість на вирішення завдання.

За параметром «нейротизму» дівчата ($M=6$) також мають переваги над юнаками ($M=4,5$), що свідчить про розвинену в них чутливість до стресу і фрустрації. У них швидше, порівняно з юнаками, виникають негативних переживання, дратівливість, тривожність, схильність до драматизації подій, а отже й схильність до поганого настрою, інтерпретування подій в песимістичному форматі. Натомість юнака притаманні більш раціональне ставлення до життя. Вони більш спокійні і врівноважені порівняно з дівчатами людьми. Вони можуть втратити спокій і рівновагу за умов критично потужних зовнішніх впливів.

За параметром «відкритості» дівчата ($M=7$) також мають переваги над юнаками ($M=6,5$), що свідчить про їхню відкритість досвіду, чутливість до нового, до незвичного досвіду. Це зумовлюється розвинутою фантазією тощо. Юнаки виявилися більш обмеженими в колі своїх інтересів, що може свідчити про меншу міру розвиненості порівняно з дівчатами оригінальності, креативності, індивідуальності.

За вимірюваними цінностями у змісті громадянської ідентичності особистості юнаків і дівчат з'ясувалося, що дівчата ($M=3,75$) дещо переважають юнаків ($M=3,5$) за параметром «конформності», тобто саме дівчатам властиві прагнення до обмеження дій, внаслідок яких можуть виникати зміни і порушення норм, традицій, які усталені в їхньому соціумі. Вони більш схильні поводитися згідно з загальноприйнятими соціальними нормами, звичаями, очікуваннями, вимогами, стандартами. Найбільш значущою особистісною рисою у них є моральність (як дотримання соціальних норм, прийнятих у середовищі), а звідси – ввічливість, коректність тощо. Це виявляється у поведінці дівчат як вияв безумовної поваги до старших, до вищих за статусом (де другою стороною цієї ситуації є схильність людини підпорядковуватися, проте переважно тим, які потужніші за цю особу).

Це підтверджується у дівчат ($M=4,5$) і значущістю параметру «доброзичливість» порівняно з юнаками ($M=4,25$). Отже, дівчатам більш прагнення до створення благополучного середовища, схильність до надання допомоги, прагнення опікування над найближчим соціальним оточенням. Вони дещо більше ніж юнаки переймаються проблемами благополуччя, добробуту, щастя. Найважливішим вони вважають такі риси особистості як відповідальність, вірність, чесність, дружельюбність. Зазвичай у взаємодії з іншими, вони можуть стати опорою для інших.

За параметром «універсалізму» дівчата ($M=4,1$) також мають переваги над юнаками ($M=3,4$). Це свідчить про те, що дівчатам, як носіям цієї цінності характерними є толерантність, прагнення до порозуміння, захист благополуччя довкілля (людей, тварин, природи). Така універсальність зумовлює у дівчат потребу в дотриманні справедливості. Вони більш схильні порівняно з юнаками виборювати справедливість (що в політиці може бути використане у достатньо неочікуваний для самої особистості специфічний спосіб). Вони можуть виявитися публічними очільниками рухів із захисту довкілля, інтересів різного роду меншин (національних, сексуальних, рухів жінок та інших субкультур, прошарків населення). Вони схильні брати участь у різних громадських об'єднаннях, тим самим більш активно залучаючись, порівняно з юнаками, до масової суспільної практики.

За параметром «самостійності» дівчата ($M=4,5$) також мають переваги над юнаками ($M=4,25$). Це свідчить про те, що дівчатам порівняно з юнаками більше властива оригінальність думок і дій, пошук ситуації вибору. Вони більш схильні вчиняти згідно зі своїми в переконаннями орієнтуючись на своє трактування правди і кривди; більше прихильні до самостійності, незалежність від впливів середовища; більше схильні брати на себе відповідальність і самостійно контролювати власним вибором, ніж юнаки; дівчата більш складно переживають ситуацію узалежнення від інших.

За параметром «досягнення» дівчата ($M=4,2$) дещо поступаються юнакам ($M=4,5$). Це свідчить про те, що для юнаків досягнення і переживання особистого успіху є найсуттєвішою сферою докладання своїх зусиль. Вони більше ніж дівчата працюють з майбутнім, вибудовуючи системи цілей, стратегій, розробляють тактики щодо їх реалізації. Найважливішим у житті юнаків є постановка і реалізація нових цілей, саморозвиток; їм властива працьовитість, оскільки їм подобається як процес, так і результат досягання мети. Вони здатні настільки віддано

працювати над своєю метою, що згодні поступитися навіть своїм здоров'ям. Для них більш значущим, ніж для дівчат є соціальне визнання.

За параметром «влади» попередня тенденція зберігається, тобто дівчата ($M=4$) дещо поступаються юнакам ($M=4,3$). Це свідчить про те, що для юнаків прагнення нав'язати свою волю, здобути статуси і ресурси є більш характерним. Цінності влади у них насамперед мають вияв у прагненні до здобуття і накопичення ресурсів – матеріальних, соціальних, суспільних (обіймання ключових та інших керівних посад тощо).

Водночас за параметром «безпеки» дівчата ($M=4,3$) мають дещо переваги над юнаками ($M=4,2$). Це свідчить про те, що їм властива схильність до стабільності, балансу і гармонії, що дає можливість переживати відчуття безпеки. Порівняно з юнаками їх більше властиві безпечні форми взаємодії. Поміж ризиком і безпекою вони здебільшого надають перевагу безпеці й готові докладати чимало зусиль, щоб створити ситуацію запобігання потрапляння у загрозові, ризиковані та нестабільні ситуації. Вони прагнуть уникати ризиків та небезпек, уникати тих впливів, які можуть порушити їхню стабільність і спокій. Для них найважливішою з поміж інших цінностей є насамперед власна безпека, безпека значущих близьких людей, безпека спільноти.

Висновки. Проведене дослідження свідчить, що в юнацькому віці громадянська ідентичність формується під впливом як особистісних, так і соціокультурних чинників. Юнацтво демонструє різноманітні стратегії самовизначення, які проявляються через особливості самоповаги, взаємодії з іншими та оцінки соціальних норм. Дівчата виявляють більшу чутливість до міжособистісних зв'язків, схильність до толерантності та дотримання норм, тоді як юнаки більше орієнтуються на власні цілі, досягнення та соціальний статус.

Різниця у базових особистісних рисах, таких як екстраверсія, доброзичливість, усвідомленість, нейротизм та відкритість досвіду, свідчить про те, що юнацтво має диференційовані підходи до прийняття рішень і взаємодії з навколишнім середовищем. Дівчата більш схильні до конструктивного сприйняття оточення, підтримки групової єдності та проявів соціальної відповідальності, тоді як юнаки частіше проявляють раціональний, цілеспрямований та іноді егоцентричний підхід у поведінці та плануванні власних дій.

Виявлені ціннісні пріоритети також відображають відмінності у способах реалізації громадянської ідентичності. Дівчата акцентують увагу на моральності, універсальності, безпеці та самостійності в межах соціально прийнятих норм, демонструючи активну соціальну позицію та готовність до участі в колективних і громадських ініціативах. Юнаки, натомість, більше орієнтовані на досягнення, владу та самореалізацію, що проявляється у прагненні контролювати ресурси, реалізовувати власні цілі та досягати успіху у суспільному середовищі. Ці закономірності підкреслюють важливість врахування статевих і вікових особливостей при формуванні програм розвитку громадянської ідентичності та соціальної компетентності молоді юнацького віку.

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THE THERAPEUTIC POTENTIAL OF ART METHODS IN WORKING WITH ADULT CLIENTS**Zhanna Dovbyk**

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ТЕРАПЕВТИЧНИЙ ПОТЕНЦІАЛ АРТ-МЕТОДІВ У РОБОТІ З ДОРОСЛИМИ КЛІЄНТАМИ**Довбик Жанна**

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Abstract

This paper explores the therapeutic potential of art methods in psychotherapy with adult clients. It highlights that art methods, including drawing, painting, sculpting, and collage, provide a safe and effective way to express complex emotions and experiences that are difficult to articulate verbally. The paper discusses how these methods facilitate self-discovery, reduce stress, and improve mental well-being. It also emphasizes the importance of a professional art therapist's guidance in interpreting the creative process and its results. The findings suggest that integrating art methods into therapeutic practice can significantly enhance the effectiveness of psychological support for adults.

Анотація

У цій роботі досліджується терапевтичний потенціал арт-методів у психотерапевтичній роботі з дорослими клієнтами. Підкреслюється, що арт-методи, включаючи малювання, живопис, ліплення та колаж, забезпечують безпечний та ефективний спосіб вираження складних емоцій і переживань, які важко сформулювати вербально. У роботі обговорюється, як ці методи сприяють самопізнанню, зниженню стресу та покращенню психічного благополуччя. Також підкреслюється важливість професійного керівництва арттерапевта в інтерпретації творчого процесу та його результатів. Висновки свідчать, що інтеграція арт-методів у терапевтичну практику може значно підвищити ефективність психологічної допомоги дорослим.

Keywords: art therapy, adults, psychotherapy, emotional expression, self-discovery, mental health, creative process.

Ключові слова: арттерапія, дорослі, психотерапія, емоційне вираження, самопізнання, ментальне здоров'я, творчий процес.

Основна частина

Терапевтичний потенціал арт-методів в роботі з дорослими клієнтами є однією з найцікавіших і найперспективніших галузей сучасної психотерапії. Арттерапія, як цілісний підхід, використовує творчий процес для покращення фізичного, психічного та емоційного стану людини. Це особливо актуально для дорослих, які часто стикаються з психологічними бар'єрами у вербалізації своїх переживань, що може бути пов'язано з соціальними очікуваннями, страхом осуду або травматичним досвідом. Арт-методи надають можливість обійти ці бар'єри, створюючи безпечний простір для невербального самовираження [2].

Одним з основних механізмів дії арт-методів є їхня здатність активізувати праву півкулю мозку, відповідальну за образне мислення, інтуїцію та емоції. Вербальна терапія переважно працює з логікою і раціональністю, що може бути недостатньо ефективним, коли справа стосується несвідомих процесів або глибоко прихованих травм. Використання фарб, глини, паперу та інших матеріалів дозволяє клієнту "винести" внутрішні образи назовні, роблячи їх доступними для усвідомлення та опрацювання. Це стає можливим завдяки процесу екстерналізації — виведення внутрішнього конфлікту чи переживання у зовнішній, візуальний формат [1].

Важливою перевагою арт-терапії є її орієнтація на процес творення, а не на кінцевий результат. Цей підхід звільняє клієнта від тиску "створити щось гарне", дозволяючи повністю зануритися у власні переживання. Тактильна взаємодія з матеріалами — м'яття глини, рух пензля, тактильні відчуття від піску — сама по собі є терапевтичною. Цей фізичний аспект творчості допомагає клієнтам заземлитися, відновити зв'язок зі своїм тілом та відчувати момент «тут і зараз». Це особливо корисно для клієнтів з високим рівнем тривоги або дисоціативними станами, коли зв'язок з реальністю є порушеним.

З нейробіологічної точки зору, арт-методи ефективно впливають на вегетативну нервову систему. Дослідження показують, що творча діяльність може знижувати рівень кортизолу, гормону стресу, і підвищувати рівень серотоніну, який сприяє відчуттю благополуччя. Ритмічні та повторювані рухи, характерні для малювання чи ліплення, діють як своєрідні регулятори емоційного стану, сприяючи зниженню напруги та покращенню настрою. Крім того, робота з різними матеріалами активує сенсорні канали, що допомагає інтегрувати сенсорну інформацію та емоційні переживання, що є критично важливим у лікуванні травм [4].

Застосування арт-методів допомагає у роботі з різноманітними проблемами, включаючи стрес, тривогу, депресію, травматичні переживання, а також у випадках, коли клієнт шукає шляхи для самопізнання та особистісного зростання. Наприклад, у роботі з травмою арт-методи дозволяють клієнту створити дистанцію від болісних спогадів, перетворивши їх на візуальний об'єкт. Цей об'єкт може бути змінений, перетворений або навіть знищений, що символічно відображає процес контролю над травмою та її опрацювання. Такий підхід менш травматичний, ніж пряме вербальне відтворення травматичних подій [3].

Різнманітність арт-методів дозволяє адаптувати терапію до індивідуальних потреб клієнта. Колаж, наприклад, може використовуватися для роботи з ідентичністю та інтеграцією різних аспектів особистості. Клієнт може вирізати зображення, що відображають різні його ролі або почуття, і об'єднати їх в єдину композицію. Ліплення з глини або пластиліну є ефективним для опрацювання гніву, вираження прихованих емоцій і роботи з тілесними блоками. Терапія піском (пісочна терапія) дає можливість клієнту створити свій власний «світ у мініатюрі», де можна безпечно досліджувати складні життєві ситуації та шукати нові шляхи їх вирішення. Ці методи надають клієнтам більше свободи та гнучкості у процесі самовираження порівняно з традиційною вербальною терапією [4].

Важливим аспектом є роль арттерапевта. Він не просто спостерігає за процесом, а допомагає клієнту осмислити створені ним образи. Це не означає буквальну інтерпретацію, а скоріше сприяння діалогу між клієнтом і його роботою. Терапевт створює підтримувальне середовище, де клієнт може досліджувати власні символи та метафори. Саме в цьому процесі відбувається справжнє цілення [1].

Висновки

Використання арт-методів у роботі з дорослими клієнтами відкриває широкі можливості для ефективної психотерапевтичної допомоги. Вони забезпечують безпечний та інтуїтивний спосіб для вираження складних емоцій, що сприяє глибинному самопізнанню, опрацюванню травм і зменшенню психологічної напруги. Арт-методи є потужним інструментом для активізації внутрішніх ресурсів, розвитку креативності та пошуку нових шляхів вирішення проблем. Ефективність цих методів значною мірою залежить від професійних навичок терапевта, який створює умови для глибокого дослідження внутрішнього світу клієнта через творчість. Таким чином, інтеграція арт-методів у психотерапевтичну практику є виправданою та перспективною.

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FEATURES OF EXPERIENCING EMOTIONAL STATES IN THE PROCESS OF DECISION-MAKING BY AN INDIVIDUAL

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ОСОБЛИВОСТІ ПЕРЕЖИВАННЯ ЕМОЦІЙНИХ СТАНІВ У ПРОЦЕСІ ПРИЙНЯТТЯ РІШЕННЯ ОСОБИСТІСТЮ

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Емоційна сфера сучасної людини зазнає чималих ненормативних впливів, з чим, насамперед пов'язана її здатність виробляти і приймати коректні рішення. Розглянемо результати поглибленого вивчення взаємозв'язку між емоційним станом молоді та особливостями прийняття ними рішень.

Методики. У дослідженні використано такі психодіагностичний інструментарій: шкала депресії А. Бека (Beck Depression Inventory, A. Beck) для визначення рівня депресивних проявів; шкала тривожності Ч. Спілбергера (State-Trait Anxiety Inventory, Ch. Spielberger, адаптація Ю. Ханіна); метод діагностики рівня стресу за Р. Кеттелом (R. Cattell) для оцінки емоційної напруги; Decision-Making Test (DMT) для аналізу особливостей процесу прийняття рішень; та опитувальник емоційної стійкості (Emotional Resilience Questionnaire) для вимірювання рівня емоційної стабільності особистості.

З метою виявлення статистично значущих зв'язків між емоційними станами та стилями прийняття рішень у молоді було проведено кореляційний аналіз за коефіцієнтом Ч. Спірмена. За основні змінні взято показники тривожності, стресу, депресії, емоційної стійкості та частота використання певного стилю прийняття рішень.

Виклад основного матеріалу. У дослідженні взяло участь 148 осіб, віком від 18 до 25 років. З них, 48% чоловіки (71 особа) та 52% жінки (77 осіб).

З'ясовано, що існують статистично значущі зв'язки між емоційними станами та стилями прийняття рішень. Аналіз показує, що реактивна тривожність має позитивну кореляцію з імпульсивним стилем прийняття рішень ($r = 0.43$, $p < 0.01$), а також з унікальним ($r = 0.31$, $p < 0.05$) і залежним стилями ($r = 0.28$, $p < 0.05$). Водночас вона негативно корелює з раціональним стилем ($r = -0.22$, незначимо). Депресія позитивно корелює з імпульсивним ($r = 0.35$, $p < 0.01$) та унікальним ($r = 0.39$, $p < 0.01$) стилями, а негативно з раціональним ($r = -0.36$, $p < 0.05$). Стрес також має позитивний зв'язок з імпульсивним ($r = 0.38$, $p < 0.01$) та унікальним ($r = 0.33$, $p < 0.05$) стилями, а негативно з раціональним ($r = -0.27$, $p < 0.05$). Емоційна стійкість проявляє зворотні кореляції з імпульсивним ($r = -0.41$, $p < 0.01$) та унікальним ($r = -0.29$, $p < 0.05$) стилями, а також позитивний зв'язок з раціональним стилем ($r = 0.32$, $p < 0.05$). Інтуїтивний стиль прийняття рішень не показав значущих кореляцій із жодним із емоційних станів (таблиця 1).

Отримані результати підтверджують загальну гіпотезу про те, що негативні емоційні стани знижують ефективність когнітивних процесів, пов'язаних із прийняттям рішень, та сприяють формуванню неадаптивних стратегій поведінки. Рішення, прийняті особистістю в умовах високої тривожності чи стресу, значно відрізняються від тих рішень, що приймаються в стані емоційної стабільності. Усвідомлення особистістю цих особливостей має не лише теоретичну цінність, а й практичне значення для орієнтування молоді під час переживання кризових ситуацій.

Таблиця 1

Кореляційна матриця між емоційними станами та стилями прийняття рішень (n=148)

Змінні	Імпульсивний	Раціональний	Унікальний	Залежний	Інтуїтивний
Реактивна тривожність	0.43**	-0.22	0.31*	0.28*	0.15
Депресія	0.35**	-0.36*	0.39**	0.17	0.09
Стрес	0.38**	-0.27*	0.33*	0.23	0.12
Емоційна стійкість	-0.41**	0.32*	-0.29*	-0.14	0.11

Примітка: * $p < 0.05$, ** $p < 0.01$

Отже, високий рівень реактивної тривожності корелює позитивно з імпульсивним стилем прийняття рішень ($r = 0.43$, $p < 0.01$), що вказує на схильність таких осіб приймати рішення під впливом емоцій та миттєвих переживань. Позитивні кореляції з унікальним ($r = 0.31$, $p < 0.05$) та залежним стилями ($r = 0.28$, $p < 0.05$) свідчать про тенденцію реагувати нестандартно або шукати підтримку у інших у ситуаціях високого психологічного навантаження. Негативна, хоча і незначуща, кореляція з раціональним стилем ($r = -0.22$) вказує на потенційне зниження здатності до логічного та системного аналізу в умовах тривоги.

Кореляційний аналіз показав, що депресивні стани позитивно пов'язані з імпульсивним ($r = 0.35$, $p < 0.01$) та унікальним стилями прийняття рішень ($r = 0.39$, $p < 0.01$). Це свідчить про те, що особи з підвищеним рівнем депресії можуть ухвалювати рішення під впливом емоцій, а також демонструвати нестандартні або творчі підходи. Негативна кореляція з раціональним стилем ($r = -0.36$, $p < 0.05$) підкреслює зниження схильності до об'єктивного та системного аналізу, що може обмежувати здатність до стратегічного планування.

Стрес позитивно корелює з імпульсивним ($r = 0.38$, $p < 0.01$) та унікальним стилями ($r = 0.33$, $p < 0.05$), що відображає тенденцію приймати рішення швидко або експериментально у напружених умовах. Негативна кореляція зі раціональним стилем ($r = -0.27$, $p < 0.05$) вказує на ослаблення аналітичного мислення під впливом стресових чинників. Залежний та інтуїтивний стилі не показали значущих зв'язків зі стресом, що свідчить про меншу чутливість цих стратегій прийняття рішень до стресових станів.

Учасники з високими показниками стресу у багатьох випадках зазначали у відкритих відповідях, що приймали рішення «під впливом емоцій», «не обмірковуючи наслідки» або «інтуїтивно, без часу на роздуми». Такі свідчення надають додаткової емпіричної ваги кількісним результатам та підтверджують гіпотезу про негативний вплив високого стресу на якість процесу прийняття рішень. Стрес функціонує не лише фоновим емоційним фактором, а й активним чинником, який змінює когнітивні стратегії, коригує пріоритети мислення та знижує здатність особистості прогнозувати довгострокові наслідки власних рішень (Schwarz, Clore, 1983). Це має особливе значення для аналізу моделей поведінки молоді в умовах кризових ситуацій, де від швидкості та точності ухвалення рішень часто залежить успішність адаптації до змінного середовища.

Показник емоційної стійкості має негативні кореляції з імпульсивним ($r = -0.41$, $p < 0.01$) та унікальним стилями прийняття рішень ($r = -0.29$, $p < 0.05$), що свідчить про меншу схильність стійких емоційно осіб до необдуманих та експериментальних рішень. Позитивна кореляція з раціональним стилем ($r = 0.32$, $p < 0.05$) вказує на те, що емоційно стійкі особи частіше обирають логічний та системний підхід у прийнятті рішень (LeDoux, 1996). Відсутність значущих зв'язків з інтуїтивним і залежним стилями свідчить про те, що емоційна стійкість не суттєво впливає на ці стратегії.

Інтуїтивний стиль прийняття рішень не демонструє значущих кореляцій з жодним із досліджуваних емоційних станів. Це може свідчити про його відносну незалежність від короточасних емоційних коливань і здатність діяти на основі внутрішнього передчуття або досвіду, а не моментальних психоемоційних реакцій (Tiedens, Linton, 2001). Йдеться про активізацію механізмів сприйняття і довіри до свого емоційного досвіду в умовах обмеженого доступу до повної інформації або у періодах невизначеності.

Висновки. В юнацькому віці емоційні стани суттєво впливають на процес прийняття рішень. Високий рівень тривожності або стресу зумовлює схильність молодих людей ухвалювати рішення імпульсивно, під впливом моментальних емоцій, або шукати підтримку у оточуючих замість самостійного аналітичного оцінювання ситуації. Депресивні прояви можуть посилювати подібні тенденції, одночасно стимулюючи нестандартні або творчі підходи до розв'язання проблем, проте знижуючи здатність до системного та логічного аналізу.

Емоційна стійкість у молоді виступає захисним фактором: юнаки та дівчата з більш розвиненими навичками регуляції емоцій частіше обирають раціональний підхід, зважаючи

оцінюють наслідки своїх дій та менше піддаються впливу миттєвих переживань. Натомість інтуїтивний стиль ухвалення рішень у підлітків проявляється незалежно від короточасних емоційних коливань і спирається на внутрішній досвід та передчуття, особливо у ситуаціях невизначеності або обмеженого доступу до інформації. В юнацькому віці емоційні стани формують когнітивні стратегії та моделюють поведінку: тривога, депресія та стрес посилюють імпульсивність і експериментальність рішень, тоді як емоційна стійкість сприяє логічності, зваженості та здатності до стратегічного планування. Це підкреслює важливість розвитку емоційної регуляції та навичок самоконтролю для успішної адаптації молоді у кризових та стресових ситуаціях.

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